REPÚBLIC DEMOCRÁTICA DE TIMOR-LESTE

THE FINAL REPORT
(Volume I)

Environmental Impact Statement

for the Condensate and Products Pipeline Route Project in Timor-Leste



Prepared by

TEAM Consulting Engineering and Management Co., Ltd.

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EIS FOR THE CONDENSATE AND PRODUCTS PIPELINE ROUTE PROJECT

FINAL REPORT

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CHAPTER 1

EXECUTIVE SUMMARY

CHAPTER 1

EXECUTIVE SUMMARY

1.1 INTRODUCTION

The Environmental Impact Statement (EIS) of the *Condensate and Products Pipeline Project* (the Project) presents results of an EIA study of the Project conducted by the Consultant on behalf of the Project Proponent - TIMOR GAP, E.P. in accordance with Decree Law No.5/2011 "Environmental Licensing". The EIA study involves reviews of secondary information relevant to the Project and its potential environmental impacts, collection of secondary and primary information on existing environmental conditions of the project area, public consultations, and consultations with the Project Proponent.

The Project is to support the Betano Refinery Project, which is one of the three key projects under the Tasi Mane Project which is designated by GoTL in its Timor-Leste Strategic Development Plan 2011-2030 (SDP) as a key pillar of the nation's future development.

1.2 DETAILS OF THE PROJECT PROPONENT

The Project Proponent is TIMOR GAP, E.P. which was established in 2011 under the Decree Law No. 31/2011. Being the national oil company TIMOR GAP, E.P. conducts, on behalf of the State, oil and gas businesses covering onshore and offshore, and national to international operations. In addition to doing businesses in oil and gas to protect the interest of the country, TIMOR GAP, E.P. is also mandated to maintain energy security of the nation. In line with this mandate, TIMOR GAP, E.P. is embarking on a major investment in the Tasi Mane Project as already discussed above.

TIMOR GAP, E.P. has a mission to excel in providing services for the industry with quality, health, safety and environment. This mission is also extended to its support activities including the implementation of this Project.

1.3 DETAILS OF THE EIA CONSULTANT

The Consultant is TEAM Consulting Engineering and Management (TEAM) in association with ATT Consultants (ATT). TEAM is the lead firm.

1.3.1 TEAM Consulting Engineering and Management (TEAM)

TEAM is one of the key subsidiaries of TEAM Group of Companies (TGC). Through its subsidiaries, TGC provides comprehensive consulting services covering a complete project cycle from project conception through project planning and feasibility study, detailed design, construction supervision, and project management.

Environmental impact assessment is one of TEAM's key businesses. TEAM's experiences in EIA cover projects in various development sectors including transport, power, water resources, mass transit, mining, ports, and industry.

1.3.2 ATT Consultants (ATT)

ATT is one of the affiliated companies of TGC. It was established with the primary objective of providing engineering services for oil and gas related projects, petrochemical facilities, marine facilities, electrical power system, and industrial plants for both public and private sectors. ATT provides services in technical surveys and investigations, CADD drafting, technical due diligence, project preparation and feasibility study, detailed design, and construction supervision.

1.4 DESCRIPTION OF THE PROJECT

1.4.1 Identification of the Project

The Condensate and Products Pipeline Project is identified as a project to support the Betano Refinery Project. The Project will transport condensate from storage tanks at Suai Supply Base to Betano Refinery, and will transport light naphtha, heavy naphtha, and diesel fuel from storage tanks at the refinery to storage tanks at Suai Supply Base.

1.4.2 Category of the Project

The environmental category of the Project is category A as it will involve petroleum products.

1.4.3 Brief Description of the Nature, Size and Location of the Project

A. Project Location

The proposed pipeline is to be laid along the highway being constructed. The pipeline's right-of-way (ROW) is set at 40 m on the south side of the highway. Including the highway width of 30 m, the pipeline's ROW and the highway will form a 90 m land corridor stretching from Betano to Suai Supply Base. Its total length will be about 60 km passing the administrative areas of Manufahi, Ainaro and Covalima districts.

With its length of 60 km and width of 90 m, the combined ROW of the pipeline and the highway will occupy 5.4 km^2 of area including water areas of rivers and streams that the corridor traverses.

B. Nature and Size of the Project

By its nature and length of the pipeline, the Project could be considered as a medium scale, civil works and mechanical works project.

The Project will construct the following facilities:

(1) Pipeline

The pipeline will consist of 4 pipes designed for the refinery's future capacity of 40,000 barrels per day (BPD). The pipe will be carbon steel with adequate coating for corrosion protection. The pipeline designs follow international standards and codes. The pipes will be laid at 1-1.5 m below ground measured from its crown to the ground surface. Along its route, the pipeline will cross 25 local roads and trails.

The pipeline will cross four small rivers with widths less than 50 m and eight large rivers with widths more than 50 m. Pipe bridges will be used for river crossing.

(2) Instrumentation System

The pipeline will be equipped with appropriate instruments for monitoring and control of pressure, temperature and flow at both ends for the purposes of operational management and safety. The gathered information will be assessed and analyzed using a SCADA system to efficiently and effectively monitor and control the pipeline operation. In addition, the pipeline will be equipped with safety equipment as specified in the design standards, such as pressure reducing valves.

(3) Pumping Stations

One pumping station will be constructed at Suai Supply Base for pumping the condensate. Another pumping station will be constructed at the refinery for pumping the three products.

(4) Pigging Stations

Pigging will be used for pipeline inspection to perform various maintenance operations without stopping the flow in pipelines.

Two pigging launching/receiving stations will be installed, one close to the pumping station at Suai Supply Base, and another close to the pumping station at the refinery.

(5) Control Buildings

One control building will be required at each end of the pipeline. The two buildings will be small and can be considered minor construction works.

(6) Block Valve Stations

The Project Proponent does not see the need for block value stations. However, the need of block value stations should be confirmed in the detailed design.

1.4.4 Project Status and Schedule

Detailed engineering designs of the Project are being prepared by the EPC. The entire distance of 155.7 km had been cleared for highway construction. The area covers pipeline corridor. The required land has already been acquired by GoTL as part of the land acquisition for the highway project. As of the end of March 2016, the highway project has commenced the first phase of the highway from Suai to Zumalai about 31 km before reaching Betano.

Tentatively, TIMOR GAP, E.P. intends to commence the construction around 2017. The construction will take about 36 months to complete.

1.4.5 Justification and Need for the Project

Although this Project is not explicitly identified in the SDP, its need is evident as the refinery will need the condensate feedstock from Suai Supply Base and will have to deliver its products to Suai Base for further transport to buyers. Pipeline transport of petroleum products is commonly used as it is normally more economical than transport by tanker trucks. Therefore, the justification and need for this Project is solidly grounded on the justification and need for the Betano Refinery Project which is accorded high importance by GoTL. Without this Project, the Betano Refinery will have to transport its feed stock and products by trucks from and to Suai Supply Base. As the unit cost of transport by pipeline is lower than by tanker trucks, the Project could be justified on an economic ground.

In addition, the pipeline transport is normally more environmentally friendly than the truck transport. Therefore, the Project could also be justified on environmental ground.

1.4.6 The Proponent's Endorsement of the EIS

The Project Proponent's letter of endorsement is prepared to submit to NDPCEI.

1.4.7 The Structure of the EIS

The EIS contains all elements prescribed in the draft document on *"Minimum Requirements for an Environmental Impact Statement (MREIS)"* prepared by NDPCEI. The structure of this EIS follows as appropriate the sequence of various sections shown in MREIS.

The EIS consists of the 16 chapters and support appendices while the proposed Environmental Management Plan is presented as a separate document. The main text of the EIS is structured as follows:

Chapter 1-Executive Summary

Chapter 2-Details of the Project Proponent

Chapter 3-Details of the EIA Consultants

Chapter 4-Description of the Project

Chapter 5-Policy, Legal and Institutional Framework

Chapter 6-Description of the Environment

Chapter 7-Climate Change

Chapter 8-Alternatives

Chapter 9-Impact Assessment and Mitigation Measures

Chapter 10-Social Impact Assessment

Chapter 11-Economic Assessment

Chapter 12-Summary of Environmental Management Plan

Chapter 13-Public Consultation and Information Disclosure

Chapter 14-Difficulties Encountered

Chapter 15-Conclusions and Recommendations

Chapter 16-Non-Technical Summary

Appendices

1.5 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The policy law and regulations in environmental management, this project will have to comply with comprise:

1.5.1 Fundamental Policy and Legal Framework

Environmental management in the Democratic Republic of Timor-Leste (RDTL) is founded on Timor-Leste's Constitution of 2002, and the Environmental Basic Law, Decree Law No. 26/2012 of 4 July 2012.

1.5.2 Law Related to the EIA Process

Decree Law 5/2011 on Environmental Licensing, this law establishes procedures and mechanisms for the EIA process and the issuance of Environmental License. This law is enforced on all new private and public development projects. The issuance of environmental license to a proposed project is contingent upon submitted EIA results and environmental management plan (EMP) by the project proponent.

1.5.3 Laws and Regulations Specific to Individual Issues

Relevant Laws and Regulations are summarized in ***Table 1.5-1***.

TABLE 1.5-1
SUMMARY OF RELATED LAWS AND REGULATIONS

Aspects	Laws and Regulations
1. Social Impact Management	1. Government resolution No. 20/2014
	2. Land Acquisition and Resettlement
	- Constitution, Article 54
	- Decree Law No. 6/2011
	3. Occupational Health and Safety
	- Draft Occupational Health and Safety Law (2004)
	- The United Nations Transitional Administration in East Timor (UNTAET) Regulation 2002/05, the Labor Code for Timor-Leste
2. Petroleum Activities	Law No.13/2005 on Petroleum Activities - Article 23 (Working Practices requires operational safety and environmental protection)
3. Ecological Protection	The World Database on Protected Area (WDPA) January 2015
	Decree Law No. 6/2004 of 21 April 2004 - Article 81 (Protection of Aquatic Environment)
4. Cultural Protection	The Government Resolution No. 25/2011

1.5.4 International Conventions, Treaties, and Agreements

Timor-Leste has signed several international convention, treaties and agreement related to the environment. The relevant ones are shown and elaborate in the Main Report, Section 5.5.

1.5.5 International Policies, Guidelines and Standards

International policies, guidelines and standards relevant to environmental and social impacts of projects that are referred to by most countries are those issued by the World Health Organization (WHO), the U.S. Environmental Protection Agency (EPA), the World Bank, and the International Finance Corporation (IFC).

1.5.6 Guidelines and Standards Proposed for This Project

Environmental management of the Project during construction and operation will comply with appropriate international standards as appropriate unless the local legislation supersedes the international standards. The international ambient standards proposed for the Project are given in ***Table 5.7-1*** while the emission or source standards are given in ***Table 5.7-2*** of the Section 5.7 in the Main Report.

1.6 DESCRIPTION OF THE ENVIRONMENT

1.6.1 Setting the Study Limits

A. Geographical Study Limit

The geographical study limit is defined as an area along the pipeline route from which the Project impacts could reach and, thus, baseline environmental information should be collected. In this Study, the geographical study limit is approximately 50 m strips on both sides of the center line within the south of Right-of-Way (ROW) of highway where defined as project study area. This geographical study limit covers 6 km^2 of rectangular area along the project alignment.

The study area is in Same sub-district of Manufahi district, Hatu-Udo sub-district of Ainaro district, and Suai and Zumalai sub-districts of Covalima district.

B. Contextual Study Limit

The MREIS defines the contextual study limit to consist of five groups of components: (i) physical components; (ii) ecological components; (iii) economic components; (iv) social components; and (v) cultural components. Information on environment of the study area was compiled from secondary sources and field survey carried out by Consultant.

1.6.2 Nature along the Project Location Route

The study area with geographical limit covers 1,482.63 acres or 598.54 hectares of land. The area can be divided into 4 parts of 1) forest area, 2) agriculture area, 3) built-up area, and 4) miscellaneous area. Its brief information can be described as follows:

1) **Forest areas:** cover nearly half of the study area. The forest areas mostly consist of mixed deciduous forest and mixed deciduous forest with palm and teak, with minority of riparian forest.

2) **Agriculture Area:** covers nearly 40% of the study area. The majority of the area is mixed of paddy field, field crop and mixed orchards. There is a small area of teak and perennial plant.

3) **Built-Up Area:** covers a very small are of less than 5% of the study area. The area consists of residential area, education institute, government institute, and industrial land.

4) **Miscellaneous Area:** covers about 10% of the study area. The area is mostly idle land. There are small parts of idle land and shrubs, and water body.

The nature along the Project location route is illustrated in ***Figure 6.5-1*** in ***Chapter 6*** of the main text.

1.6.3 Physical Components

A. Climate and Meteorological Condition

Section 1 KP 0+000 to 30+000: The area in this section starts at Betano refinery until the km 30+000 of the pipeline route, located in Manufahi and Ainaro districts. The climate of the region is governed by the West Pacific Monsoon with distinct wet and dry seasons. The wet season is from December to August and the dry season from September to November. The average daily temperature vary little within the range of 23.9-28.1˚C throughout the year. The average daily relative humidity (RH) range from 73.3-85.6 percent. The average monthly rainfall in the summer range from 4.0-26.0 mm. and in the rainy season range from 54.8-266.8 mm. The average daily wind speed vary little throughout the year and range from 0.8-1.0 knots. The prevailing wind directions are southeast and northeast, respectively. The average annual evaporation is 1,633.7 mm above the average annual rainfall of 1,376 mm. The monthly evaporation range from 75.6-167.7 mm.

Section 2 KP 30+001 to 60+000: The area in this section starts at km 30+001 until the end of the pipeline route, located in Ainaro and Covalima districts. The climate of the region is governed by the West Pacific Monsoon with distinct wet and dry seasons. The wet season is from December to July and the dry season from August to November. The average daily temperature vary little within the range of 24.1-29.0 ˚C throughout the year. The average daily relative humidity (RH) range from 72.0-88.6 percent. The average annual rainfall is 1,032.0 mm. The average monthly rainfall in summer range from 9.6-26.9 mm. and in the rainy season range from 35.6-194.9 mm. The average daily wind speed vary little throughout the year and range from 0.4-7.0 m/s. The average annual evaporation is 1,217.3 mm above the average annual rainfall of 1,032.0 mm. The monthly evaporation range from 55.5-142.1 mm.

B. Topography

The first section from Sta. 16+750 (Labarai village which is close to tank farm) to Sta. 33+350 (Mola River) is mainly located at river flood plain with gentle slope area. The average elevation is between 140 m. local datum to 80 m. local datum.

The second section from Sta. 33+350 to Sta. 54+600 (Bobe Sub-Village, Foho-Ailico Village): Topography is mainly hilly slope to mountainous area with river flood plain. The average elevation is between 40 m. local datum to 180 m. local datum with peak elevation of 318 m. local datum.

The third section from Sta. 54+600 to Sta. 68+050 (The Betano Refinery): This area is mainly flood plain of Karaulan River. The average elevation is between 40 m. local datum to 60 m. local datum. The area close to the refinery is gentle slope and the average elevation is between 40 m. local datum to 65 m. local datum.

C. Geology

The condensate pipeline is underlain by Suai Formation, Baucau Limestone Formation, Bobonaro Scaly Clay Formation, Viqueque Formation, Wai Bua Formation, and Wai Luli Formation.

D. Geotechnical and Soil Engineering

Soil characteristic along the condensate pipeline can be summarized based on the topography which consists of 1) coastal and flat plain, 2) hilly or mountainous area, and 3) river flood plain. The coastal plain is underlain mainly by coastal sediment which consists of clay, silt and sand mixture. The hilly or mountainous area is underlain mainly by clayey to sandy silt with layer of sand and gravel. The river flood plain is underlain by alluvial sediment which consists of silt, sand, and gravel.

E. Hydrogeology

- **Groundwater Aquifer**

Along the condensate pipeline there are two main aquifer types as: 1) an intergranular aquifer type with high productive, and 2) a low productive localized aquifer of Wai Bua Formation. It was noted that a high productive carbonate (karst-fissured) was found between Sta. 5+000 to 10+000.

- **Groundwater Quality**

Groundwater quality survey was conducted in February and April 2016. The conductivity values between 713 to 26,131 microSiemen (µS/cm) which are much higher than standard of WHO guidelines for drinking-water quality. That mean the condition of groundwater within the study area is not good for drinking, but still applicable for domestic uses. The pH values ranged 6.77-9.06 which are within the standard of WHO guidelines for drinking-water quality. Salinity values range from 0.3 to 14.5 ppt and Total Dissolved Solids (TDS) values range from 0.66 to 24.08 g/L.

F. Seismology

Earthquake intensity is level VIII on the Modified Mercalli Scale. However, Level VIII intensity will inflict less damage to good constructions with only partial damage to building, whereas heavy damage will be inflicted to poor constructions such as movement of heavy furniture, collapse of wails and columns of building.

G. Air Quality

Volatile Organic Compounds (VOCs), Nitrogen Oxides (NO_x), and Sulfur Oxides (SO_x) were less than the limit of reporting, only Freon 12 was found greater than the limit of reporting, with the concentration of 0.8 ppbv or 4 $\mu g/m^3$.

The average PM10 concentration was approximately 29 $\mu g/m^3$ which was less than the 24-hour average concentration of U.S. EPA. Standard. (Standard value = 150 $\mu g/m^3$).

H. Noise

The primary noise source was associated with weather and vehicular traffic. The $L_{linear, peak}$ values was above 96 dB and were associated with vehicles passing the sound level meter in close proximity. The noise level within the measurement period of 15 minutes (L_{Aeq}) ranged from 45.5-56.1 dB.

I. Surface Waters

- **Hydrology**

Along the pipeline route, there are about 12 catchment areas in which four of them are very large rivers of width >500m. These rivers have water runoff throughout the year.

- **Surface Water Quality**

Surface water samples were collected at six stations for water sources to be crossed by the pipeline alignment namely the Foura River, the Loumea River, the Mola River, the Belulic River, the Ukasa River, and Karaulun River. DO and pH of all stations were within the Standard with values of 6.83-7.33 mg/L and 7.84-8.24. The overall water quality in the Rivers is suitable to be used as freshwater preservation, livestock and irrigation.

J. Marine Waters

- **Oceanography**

The result of RIMES's tsunami assessment using earthquake source along Timor Trough shows that most parts of the southern coast will be impacted by tsunami wave with the maximum inundation depth of 6 m. and maximum distance from shoreline of about 500 m. especially at the flat area.

- **Marine Water Quality**

Water temperature were within similar ranges of between 30.7°C and 31.8°C, with pH values ranged between 7.9-8.1. Conductivity value ranged between 53.2-53.6 mS/cm. Salinity varied around 35.2-35.5 ppt. The level of turbidity was in range 0.1-3.0 NTU and dissolved oxygen was relatively high, 6.11-6.62 mg/L.

The concentration of chemical substances and heavy metals were lower than the maximum concentration prescribed in ASEAN MARINE WATER QUALITY Standards and National Recommended Water Quality Criteria.

Total petroleum hydrocarbons (TPH), total recoverable hydrocarbon (TRH) and Polycyclic Aromatic Hydrocarbon (PAH) were detected at low concentration.

K. Sediment Quality

Nearshore sediment mostly consisted of sand and gravel while offshore sediment mostly consisted of sand and fines. Sediment nutrient quality was slightly low. The heavy metals including cadmium, chromium, copper, lead, nickel, zinc and mercury were within NOAA standard. That means the sediment is suitable for ecosystem.

1.6.4 Biological Components

A. Wet Land

There are no significant wetlands within condensate pipeline alignment and within 50 meters strips along both sides of the condensate pipeline.

B. Mangroves

Field survey on mangroves within condensate pipeline alignment and within 50 meters strips along both sides of the condensate pipeline was conducted in February 2016. There are no mangroves within condensate pipeline alignment and within 50 meters strips along both sides of the condensate pipeline since the area is on high evaluation beyond influence of sea water.

C. Corals

Five coral families were found, consisting of Acroporidae, Favviidae, Poritidae, Fungiidae and Dendrophyllidae. The reef flat was low in diversity and appeared to have a higher cover of sponges, hydroids, algal groups, ascidians, and Montipora corals. The reef flat drops steeply into deep water (1 to 25 m).

D. Fisheries

There is no fisheries zone adjacent to the proposed project.

E. Protected Areas and National Parks

All of the protected area are outside the condensate pipeline alignment and the study area of 50 meter strips long both sides of the condensate pipeline alignment.

F. Wildlife, Especially Any Rare, Endangered or Vulnerable Species or Habitats

- **Areas along the condensate pipeline**

There are 67 species, 60 genera in 42 families from 20 orders of wildlife comprising 13 species of mammals, 44 species of birds, 7 species of reptiles, and 3 species of amphibian.

There are 5 threatened wildlife species in conservation status according to IUCN 2015 comprising 1 endangered mammal species, 1 vulnerable mammal and 3 near

threatened mammal and bird species. There are 3 species of wildlife in List 2 (AppII) of CITES list comprising 1 mammal species and 2 bird species. There are 5 endemic species in conservation status according to Timor-Leste.

The wildlife habitat along the condensate pipeline can be classified into 3 categories as mixed deciduous forest, mixed deciduous forest intermigled with teak plantation and plam and riparian forest.

- **Within 50 strips on both sides of the Condensate Pipeline alignment**

There are 72 species 62 genera in 44 families from 20 orders within 50 meters strips on both sides of the condensate pipeline alignment comprising 13 species of mammals, 48 birds species, 48 birds species, and 3 species of amphibian.

There are 5 species of wildlife in Threatened status in n conservation status according to IUCN 2015 comprising 1 endangered mammal species, one vulnerable species, and 3 near threatened mammal and bird species. There are 3 wildlife species in List 2 (AppII) according to CITES List comprising 1 mammal species and 2 bird species. There are 5 Endemic species in conservation status according to Timor-Leste.

There are 5 types of wildlife habitat i.e. mixed Deciduous forest, mixed deciduous forest intermingled with teak plantation and palm, riparian forest , water source and connecting zone with agricultural area.

G. Forest and Flora

- **Areas along the condensate pipeline**

Along the condensate pipeline alignment there are 125.25 ha of mixed eciduous forest,137.4 ha of mixed deciduous forest intermingled with teak plantation and palm, and 20.16 ha of Riparian forest.

There is 1 vulnerable plant species in according to IUCN 2015. There are no rare, endangered or endemic species according to CITES List found. These is 1 endangered species in conservation status according to Timor-Leste.

- **Within 50 strips on both sides of the Condensate Pipeline alignment**

There are forest with at least 120 plant species. Types of forest are mixed deciduous forest, mixed deciduous forest Intermingled with teak plantation and palm, and riparian forest.

There is 1 vulnerable plant species in according to IUCN 2015. There are no rare, endangered or endemic species according to CITES List. These is 1 undangered species in conservation status according to Timor-Leste.

H. Coastal Resources

There are 1,249 planktonic fauna from 17 taxonomic groups, and 36 macroinvertebrates from 24 taxonomic groups. Three biota classes, including algae and invertebrates were identified. Coralline and turf algae were the main types of algae present

with the invertebrates mainly consisting of sea whips, sponges, crinoids and gorgonians. In addition, brittle stars (ophiuroids) and other mobile organisms as well as a total of 27 taxa were identified as inhabiting the reef platform.

1.6.5 Economic Components

A. Employment Sectors

Most of villagers in Betano Village are agriculturist and fisherman (80%). The remaining work as employee (15%) followed by government officers (2%) and unemployed persons (5%) who are adult after school or 18-60 years old.

For Foho-Ailico and Leolima villages of Hatu-Udo sub-district, Ainaro district, about 85% of households are agriculturist and the remaining is employee.

For Raimea, Tashilin and Zulo villages of Zumalai sub-district, Covalima district, they have secondary data about occupation of villagers. Most of villagers in these three villages are agriculturist followed by government employee and the business man, labour and others.

For Beco and Labarai villages of Suai sub-district, Covalima district, about 95% of households are agriculturist and the remaining is government officer and employee.

B. Infrastructure Facilities

For water supply system, Betano village had piped water supply system to support two sub-villages (Selihasan and Rai-fussa) and groundwater well supply for five sub-villages (Bemetan, Lalica, Leo-ai, Loro and Sessurai). In addition, there is irrigation system which supplies water for agriculral activities. Two villages of Hatu-Udo sub-district (Foho-Ailico and Leolima) have piped water supply system from spring water as same as with three villages (Raimea, Tashilin and Zulo) of Zumalai sub-district. For the two villages of Suai sub-district, (Beco and Labarai). Major source of water supply in these two villages are groundwater.

For electricity supply, seven villages are supplied with electricity from Betano Power Plant except for Labarai village which uses electricity supply from Suai. In addition, some households in these areas have small generators and some have solar panel and battery for lighting only during nighttime.

In case of waste and wastewater treatment system, all villages along the proposed condensate pipeline alignment have no central systems for waste management and wastewater treatment system. Excreta is disposed in cesspits while sullage is disposed of on ground. Garbage from individual households is dumped on open land around the villages or burnt.

C. Land Use

The study area is characterized by fourteen types of land use: (i) mixed deciduous forest, (ii) mixed deciduous forest, palm and teak, (iii) riparian forest, (iv) paddy

field, (v) field crop, (vi) mixed orchards perennial, (vii) teak and perennial plant, (viii) residential area, (ix) education institute, (x) government institute, (xi) industrial land, (xii) idle land, (xiii) idle land and shrubs, and (xiv) water bodies.

D. Use of Forests and Other Natural Resources

The inland forest within eight villages is resources for food, energy and medicine. Villagers collect wood for building and fuel of cooking and selling. Some medical plants in the forest are collected when necessary.

In the study area, palm leaves are used for thatching the roofs and making walls of houses. The grassland is used for grazing animals such as cattle and goat.

Villagers in eight villages apply water of the big river for irrigation system. Wells and spring water are used for household consumption. Some villagers collect rock from the river for building house base.

E. Fishing

There are no subsistence fishing in the rivers by villagers. Therefore, there is no fishing zone adjacent to the proposed project.

F. Agriculture

- **Zumalai sub-district, Covalima district**

Main crops within the three villages are maize or corn, rice, banana, sweet potato and vegetables. Average land size per household in the three villages is about 1 to 5 acres. Some households in the three villages also engage in livestock raising such as pig, chicken, cow and goat.

- **Suai sub-district, Covalima district**

Main crops within the two villages are maize or corn and rice. Average land size per household in the two villages is about 1 to 5 acres. Apart from growing crops, some households in the two villages also engage in livestock raising such as pig, chicken, cattle and goat.

- **Hatu-Udo sub-district, Ainaro district**

Main crops within the two villages are maize or corn, rice, cassava, banana, mango and vegetables. Average land size per household in the two villages is about 2 to 6 acres. Apart from growing crops, fruit trees and vegetables, some households in the two villages also engage in livestock raising such as pig, chicken, cattle, goat and fish.

- **Same sub-district, Manufahi district**

Main crops within the Betano village (Bemetan sub-village) are maize or corn, rice, cassava, banana, mango and vegetables. Average land size per household is about 1 to 2 acres. Apart from growing crops, fruit trees and vegetables, some households also engage in livestock raising as pig, chicken, cattle, goat and fish.

G. Tourism

The beach in the study area which is tourist place and recreation area is Betano beach. Betano beach is about 13 km south of the Same sub-district and 1.72 km south of pipeline route.

H. Other Industries

No industries in the project area.

I. Land Transportation

Major road nearby the Condensate pipeline alignment is paved road, about 7 m wide without median, divided traffic lane, and shoulder. Most of the local roads can be used all year round. There is very good traffic flow condition during working days and holidays.

1.6.6 Social Components

A. Population at the Village Level

- **Betano Village**

Based on 2015 census, its population was 6,071, living in 292 households, giving an average household size of about 5-6 persons.

- **Foho-Ailico Village**

Based on 2015 census, its population was 4,473, living in 1,094 households, giving an average household size of about 4-5 persons.

- **Leolima Village**

Based on secondary data of Hatu-Udo Sub-district, its population was 5,872, living in 1,470 households, giving an average household size of about 3-4 persons.

- **Raimea Village**

Based on secondary data of Zumalai Sub-district, its population was 1,757, living in 422 households, giving an average household size of about 4-5 persons.

- **Zulo Village**

Based on 2015 census, its population was 5,872, living in 607 households, giving an average household size of about 9-10 persons.

- **Tashilin Village**

Based on secondary data of Zumalai Sub-district, its population was 2,370, living in 503 households, giving an average household size of about 4-5 persons.

- **Beco Village**

Based on secondary data of Suai Sub-district, its population was 5,111, living in 986 households, giving an average household size of about 5-6 persons.

- **Labarai Village**

Based on secondary data of Suai Sub-district, its population was 2,956, living in 664 households, giving an average household size of about 4-5 persons.

B. Education

Overall, the majority of people in the study area do not have high education. A large number of people are uneducated, not completed primary school and completed only primary school. A small number of people have higher education than that.

C. Language

Four major languages are spoken in Betano Foho-Ailic, Leolima, Raimea, Tashilin, Zolu and Beco villages. Tetum Prasa and Mambai are spoken by the largest proportion of the locals (about 40% in each language), followed by Tetum Terik and Bunak. For Labarai village, more than 90% of local people speak Bunak language, the remaining are Mambai and Makasai.

D. Social Problems and Crime

- **Betano Village**

The serious problems here are poverty and land holding.

- **Leoima Village**

The serious problems in Leoima village are land dispute and sexuality violence.

- **Foho-Ailico Village**

The serious problem in Foho-Ailico village is land ownership.

- **Raimea, Zulo, Tashilin and Labarai Villages**

The serious problem in these four villages is land dispute.

- **Beco Village**

According to the key informants, there is no serious problem in this village.

E. Health Profiles of Communities

Most of the people in these eight villages are relying on the service of village hospital. Their preference is the village hospital due to better equipped than health care center available in all sub-villages where each center has only temporary doctor, one nurse, and no bed. These are alternatives for people who live nearby. Communicable diseases in the study area appear to be common cold and malaria.

F. Institutions, Schools and Health Facilities

Primary and secondary schools are available in nearly every village, except Beco where only one elementary school exists. Well, church, shop and village hall are also available in all villages. Villagers nearby the proposed condensate pipeline alignment rely on village hospital, except some communities and sub-villages which are far from the village hospital, they rely on health center of the sub-village.

G. Communities Structures and Family Structures

Based on the old cluster type of settlement and social structure, the local communities pay respect to their leaders, chiefs of villages, and the mediator in particular. Normally, there are formal social groups in the study area, responsible for community activities. For example, they gather together to serve the local needs related to religious and funeral activities.

H. Land Ownership

Some households in these communities have no land right document. Land ownership documents could be Land Certificate or Tax Receipt for residential land. Officially, land belongs to the government. However, land is controlled by family, at the local level. Land transition is within family and within village area.

I. Natural Resources Utilization

Natural resources utilizations can be classified into 3 categories of, medicine, housing and fuel.

1.6.7 Cultural Components

A. Cultural Heritage

The majority of the people here are Austronesian (Malayo-Polynesian) and Papuan, speaking four languages of Mambai, Tetum Prasa, Tetum Terik and Bunak. Among these, Mambai is preferred language. Most of the people practice Roman Catholic. Very small number of people practice Protestant/Evangelical, Muslim and others.

B. Archeological Sites and Historic Sites

There is an old port of Portuguese in the Betano sub-village. This port is located about 1.7 kilometer to the south of condensate pipeline. The other 2 historical sites are in the Ainaro district. Ave Maria Church is located in Suai sub-district, about 5.8 kilometer to the west of the condensate pipeline.

C. Sacred Sites

There is a cemetery in the Bobe sub-villages. This cemetery is located about 650 meter to the north of condensate pipeline.

D. Unique Landscape

All the natural visual components of the project area do not form a picturesque unique landscape. The current landscape quality is considered at a moderate level.

1.7 CLIMATE CHANGE

1.7.1 Historic Weather Observation and Trends

Timor-Leste submitted the National Adaptation Programme of Action in 2011 (NAPA: 2011) and Initial National Communication in 2014 (INC: 2014), respectively. According to the INC: 2014, the weather observation data of Timor-Leste during 1901-2009 includes mean monthly temperature and mean monthly rainfall, as summarized below:

- ***Temperatures:*** The monthly mean temperature in Timor-Leste ranged from 20 °C to 30 °C during the wet season and 16 °C to 27 °C during the dry season. The data shows that the annual mean temperature increased over the reporting period at an average rate of 0.016 °C/year.
- ***Rainfall:*** The highest monthly rainfall of about 250 mm was found in January and February. The lowest monthly rainfall of about 25 mm was experienced in August and September.

1.7.2 Future Projections under Projected Climate Change

According to the INC: 2014, the projections of climate change of Timor-Leste were made based on the historic weather data using the multi-model. The predicted results are summarized below:

(1) ***Temperature:*** The annual temperature over Timor-Leste is likely to increase 1° C by the year 2040. After 2040, under the high emission scenario (RCP8.5), the annual temperature may increase up to 3° C by the year 2100. The low emission scenario (RCP2.6) predicted an increase up to 0.5° C.

(2) ***Rainfall:*** In the long term, the rainfall pattern may change. According to the emission scenarios used in the projections, the beginning of the wet season may delay about 20 days, while that of the dry season is about 11 days.

1.7.3 Implications for the Proposed Project

A. Sources of Potential Impacts

(1) ***Pre-construction and Construction Phases:*** The main source of GHGs during these phases would be from operation of diesel engine equipment such as backhoes, bulldozers, and trucks, etc.

(2) ***Operation Phase:*** The main sources of GHGs during this phase would be from electricity consumed for pumping operation. Quantity of GHGs emissions at this phase would be very small and can be negligible.

(3) ***Deactivation Phase*****:** Operation of diesel engine equipment such trucks, backhoes, bulldozers, and trucks, etc., would be the main source of GHGs during this phase. Quantity of GHGs emissions at this phase would be about one-fourth of those to be used in the construction phase.

B. Predicted GHGs Emissions

A summary of GHGs emission at each phase of the project is given below:

Phase	Source	GHGs Emission (Mt of CO_2e)
Pre-construction and Construction Phases	The operation of diesel engine equipment such as backhoe, bulldozer and truck, etc.	0.0043
Operation Phase	The electricity consumed for pumping operation	-
Deactivation Phase	The operation of diesel engine equipment such as backhoe, bulldozer, and truck, etc.	0.0011

1.7.4 Evaluation of the Significance of Impacts

Based on the above prediction, an annual contribution of this Project to the GHGs emissions in Timor-Leste during all project phases could be considered Low.

1.8 ALTERNATIVES

1.8.1 Pipe Installation Alternatives

For the sections on land, the pipeline can be laid on-ground on precast concrete sleepers or other strong supporting material, or underground.

1.8.2 River Crossing Alternatives

There are four methods of pipeline river crossing: (i) open trench method; (ii) bridge connection; (iii) suspension connection; and (iv) trenchless crossing under the river bed.

For this Project, the open trench method is ruled out considering difficulties in trench excavation during high flows and damage to the river beds. The bridge connection method is ruled out as the highway bridges are not structurally designed for carrying four steel pipes and bridge vibration from traffic could damage the pipes. The trenchless methods are also considered inappropriate due to economic and technical reasons.

Therefore, the new aerial pipeline bridge method is selected for pipeline installation crossing streams and rivers. The pipeline may be supported by in-river columns or by truss structure without in-river columns.

1.9 IMPACT ASSESSMENT AND MITIGATION MEASURES

1.9.1 Impact Assessment and Mitigation Measures

Impact assessment will cover the pre-construction phase, construction phase, operational phase, and decommissioning (or deactivation) phases as appropriate. However, impact assessment of the pre-construction phase, except involuntary resettlement, should be combined with that of the construction phase for the following reasons:

- Project activities during the pre-construction and construction phases normally create similar environmental disturbances such as fugitive dust, noise, gaseous emissions, and waste disposal. Similar mitigation measures are therefore applied during the pre-construction and construction phases of the Project.
- The project construction contract always covers both the pre-construction and construction phases. Therefore, it is more practical to have only one environmental management plan (EMP) that covers both phases of the Project and implemented by one contractor.

1.9.2 Methodology and Approach

The impact assessment of this project on each environmental issue will be carried out to assess its significance. The following tasks will be carried out in steps as follows:

- Estimate Magnitude of the Environmental Issue from the relevant project information.
- Identify Best Practicable Measures to Minimize the Magnitude of the Issue through best practicable practices or measures to be implemented through design, construction method, good construction practices, and operational management, as relevant.

- Estimate the Remaining Magnitude of the Issue from the efficiency of the adopted mitigation measures reported in various references.
- Compare the Remaining Magnitude of the Issue with Applicable Source Standards
- Calculate or Estimate the Impact of the Remaining Magnitude of the Issue on Ambient Environmental Quality
- Determine the Duration and Nature of the Impact

Most primary impacts caused by construction activities and requirements are transient and reversible. Few impacts are permanent and irreversible. Examples:

- Compare the Resulting Ambient Environmental Quality with the Applicable Ambient Environmental Quality Standard.
- Determine Significance of the Impact and the priority of the environmental issue in environmental management.

The impact of an environmental issue is divided into 5 levels based on six criteria or considerations as shown in ***Table 1.9-1***.

TABLE 1.9-1

LEVEL OF IMPACT OF THE ISSUE IN ENVIRONMENT MANAGEMENT

Consideration	Level of Impact or Significance of the Issue in Environmental Management				
	Critical	**Major**	**Moderate**	**Minor**	**Insignificant**
Magnitude of the issue	Very large	Large	Medium	Small	Very small
Nature of the issue	Irreversible	Irreversible	Reversible	Reversible	Reversible
Duration of the issue	Permanent	Long	Relatively short	Short	Very short
After implementing best available measures					
- The remaining magnitude can meet the source standards	No	No	Yes	Yes	Yes
- Impacts of the remaining magnitude on ambient environmental quality					
- Resulting ambient environmental quality can meet the ambient standards	No	Yes	Yes	Yes	Yes
Sensitivity of the impacted area	Very high	High	Medium	Low	Relatively Low

Source : TEAM Consulting Engineering and Management Co., Ltd, 2016

1.9.3 Identification of Impacts

A. Pre-Construction Phase

Typically, pre-construction activities of development projects will include land acquisition and relocation of affected families, site preparation, and construction of temporary facilities to support the construction works. For this Pipeline Project, the required land for the Project and the highway project has already been acquired by GoTL.

Site preparation works will cover a narrow pipeline corridor and small areas where pipe jagging will be carried out. Site preparation works will involve vegetation clearing and land grading to create the pipeline corridor. As the pipeline corridor is 40 m wide, the land clearing will cover 240 ha.

As the pipe construction will move along the long corridor, the contractor would establish one or two base camps along the pipeline corridor and two to three work camps for material storage and equipment parking.

B. Construction Phase

The scope of construction will cover the pipeline system, including the laying of pipeline and installation of associated facilities and equipment, testing, and commissioning of the pipeline system. The construction will be mostly civil works and mechanical works.

C. Operation Phase: Pipeline Operation and Maintenance

The operation and maintenance of the pipeline system would require not more than 30 persons. The number of personnel is based on 24 hours operation with three shifts. The pipeline operation and maintenance will have to strictly follow the guidelines to be issued by the designer. The operation will use a computerized SCADA system for monitoring and control of flows and pressure of the fluids in the pipeline. Periodically, the pipeline will have to be inspected and cleaned using pigging.

D. Deactivation Phase

Deactivation or decommissioning of the pipeline system will be carried out at the end of the pipeline life, in accordance with prevailing legislation and industry best practicable technology available at that time. The activities will be reverse of the construction. The pipeline would be cleaned before decommissioning. The pipe bridges will be demolished and the pipes will be removed for disposal as scrap. The pipes under the ground or the rivers would be left as they are since those pipes are empty, there will be no impacts on soil and water including communities nearby. The pig station will be demolished. During the deactivation phase, the impact will be similar to those occur during the construction phase.

1.9.4 Significance of The Identified Impacts and Mitigation Measures

A. Pre-Construction and Construction Phases

The impact of each identified issues was assessed and overall proposed mitigation measures are summarized in ***Table 1.12-1***.

B. Operational Phase

The impact of each identified issues was assessed and overall proposed mitigation measures are summarized in ***Table 1.12-2***.

C. Deactivation Phase

Environmental issues during demolition of the pipeline system will include, hazardous wastes, groundwater contamination, soil contamination, noise and gases emission, and occupational health and safety of demolition workers. They are similar to the corresponding issues during construction (see ***Table 1.12-3***).

1.9.5 Incorporation of Mitigation Measures into Project Design

A. Construction Wastes

There are five key principles that design teams can use during the design process to reduce waste. They are summarized below together with questions the design team should address to design out waste.

- Design for reuse and recovery
- Design for materials optimization
- Design for waste efficient procurement
- Design for deconstruction and flexibility

B. Wastewaters

The contractor will be required to prepare detailed design of a wastewater management system for the base camp and the two satellite camps. The wastewater management system will consist of a collection system and a simple treatment system. The proposed design concept is based on the principle of wastewater segregation, treatment and reuse.

C. Hydrotest Water

A retention basin for storing the hydrotest water for gradual discharge or for reuse.

1.9.6 Determination of Any Residual Impacts

Residual impacts of the identified environmental issues in the construction and operational phases will be insignificant if the recommended mitigation measures are implemented.

1.9.7 Risk Assessment

Potential rias events and mitigation measures to minimize the risk are presented in ***Table 1.9-2***.

1.10 SOCIAL IMPACT ASSESSMENT

1.10.1 Social Impacts during Construction

The four key social impact management areas in the construction phase are: (i) land acquisition and resettlement; (ii) conditions of worker camp; (iii) influx of workers; and (iv) community health, safety and security.

A. Land Acquisition

Based on 90 m width and 60 km length, the combined pipeline and highway construction corridors will occupy 418.98 ha of land, including the river water area. Of the total 418.98 ha, about 346 ha would be privately owned or used (total of agricultural land, teak plantation, and built up area). The remaining would be state owned. Therefore, social impacts of the land acquisition would be related to about 346 ha.

The acquisition of this 346 ha of land in theory could raise three issues: (i) compensation to owners or users of the land; (ii) relocation of houses located on the corridor; and (iii) impacts on livelihood of people whose land is acquired. The first issue has already been resolved by the Government when the land required for both the highway and the pipeline was acquired as one package at fair rates agreed to by the sellers and buyer. This is only for the first phase from Suai to Zumalai with the distance of 31 km. The second issue would affect Bobe and Bonuc sub-villages where the corridor will cut through the communities. About 10 houses in each of these two affected communities will need to be relocated. The third issue is relevant as land loss regardless of compensation could have impacts on livelihood of the land sellers. This issue is more significant to the affected peoples who will be relocated.

As the compensation for land acquisition has already been paid in full amount to all eligible affected people, the impacts of land acquisition will be confined to the second and third issues. Their impacts, particularly on Bobe and Bonuc communities, are considered significant. The issues, if not amicably resolved, could affect Project implementation and reputation of TIMOR GAP, E.P.

The land acquisition and resettlement will need to be based on a sound resettlement action plan (RAP).

TABLE 1.9-2

POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK

Potential Event	Mitigation/Prevention Measures
1. Third Party Damage	
1.1 Excavation - Ease to access by third party - No pipeline signal or marker	- The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. - The pipeline signal or marker will be installed along the pipeline route. - Regular survey patrol driving along the pipeline right of way. - The minimum cover of buried pipeline shall be accordance with ASME/ANSI B31.4 standards.
1.2 Traffic Accident - No pipeline signal or marker	- The pipeline signal or marker will be installed along the pipeline route. - The traffic signal shall be installed while pipeline laid above ground.
1.3 Vandalism	- The project shall be educated the people who living in the vicinity area, in order to make the community understand and participate in the process of project development. - The project shall be built-up the relationship with the local communities.
1.4 Other damage, i.e., Fire/Explosion, arcing of Electronic from the other etc.	- The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. - The pipeline signal or marker will be installed along the pipeline route. - Regular survey patrol driving along the pipeline right of way.
2. Incorrect Design	- The pipeline designed in accordance with the international standards (ASME/ANSI B31.4, ASME/ANSI B31.1, API RP 1102, etc.) - The pipeline material conforming to API 5L Specification.

TABLE 1.9-2
POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK (CONT'D)

Potential Event	Mitigation/Prevention Measures
3. Incorrect Operation	
3.1 Mechanical/Equipment Failure	– The pipeline operation shall be done in accordance with the international standards (ASME/ANSI B31.4, ASME/ANSI B31.1, etc.) – Regular maintenance and inspection the equipment, machines to be in good conditions.
3.2 Incorrect Installation	– Installation of machinery and equipment shall be in accordance with codes applicable to the specific type and their installation manual or guidelines. – After installation, machinery or equipment shall be tested under conditions approximating actual operations to assure their proper functioning.
3.3 Human Errors – No operation skill – Staff is not physically or mentally fit for duty – Negligence or inadequate attention to details of staff	– Staff training to be provided on a regular and continuing basis. – Physical check up programs for staff relevant to their tasks as required by regulations or safety standards – Random checks of drug use. – Instilling work safety discipline into staff
4. Natural Forced	
4.1 Earthquake	– The pipeline is designed in accordance with the following criteria: • Design Code ASCE: 7-10 • Load Combination shall be as per ASCE 7-10 • Site Class: B • Risk Category: IV • Seismic Design Category: D • Design return period: 475-year

TABLE 1.9-2
POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK (CONT'D)

Potential Event	Mitigation/Prevention Measures
4.2 Storm	– The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. – The pipeline signal or marker will be installed along the pipeline route. – Regular survey patrol driving along the pipeline right of way.
4.3 Hit of Lightning	– The pipeline shall be provided the lightning or fault currents prevention systems in accordance with NACE RP-O1-77 Guidelines.
4.4 Flood/Heavy Rain	– The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route.
4.5 Volcano Eruption	– According to TIMOR LESTE: Natural Hazard Risks map provided by United Nation Office for the Coordination of Humanitarian Affairs (OCHA), there are no actives volcano within the project area and vicinity.
5. Corrosion	– The pipeline shall be used 3LPE for External Coating, that consist of a three layers coating system comprising: • First layer (inner): Fusion Bonded Epoxy (FBE). • Second layer (intermediate): Chemically Modified Polyethylene Copolymer • Third layer (outer): High-density high molecular weight UV stabilized Polyethylene (HDPE) – Three layers shall be used for Painting (External Coating for A/G) – The Cathodic Protection (CP) shall be provide to prevention the corrosion. – Pre-cast concrete sleeper shall be used for above-ground pipeline instead of steel structure in order to avoid corrosion problem.

B. Conditions of Worker Camp

Considering the international status of this Project, the design and operation of its worker camp should follow international guidelines as much as possible. Inadequate space and facilities and inadequate management of the worker camp could have such impacts as: (i) unhygienic living conditions with implications on health of workers; (ii) pollution or contamination of the natural environment outside the worker camp, such as fly infestation, water pollution, and odor; and (iii) exposure of workers on accidental risks or worker safety.

The impacts are considered significant as they could affect workers' productivity, environmental quality, and health condition of the nearby communities.

The design, operation, and management of worker camps is the responsibility of the main contractor and subcontractors. Therefore, the Project Proponent will ensure that the construction contract will cause the main contractor and subcontractors to meet all requirements of the design, operation, and management of the worker camp.

C. Impacts Related to the Influx of Workers

The influx of several hundreds of workers during the three-year construction period could have both positive and negative impacts on the local communities as follows:

- Creation of Demand for Local Goods and Services
- Competing Use of Local Resources
- Health Risks
- Conflicts with Locals:

The above negative impacts are considered moderately significant as the number of workers is not very large.

Mitigation Measures

- The contractor should ensure that local provision of goods and services to the workers will be orderly and clean
- The contractor should avoid using local resources as much as possible
- The contractor will need to design and implement an effective program for control of communicable diseases among the workers.
- Non-local workers should receive information and a briefing to make them aware of cultural sensitivity of the locals.

D. Community Health, Safety and Security

This issue will be of concern to the communities near the construction corridor. As Bobe and Bonuc communities will be relocated, they will not be considered as receptors of the impacts of this issue. The significance of this issue will depend on the distance between the community and the construction corridor. The issue will be most

significant in Karetamute sub-village (150 m from the corridor) and Bemetan sub-village which is only 20 m from the corridor.

Mitigation measures for community safety will cover site safety and traffic safety. The following measures are proposed to be included in the construction contract.

- The contractor will undertake a program of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto the construction corridor where the construction is ongoing,
- The contractor will ensure that signs are put up around work fronts and construction sites advising people of the risks associated with trespass.
- The contractor will ensure that there is adequate fencing around pipe lay down yards and other similar facilities to minimize the risk of trespass.
- When work fronts are within 100 m of an inhabited building, all equipment will be parked overnight in a demarcated area;
- The contractor will select security personnel based on a careful background screening of the applicants and provide their training with regards to human rights and a careful monitoring of their services.
- At the intersection of the construction corridor and local roads or trails, a diversion route must be provided during construction with warning signs to vehicles and pedestrians.

1.10.2 Social Impacts during Operation

As the pipeline operation would require only not more than 30 persons, social impact issues related to workers will not be as significant as the corresponding impacts during construction. During routine operation of the pipeline system, the subjects of OSH, grievance redress mechanism, and emergency preparedness related to personnel will be important and could be combined with those of refinery personnel.

During the operational phase the pipeline will not affect health of the communities. Therefore, pipeline safety is the only issue.

Communities along the pipeline corridor would naturally have concerns over safety associated with the pipeline once it is operational. Particular concerns included; risk of explosions, pipeline ruptures and oil leaks. While such concerns are generally unfounded due to the design of the pipeline (i.e. buried underground, restrictions along the pipeline corridor, and various safety measures), these concerns could affect community wellbeing and their perception of the safety of the area.

The pipeline safety issue is considered significant and needs to be adequately addressed to alleviate concern of the communities.

The following mitigation measures will need to be implemented to minimize the concern of the communities on pipeline safety:

- The Project Proponent will undertake stakeholder engagement regarding the pipeline operations to present and discuss safety features of the pipeline system;
- The Project Proponent will maintain the Grievance Mechanism throughout the operation of the pipeline so the communities can report their specific concerns; and
- The Project Proponent will undertake a community education program on pipeline safety to alleviate concerns.

1.10.3 Social Impacts during Deactivation

During the deactivation phase there is a potential for social impacts to occur. However, comparing with the construction, the decommissioning will take a much shorter period and require significantly less workers. If a decision is made to remove the pipes from under the ground, community health, safety, and security issue would be similar in scale to that during the construction. Mitigation measures would be similar.

1.10.4 Local Employment

Although this subject is not relevant to social impact, local employment is an expectation of the local communities. Therefore, the Project Proponent needs to take measures to ensure that this expectation of the villagers will be met. In this regard, the construction contract will require the contractor to give preference to hiring workers from the nearby villages. Terms of employment will follow relevant rules and regulations of the Government, particularly those related to minimum wage, discrimination, over-time payment, compensation in case of injuries or death related to work, employment termination, and child labor. The workers will be selected using a procedure that is transparent and fair.

1.11 ECONOMIC ASSESSMENT

1.11.1 Conceptual Framework

There have been several attempts to include environmental costs and benefits into direct economic costs and benefits in determining economic feasibility of development projects using such indicators as economic internal rate of return or benefit to cost ratio. However, quantification of environmental costs and benefits have to be based on several assumptions which are country and project specific. Consequently, estimates of environmental costs and benefits in monetary value are open to challenge. At present, the environmental economic assessment is still not a standard practice. Qualitative assessment is normally practiced.

1.11.2 Economic Loss Due to Environmental Impacts

The impact assessment in Chapter 6 clearly indicates the following environmental cost of the Project:

- **Pre-Construction and Construction Phase**

Economic loss due to environmental impacts during the pipeline is related to the loss of forest and agricultural land along the pipeline construction corridor. The 90-m wide combined corridor of the pipeline and highway will affect 254.52 ha of forest, about half are degraded deciduous forest and teak plantation, and 204.65 ha of agricultural land. However its compensation cost will be covered by the Ministry of Public Works, Transport and Communication.

- **Operational Phase**

The pipeline will have no significant social issues and impacts during its operation. The amount of wastes will be small and the treatment cost would not be significant.

1.11.3 Costs, Benefits, and Cost-Effectiveness of Mitigation Measures

A. Costs of Mitigation Measures

- **Pre-Construction and Construction Phases**

The proposed measures for mitigating environmental impacts during the construction will not require capital investment in permanent facilities. Most of the measures are good construction management practices. Their costs are mostly included in the contract cost and are not normally presented as separate cost items. Expenses or costs in implementing the measures would be only a very small percentage of the total construction cost.

However, solid waste management cost is estimated separately, at 25,820 USD in total.

- **Operational Phase**

The total cost of the project is estimated at USD 522 million. The cost of treating pigging wastes will be small compared to the Project's capital investment and operational expenses.

- **Deactivation Phase**

Assumed the cost of mitigation measures is about 50% of pre-construction and construction phases and duration of deactivation phase is also about 50% of pre-construction and construction phases. Therefore, the total cost of solid waste management is estimated at USD 13,000.

B. Benefits of Mitigation Measures

Benefits of mitigation measures are the savings in economic cost between without and with mitigation measures. As environmental cost of the impacts without mitigation cannot be estimated, the benefits cannot be estimated as well.

C. Cost Effectiveness of Mitigation Measures

All proposed mitigation measures for the Project are conventional and established practices. They are most cost effective compared to other alternative measures. Their cost effectiveness should not be evaluated based on environmental benefits to be gained from the investment. The Project has to comply with international environmental management standards for the industry.

1.11.4 Intangible Impacts

Intangible impacts are impacts that are not possible to estimate their economic costs. For this Project, the intangible impacts include:

- Visual pollution: the Project will change the scenery of the corridor from green hilly area to an open land strip.

- Psychological impact on people living near the pipeline corridor due to concern on accidental fire or explosion at the pipeline.

1.12 SAUMMARY OF ENVIRONMENTAL MANAGEMENT PLAN

1.12.1 Purpose and Objectives of the EMP

The purpose of this EMP is to provide a framework for environmental management in all phases of the Project to the parties responsible for environmental management of the Project, including the Project Proponent, the Contractor, and the Entity to be set up for the operations and maintenance of the pipeline and its associated facilities. The objective of this EMP is to prescribe what will need to be done to: (i) minimize environmental (and social) impacts of the Project; and (ii) ensure that the environmental performance of the Project in all phases will comply with applicable laws and regulations, conditions of the environmental licensing, international standards and industry best practice.

1.12.2 Content of the EMP and Its Application

As activities and consequential impacts in each Project phase are different in nature, scope and responsible parties, the EMP will consist of three EMPs: (i) Construction EMP (CEMP); (ii) Operational EMP (OEMP); and (iii) Decommissioning or Deactivation EMP (DEMP). The three EMPs are implemented within the corporate's environmental policy framework and national legal and institutional framework as applicable to each Project phase.

1.12.3 Corporate Environmental and Social Policies

TIMOR GAP, E.P. states its environmental and social policy as follows:

Our company is committed to the promotion of quality, health, safety and environmental (QHSE), as well as social responsibility. There are the values that shape the way TIMOR GAP, E.P. conducts its business.

Therefore, the Project Proponent is obliged to make its best efforts to strive for excellent environmental performance of this Project.

1.12.4 The Content of EMP in General

Environmental management in each phase of the Project is based on the basic principle of management known as the PDCA cycle (see ***Figure 12.4*** of Chapter 12 in the Main Report).

1.12.5 Summary of EMP

Key issues of environmental management plan (EMP) which comprise potential impacts, proposed mitigation measures, monitoring program, risk assessment, responsible parties and cost estimates are summarized based on each phase of implementation, as shown in ***Table 1.12-1, Table 1.12-2*** and ***Table 1.12-3*** respectively.

TABLE 1.12-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Land requirement for establishment of base camp, office, corridor with space, pipe laydown area with materials and shed including satellite camp	Loss of about 255 ha of forest land and 205 ha of agricultural land in relation to land requirement.	• Built up area in Bobe and Bonuc sub-villages where the corridor cut through the communities. • Agricultural land and forest land which are within 90 m strip of pipeline corridor.	• Compensation for forest and agricultural land • Compensation and relocation for affected persons in Bobe and Bonuc sub-villages	Compensation cost will be covered by the Ministry of Public Works, Transport and Communication.	• The Ministry of Public Works, Transport and Communication. • The Project Proponent to coordinate with the Ministry of Public Works, Transport and Communication.	To be managed and identified by the Ministry of Public Works, Transport and Communication.	To be managed by the Ministry of Public Works, Transport and Communication.
Fugitive dust Site clearing, excavation work, move of heavy equipment and vehicles along the dirt road will generate fugitive dust	Fugitive dust includes: • TSP about 411 $\mu g/m^3$ compared to standard of exceeding 230 $\mu g/m^3$. • PM_{10} about 214 $\mu g/m^3$ compared to standard of not exceeding 150 $\mu g/m^3$	• At construction site such as stockpiles, vehicles and roads leaving the construction sites • At sensitive area of the two nearest communities to the pipeline corridor, namely Bonuc and Bobe sub-villages.	• Spray water at and around the construction areas and access roads during site preparation and grading. • Limit speed for vehicles and trucks not to exceed 40 km/hr. • Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance. • Prohibit the open burning of waste in the pre-construction area. • Dust masks should be provided (where applicable) to all workers. • For construction site including spoil placement sites: – Use watering or other effective techniques on unsealed areas; – Rehabilitate construction sites and spoil placement as soon as the land becomes available. • Take measures (e.g. rumble bars and wheel wash bays) to ensure dust-creating material (earth or similar material) is not transported from the construction sites to roads or other areas in the public domain. • Cover all trucks carrying spoil or other loose materials. • Clear and remove all loose earth and similar material spilled or deposited within the construction sites and the transport routes from trafficked areas. • Take measures to avoid impacts of dust on adjacent properties such as: – Modify construction methods; – Increase dust suppression measures; or – Cessation of work when no other reasonable or practical measure is available.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Total Suspended Particulate (TSP-24 hrs) • Particulate Matter less than 10 micron (PM10-24 hrs) Nitrogen dioxide (NO_2) • Wind speed and direction (WS/WD)	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.

TABLE 1.12-1

ENVIRONMENTAL MANAGMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Gaseous emissions Operations of diesel-powered heavy construction equipment, vehicles and generator sets will generate gaseous emissions during the construction.	• Gaseous emission will be mostly generated by typical pollutants such as NO_x, SO_x, CO, and particulate in the exhaust gases discharged from the engines. • Its effect would be on health of construction workers.	• Construction site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages.	• Manage the movement of construction vehicles entering and leaving the construction sites to avoid the potential for vehicle emissions impacting on adjacent properties such as avoiding or minimizing queuing on streets approaching the worksites or adjacent to other sensitive activities; • Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites; • For stationary plant and equipment powered by diesel motors, take measures to avoid or mitigate and manage the potential impacts of exhaust emissions on adjacent residential or other sensitive activities such as all equipment powered by diesel motors are fitted with emission control measures, and are regularly maintained to manufacturers' specifications. • Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. • Provide adequate training to the equipment operators in the proper use of equipment. • Use the proper size of equipment for the job. • Use the equipment fitted engines with latest low emission technologies. • Perform on-site material hauling with trucks equipped with on-road engines • Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Nitrogen dioxide (NO_2) • Sulfur oxides (SOx) • Vehicle motors idling for periods exceeding 5 minutes while in queues to access construction sites (on-going). • Inspect the position of stationary plant and equipment powered by diesel engines to ensure exhaust emissions are directed away from sensitive activities and neighboring properties (initially on establishment).	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.
Noise level Operations of heavy construction equipment during land clearing, pipeline lowering, and backfilling, etc. would generate noise.	• Loud noise will disturb and cause annoyance to hearing capacity of the people in surrounding area. • Loud noise over long period will cause hearing impairment.	• Construction site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	**Design** • Design to use construction equipment that generate low levels of noise with adoption of best available technologies to minimize noise. • Conduct a noise survey covering the identified sensitive receptors to update the existing baseline data in the Final EIA Report. • Demonstrate through predictive modeling of the proposed construction techniques and monitoring ambient noise readings prior to construction to establish pre-disturbance levels, the likely levels of noise due to construction works throughout the construction period.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Leq 1 hr • Leq 24 hrs • Lmax	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.

TABLE 1.12-1

ENVIRONMENTAL MANAGMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Noise level Operations of heavy construction equipment during land clearing, pipeline lowering, and backfilling, etc. would generate noise. (cont'd)			**Pre-Construction and Construction Noise** • Construction works which generate excessive levels of noise must be carried out, only during the period between 6.30 am to 6.30 pm Mondays to Saturdays. Such construction works on Sundays or public holidays will need approval from the resident engineer of the Project Proponent. • Protect the affected sensitive receptors beyond standard construction hours such as installation of acoustic walls or noise barriers. • The noise reduction at the perimeter could be achieved using an acoustic wall or a sound barrier (Steel 18 ga with 1.27 mm. thickness which transmission loss of 25 dB(A) or equivalent) at least 3 m high with adequate length to block the noise emanating to the receptor. • Provide ear plugs or ear muffs to workers operating in the excessive noise areas. • Limit speeds of vehicles in the construction site, not exceed 40 km/hr. • Include measures to achieve the construction noise targets such as: – Commence advanced notification of works and undertake on-going consultation with potentially affected property owners and occupants. – Establishing temporary noise barriers between construction worksites and sensitive receptors. – Fitting noise-reduction measures to all equipment engaged in the construction works; • Designing worksites to minimize potential noise impacts on nearby sensitive places.				
Wastewater Daily activities of the workers/employees in relation to kitchen, canteen, toilets, bath rooms, and wash water in the base camp and satellite camp will generate wastewater.	Wastewater volume will be from: • about 15.3 m^3/day from base camp • about 1.9 m^3/day from each satellite camp.	At the outlet of retention pond at the 3 worker camps	**Design Concept** The Contractor will prepare detailed design of a wastewater management system for the worker camp, consisting of a collection system and a simple treatment system. Its proposed design concepts are: **For Domestic Wastewater** • Toilet wastes will be separated from grey water or sullage.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • Total Nitrogen • Temperature • Total Suspended Solid • Oil and Grease • BOD_5 • COD • Total Phosphorus • Sulfides	Twice a year during construction

TABLE 1.12-1

ENVIRONMENTAL MANAGMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Wastewater Daily activities of the workers/employees in relation to kitchen, canteen, toilets, bath rooms, and wash water in the base camp and satellite camp will generate wastewater. (Cont'd)			• Toilet wastes will be discharged into a septic tank(s) with a hydraulic retention time of about 5 days. The volume of toilet wastes is estimated at about 20% of the total volume of domestic wastewater. The septic tank effluent (septage) will be discharged into the retention pond. Alternatively, toilet wastes will be treated in a package treatment plant using an aerobic process. • The temporary retention pond within worker camp site areas will be designed as an oxidation pond. **During Construction** • Water in the retention pond will be used for dust suppression on unpaved areas in the construction site, and also for watering of the green area. • The remaining volume will be discharged into the water sources.				
Construction Waste • Activities related to site clearing, excavation, concrete works, steel works, piping works, installation of equipment, and construction of buildings will generate wastes. • Daily activities of the workers will generate non-construction wastes, including wastes from canteens and offices such as paper, food and beverage containers, food wastes, and other domestic items.	An amount of waste is equivalent to: • About 237 tons of *construction waste* over the 60 km length of pipeline corridor, or about 0.2 tons/day over the period of 36 months. • About 0.8 m^3 / day of *waste from workers.* • About 0.25 tons/month of *hazardous waste*.	• Construction site • Waste disposal area	**Design and Planning before Commencing the Construction** • Design own disposal facility, preferably within the construction site. • Design the construction methods to generate the least amount of wastes. • Design methods of waste transport and disposal. • Prepare an action plan for waste management to reflect cumulative results of the previous quarters. • Consider using materials and products that have a recycled content. • Arrangements with suppliers to return any unused construction materials; • Where possible, goods to be ordered in bulk to minimize packaging waste and packaging material returned to the supplier wherever practicable; and **During Construction** **Waste Segregation** • Design and implement a waste segregation system. • Provide an appropriate number of containers with adequate volume and appropriate materials at strategic locations to support the segregation in terms of recycling, reuse and disposal sub-categories.	To be included in total solid waste management cost of 25,820 USD.	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Efficiency of the collection, • Storage, and disposal volume, and • Record keeping	• Daily site inspections, and • Detailed weekly site inspections.

TABLE 1.12-1

ENVIRONMENTAL MANAGMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Construction Waste • Activities related to site clearing, excavation, concrete works, steel works, piping works, installation of equipment, and construction of buildings will generate wastes. • Daily activities of the workers will generate non-construction wastes, including wastes from canteens and offices such as paper, food and beverage containers, food wastes, and other domestic items. (Cont'd)			**Waste Collection and Storage** • Collection and transport each sub-category of segregated wastes on daily basis. • Provide a roofed storage area with adequate space for storing the segregated wastes waiting for the on-site or off-site reuse or recycling. • Special design the storage area for hazardous waste to prevent spills or leaks onto the soil. **Waste Reuse and Recycling** • Chipping and mulching of vegetation and reuse for landscaping purposes; • Reuse of excavated material as fill at approved fill sites; • Topsoil free of weeds to be stockpiled and stored for re-use, if possible; • Collection and return of packaging materials (e.g. pallets) to suppliers wherever practicable; • Remove any contamination inadvertently deposited in recyclable waste material containers. Provide cleanup of excessive contamination at recycling vendor locations when such contamination is not controlled at the project site. • Collection and recycling of used oils by a licensed contractor; • Collection by a licensed contractor of empty oil and fuel drums and other containers for return to recycling facilities; **Waste Disposal** • Disposal of the remaining wastes that are unable to be reused or recycled in the approved landfill site. • Prohibit haphazard disposal of construction waste in or off the construction site. • Inert wastes such as broken tiles, bricks, plastics should be used for filling the site in areas planned to be vacant space. • No burning of wastes. • Decomposable wastes such as food wastes and vegetation may be disposed of by composting. • Hazardous wastes will be handled by a licensed hazardous waste contractor, otherwise finding for appropriate arrangements for incineration, safe permanent storage, or other appropriate methods of disposal.			•	

TABLE 1.12-1

ENVIRONMENTAL MANAGMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
			On-site Record Keeping Design and maintain record keeping procedures with provisions for: • Tracking collections of waste materials at the sites and deliveries to recycling, reuse, salvage, and landfill facilities. • Maintaining on-site logs that include for each load of materials removed from the site: type of material, load weight, recycling/hauling service, and date accepted by recycling service or landfill.			•	
Hydrostatic Test Water Hydrostatic test of all four installed pipes generate tested water.	Discharge of 9,900 m^3 tested water to natural receiving water.	Receiving water at Suai Supply Base	• Formulate and submit a hydrostatic test plan for approval. • Conduct the hydrostatic test with specific practices.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • Temperature • Suspended Solids	Once after construction, at the beginning, middle and end of the discharge of hydrostatic test water.
Water Turbidity In-river construction of pipe support columns will cause water turbidity.	A small turbidity plume would be observed in the river around the site, over a short distance before the turbidity returns to its normal level.	At 100 m and 200 m downstream of the 12 river construction sites	**Design and Planning** • Ensure the design of pipeline bridge for each river and the method of its construction will give due consideration on impacts on water quality, particularly turbidity or suspended solids. • For each river, the Contactor will: – Conduct a survey of downstream water user, river bed and embankment conditions at the proposed construction section. – Estimate the duration and magnitude of likely impacts of the in-river construction activities on river water quality. – Submit an action plan containing results of the surveys and impact assessment, and proposed methods of construction and mitigation measures to be implemented in each river. **Construction** • Undertaken in the low flow conditions, and should be completed with all temporary facilities in the river completely removed before the high flow season. • Minimize the areas that will be disturbed, including the river bed, bank, access to the construction site, and laydown area. • The on-land construction area near the river bank will have appropriate measures to minimize soil erosion during rainfalls. • The on-land construction area will be rehabilitated to its previous conditions as soon as the construction is completed.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • DO • Suspended Solids • Turbidity	2 times; before and during construction.

TABLE 1.12-1

ENVIRONMENTAL MANAGMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Chance Finds for Archeological, Historic and Sacred Sites During site clearing and excavation of pipe trench, the Contractor may discover artifacts which potentially could have archeological, historic, religious, or cultural value.	Operational activities may possibly destroy some artifacts presented under the pipeline corridor.	Area along the condensate pipeline between KM 35+000 to KM 50+000, which are situated in Bonuc and Bobe sub-villages.	• Site supervisor/foreman shall order construction workers to stop immediately the construction activities in the area of the chance find. • Inform concerned authority, including local leaders, for proper management if historic is found. • Delineate and mark clearly the discovered site or area and prohibit physical activities in the area without prior approval of the concerned authority. • Install temporary site protection measures (warning tape and stakes, avoiding signs). • Strictly enforce any no-go area needed to protect the site. • Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the responsible Ministry takes over. • If it is necessary to relocate a cemetery and grave yard, cultural ceremony should be arranged prior to the relocation.	To be included in the total construction contract cost	• The contractor to inform the Project Proponent. • The Project Proponent to inform concerned authorities in case of chance finds archeological, historic, religious, or cultural value.	Site inspection	During land clearance and site preparation
OSH of construction workers Activities related to pre-construction and construction may harm health of construction workers	There is a possibility that the workers/employees might be injured during working. Pre-construction.	• Construction area along the pipeline route • Worker camps	Mitigation measures are identified in the worker camp management. (Under social issue)	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Accident • Record keeping	Daily and weekly inspection
Social Issues							
Land acquisition Site preparation for establishment of base camp, office, corridor with space, pipe laydown etc will occupy some forest and agricultural areas.	Reduce of forest and agricultural areas which are economic resources of villagers who collect forest products and cultivate on these areas.	• Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	Compensation and relocation for affected persons in Bobe and Bonuc sub-villages	Compensation cost will be covered by the Ministry of Public Works, Transport and Communication.	• The Ministry of Public Works, Transport and Communication. • The Project Proponent to coordinate with the Ministry of Public Works, Transport and Communication.	To be identified and managed by the Ministry of Public Works, Transport and Communication.	To be managed by the Ministry of Public Works, Transport and Communication.
Worker Camps Mismanagement of worker camps may harm workers' health and pollute surrounding environment.	• Unhygienic living conditions will affect health of workers; • Pollution of the natural environment outside the worker camp, such as fly infestation, water pollution, and odor;	Worker Camps	Ensure the design, operation, and management of the worker camp are within specific requirements as follows: • The worker camps should be made of decent materials that could withstand heavy rains and storms, with adequately ventilated and lighted.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent	• Worker Camp • Worker health and safety	Daily and weekly inspection.

TABLE 1.12-1

ENVIRONMENTAL MANAGMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Worker Camps Mismanagement of worker camps may harm workers' health and pollute surrounding environment. (Cont'd)	• Exposure of workers on accidental risks or worker safety.		• Provide a sleeping space of at least 4 m^2 per worker, with separate rooms for professional staff. • Number of toilets and baths should be 1 unit for 20 workers. • Plan for common canteen which can accommodate at least 150 persons. • Provide common areas for cloth washing and drying with adequate water supply and drainage. • Provide recreational facilities with sufficient accessories. • Set up one shop to sell sundry goods to the workers. • Strictly control fly, insect and rodent. • Provide medical services at a small clinic served by a doctor. • Prepare fire and safety plan for the camps. • Basic camp infrastructure with facilities of power supply, telecommunication, water supply, drinking water, drainage, sanitation and solid wastes management. • Establish and enforce codes of conduct within and outside the worker camps covering camp security, fire safety, drug using, drinking, smoking, and visiting guests. • Provide security guards to be in charge of the security of camp. • Provided transport services from the project site to nearby communities. • Environmental management of the demolition and dismantling of the worker camp and associated facilities after the construction is completed.				
Influx of Worker Employment of a large number of construction workers will create both of positive and negative impacts	*Positive impact* • Creation of demand for local goods and services; *Negative impact* • Competing use of local resources; • Health risks to the communities such as communicable diseases; • Conflicts with the locals due to differences in culture, value and ways of life.	• Worker camps • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Ensure that local provision of goods and services to the workers will be orderly and clean, and will not create unsanitary conditions near the worker camp. • Avoid using local resources as much as possible, and should provide a medical clinic within the worker camp. • Provide communicable diseases control program related to the sanitation and hygiene program for the worker camp. • Provide brief information to non-local workers, to make them aware of cultural sensitivity of the locals.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent	Feedback and complaints from affected households.	Daily and weekly inspection

TABLE 1.12-1

ENVIRONMENTAL MANAGMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Community health and safety Mismanagement or improper control of pre-construction and construction works may affect health and safety including security of the communities resided the pipeline corridor.	The locals and passers-by along the pipeline route might be injured or being insecure.	• Worker camps • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Undertake a program of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto the construction corridor where the construction is ongoing. • Ensure that signs are put up around work fronts and construction sites advising people of the risks associated with trespass. • Ensure that there is adequate fencing around pipe lay down yards and other similar facilities to minimize the risk of trespass. • When work fronts are within 100 m of an inhabited building, all equipment will be parked overnight in a demarcated area • Select security personnel based on a careful background screening of the applicants and provide their training. • At the intersection of the construction corridor and local roads or trails, a diversion route must be provided during construction with warning signs to vehicles and pedestrians. • Truck drivers and operators of heavy construction equipment must receive training in public safety in their works.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent. • The EHS Manager to involve in CSR program.	CSR program and its implementation	Daily and weekly inspection

TABLE 1.12-2
ENVIRONMENTAL MANAGEMENT PLAN DURING OPERATION PHASE

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Environmental Issues							
Waste Cleaning of using pigs along the pipeline will generate waste.	Waste from pigging	• The pigging station at Suai Supply Base • The Betano Rifinery's wastewater treatment system	**Pigging Waste Collection and Transportation** • The pigging wastes will be collected and transported to the waste oil treatment unit of the Betano Refinery's wastewater treatment plant. • The Operational Manager will supervise the collection, storage, and transport of the pigging wastes to the refinery's wastewater treatment plant. **On-site Record Keeping** • The ESH manager will design and maintain procedures for recording the volume of pigging wastes collected and sent for treatment at the refinery.	Including in the operational cost of Betano Pipeline System Company	The Operational Manager, the Maintenance Manager and the EHS Manager under supervision of the General Manager of the BPSC.	• Quality of oily sludge before and after the pigging waste is treated. • Volume and characteristics of pigging wastes	Every time the pigging waste is sent to the refinery for treatment, about 2 times per month.
Operational risk Defective design, installation, and operation and management of operational work may cause accidental fires and explosions of pipelines	Damage of the pipeline due to risk of oil leak and explosion	Along the pipeline route	Risk Management Program must be in place as a means to guarantee the safe start-up of the commercial operations with all risks fully under control (Details are in ***Table 9.5-1***).	Including in the operational cost of Betano Pipeline System Company	The Operational Manager, the Maintenance Manager and the EHS Manager under supervision of the General Manager of the BPSC	Monitoring emergency incidents situations such as accident, fire, oil spill, etc. including restrain and recovery the situations	Daily and weekly site inspections
Social Issues							
Community Health and Safety Mismanagement or improper control of operational work may affect health and safety including security of the adjacent communities	• Risk of explosions; and • Pipeline ruptures and oil leaks	Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Undertake stakeholder engagement regarding the pipeline operations to present and discuss safety features of the pipeline system. • Maintain the Grievance Mechanism throughout the operation of the pipeline so the communities can report their specific concerns; and • Undertake a community education program on pipeline safety to alleviate concerns.	Including in the operational cost of Betano Pipeline System Company	The General Manager of the BPSC	Feedback and complaints from affected households.	Throughout the entire operation period

TABLE 1.12-3

ENVIRONMENTAL MANAGEMENT PLAN DURING DEACTIVATION PHASE

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Demolition of structures and operation of heavy equipment and vehicles along the dirt road will generate: - *Fugitive dust* - *Loud noise* - *Solid waste* - *Hazardous wastes and oil products* from the storage tanks and pipelines - *Wastewater* from cleaning of storage tanks and pipeline	Fugitive dust will be generated and disturb health of workers and the locals adjacent to the demolition site.	• Demolition site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• During the deactivation phase, the Project Proponent prepared at the EIA stage will not be applicable and will replaced by the new deactivation environmental management plan based on the new EIA. • The environmental issues, major sources, magnitude, receptor, predicted impact and mitigation measures in this phase will be similar to those occur during the construction phase. • However, activities of this phase will be demolition only then impacts from demolition activities will be controlled by the demolition contractor. • The contractor will be required to adopt the best practice to minimize impacts from : - Dust - Gas emission - Noise from heavy machinery and from demolition activities - Hazardous wastes and oil products - Wastewater and wastes	• To be included in the demolition contract • To be included in the total solid waste management cost of 13,000 USD	The demolition contractor and to be controlled by the project proponent.	*Fugitive dust* • Quantity of dust • Wind speed and direction • Complaints from the nearest communities *Noise level* • Complaints from the nearest communities *Solid waste* • Quantity • Its disposal *Hazardous wastes and oil products* • Quantity • Disposal management *Wastewater* • Volume and • Its discharge	Regular site inspection (weekly minimum) by in-house staff.
Community Health and Safety Mismanagement or improper control of demolition work may affect health and safety including security of the workers adjacent communities	Demolition workers, the locals and passers-by along the pipeline route might be injured or being insecure.	• Demolition site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	Maintain the Grievance Mechanism throughout the operation of the pipeline so the communities can report their specific concerns.	To be included in the annual budget of the Project proponent	The Project proponent	Complaints from local communities	Regular inspection (weekly minimum) by in-house staff.

1.13 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

1.13.1 Purposes of the Consultation During The Preparation of The EIS

Public consultation conducted during the preparation of the EIS has three purposes:

(1) Informing the stakeholders about the Project, environmental and social issues related to the Project pre-construction, construction, operation, and deactivation including mitigation measures to minimize environmental and social impacts;

(2) Seeking views of the stakeholders on the Project and mitigation measures; and

(3) Participation and partnership where issues and needs are jointly discussed and assessed.

Results of the public consultation are useful to the formulation and implementation of environmental and social management plans, purposing on alleviating the adverse impacts while promoting positive impacts of the Project.

1.13.2 Methodology and Approach

Public Consultation was conducted during the period from 31 March to 8 April, 2016. The methodology and approach of public consultation is presented below:

A. Identification of Stakeholders and Group Affected by the Project

The Project's stakeholders could be identified and classified into three categories:

(1) Government Authorities Involved in EIA Administration and Energy Development

(2) NGO

(3) Local Communities

The Project's stakeholders in this category are the local people in eight villages settling along the 60 km of condensate pipeline alignment, namely Betano, Foho-Ailico, Leolima, Raimea, Tashilin, Zulo, Beco and Labarai villages, located in four sub-districts of Same, Hatu-Udo, Zumalai and Suai, and three districts of Manufahi, Ainaro and Covalima.

B. Methods of Consultations

The public meeting method was complemented by disclosure of project information through presentation in the meetings. This served the informing purpose.

C. Approach to the Public Meetings

The following approach to the public meetings had been adopted:

- At the national level, the Project Proponent and the Consultants invited key officials of relevant government offices, arranged for the meeting venue and issued invitations.
- At the local level, the Project Proponent and the Consultants invited the local people to participate the public meeting. This was performed in line with social structure. Invitation letter was sent to the Administrators of Manufahi, Ainaro districts and Suai sub-district, including chiefs of eight villages to inform their communities.
- Representatives of the Project Proponent and the Consultant were jointly conducting the meeting. The Project Proponent's representative was responsible for providing information on Project development plan and expected outcomes. The consultants were responsible for informing about details of project components and the EIA study, comprising existing situation of the project areas, potential impacts and mitigation measures addressed the impacts. The two parties had worked as a Project team.
- The meeting then provided an open forum for discussions.

1.13.3 Public Participation Activities

A. Meeting Organization

The public meetings were organized at both of national and local levels. The Project proponent had invited relevant government authorities and NGO for consultation meeting on 31 March 2016 and the locals on 4 to 8 April 2016. All attendances are listed for the record of the Main report.

- **Topic Discussed**

For the consultation meeting with the government officials and NGO, the Project information was disclosed through slides in English language. Its brief information was posted at the conference room, and provided to attendance in handout form. Questions and answers were in both English and Tetum language.

At the local level of two sub-villages, the Project information was disclosed through slides in English, and translated into Tetum language. Its brief information was posted at the meeting place. Questions and answers were in both of English and Tetum Languages. Translation was made back and forth.

- **Issues Raised by Stakeholders**

There were comments and feedbacks from each group of stakeholders during discussion. Clarifications were made by representatives of the Project's Proponent and Consultants accordingly. All are recorded in the Minutes of Meetings, and documented for reference as shown in ***Appendix 13D*** of Main Report.

1.13.4 Summary of Main Comments Received from Stakeholders

(1) Government Authorities

Concerns and comments from the nine government organizations were on several issues, including impacts from noise, environmental risk from oil transportation, alignment of pipeline route, land release for pipeline alignment, integration of highway and pipeline project. Suggestion was on preservation of artifacts, sacred and cemeteries found.

(2) NGOs

The Lao Hamutuk NGO expressed the concerns and comments in two occasions: (i) during the consultation meeting on 31 March 2016; and (ii) later by open letter. The major issues were on noise impacts, realignment of highway and pipeline, EIA study, construction of pipeline and highway, impacts on groundwater, products transported by pipeline, risk of pipeline explosion and poor record of PTT.

(3) Local Communities Groups

Consultation meetings at five sites of the local level were conducted on 4 to 8 April 2016. Issues identified by the participating villagers are as follows:

- **Betano Village**

Sixty seven villagers participated in the meeting.Besides representatives of the Project's Proponent, the Consultants, representatives of National Directorate for Pollution Control and Environment Impact (NDPCEI) and district official also joined the meeting. Concerns/suggestions from villagers in Betano were on impacts related to leakage of the pipeline and upgrading road.

- **Hatu-Udo Sub-District**

Seventy three villagers participated in the meeting. They are from Ainaro district, Leolima and Foho-Ailico villages, Bobe and Bonuc sub-villages. Besides representatives of the Project's Proponent, the Consultants, representatives of National Directorate for Pollution Control and Environment Impact (NDPCEI) and district officials also joined the meeting. Concerns/suggestions from these people were on impacts on water and culture, explosion risk by the earthquake, distance to community and suggestion for consultation in Aldeia Ainaro Kiik.

- **Cassa Village**

The meeting at Cassa village was arranged by the Project proponent. Seventy eight villagers participated in the meeting. Concerns/suggestions from these people were on risk from pipe leakage, pipe destroyed by river flow, responsible agency for pipe maintenance and suggestion on not to relocate sacred places including information disclosure about risk associated to pipe explosion.

- **Beco and Labarai Villages**

The Project proponent had confirmed with villages' chief a day before the meeting date. However, the meeting was not visualized. Villagers did not come because they attended the other meeting which was chaired by the Minister of Petroleum Authority on the same day. Therefore the Project proponent and consultants had the meetings with chiefs of Beco and Labarai villages instead.

They informed chiefs of these two villagers about the Project information, with provision of handouts for dissemination in the public.

There were no feedbacks/questions from chiefs of these two villages.

- **Zumalai Sub-district**

Twenty three villagers participated in the meeting. Concerns / suggestions from these people were on risk from pipeline explosion, opportunity of local employment, negative impact on soil and water, and distance of pipeline.

1.13.5 Public Acceptance on Proposed Project

Key informants in the communities were interviewed in order to collect socio-economic information, including their opinions toward the Project development. Findings showed that communities in these eight villages agreed with the project development. Their reasons were: the Project would offer job opportunities including capacity building and development at the local and national level of Timor-Leste.

1.13.6 How These Comments Were Taken into Account

All comments/ issues obtained from the consultations are the basis for planning and arranging subsequent consultation meetings during the project implementation. Results of all public consultation meetings will be utilized for implementation of environmental and social management plans of the Project as well as community support development programs to be provided by the Project Proponent in the Corporate Social Responsibility (CSR) context.

1.13.7 Other Related Materials

Before the conduct of public consultation at the local level, the Project had sent the invitation letters to inform villagers in eight villages of the study area.

1.13.8 Recommendations for Future Consultations

Public consultation will be carried out during the construction and operational phases as part of environmental management of the two project phases. Public consultation during the construction would mainly concern with measures to minimize various environmental disturbances which some communities may experience. The issues discussed would vary with the progress of construction and change in the nature of construction works. Public consultation during the operational phase would be less intense as environmental and social management become predictable and routine. Community development support would be a major issue for public consultation.

1.14 DIFFICULTIES ENCOUNTERED

Difficulties that the Consultant encountered in conducting the EIS for this Project are as follows:

1) Insufficient information on technical aspects of the Project and the absence of a comprehensive report on technical and economic analysis of the Project due to its early stage and planning. For example, there is no precise information on construction wastes, worker camp and pipe storage area locations and facilities, design alternatives for pipeline installation crossing rivers, hydrostatic testing procedures and testing program, and the number of personnel for operation and maintenance of the pipeline corridor. Therefore, the Consultant has to work out own estimates to fill the information gaps so that the impact assessment could be done. These estimates would be later revised by the contractor. However, the discrepancies between the information worked out by the Consultant and the contractor would not be too great to distort the conclusions on environmental impacts of the Project.

2) The content of the section on Social Impact Assessment is more relevant to a project social analysis for project feasibility and planning study for rural development projects. It is not applicable to the social impact context of this Project. The Consultant has to give up an attempt to prepare a social impact assessment following the prescribed guideline and content. This difficulty initially caused confusion and loss of time trying to fit the social impact assessment in an unsuitable structure.

1.15 CONCLUSIONS AND RECOMMENDATIONS

1.15.1 Conclusions

From the EIA investigation results, the following major conclusions may be drawn:

(1) Clearing the proposed pipeline corridor of existing mixed deciduous forest, and teak and palm plantation is unavoidable environmental and economic cost. However, it will not have significant impacts on the terrestrial ecosystem.

(2) The proposed pipeline corridor will need to relocate about 10 houses each in Bobe and Bonuc communities. These affected people would also need assistance in livelihood restoration in addition to relocation.

(3) During Project construction, dust, noise, and gaseous emissions will be experienced and would have impacts on communities along the construction corridor. These environmental problems are transient and their duration will be short and the construction will move along the corridor.

(4) The worker camps will need to be well designed, planned, and managed to minimize environmental, social, and cultural impacts, and to comply with OHS requirements.

(5) The small volume of pigging wastes generated during the pipeline maintenance could be sent to the wastewater treatment facilities of Betano Refinery. In case the pigging station is located at Suai Supply Base, the waste need to be gathered there. They then will be taken to Betano Refinery later.

(6) The pipeline has inherent accidental fire and explosion risks triggered by leakage. This risk is assessed and considered as possible with the likelihood of occurrence of 3.94 times in 1,000 years.

(7) Areas at risk are the pipe tie-in points at Suai Supply Base and Betano Refinery, and exposed sections near river crossing. Under the worst scenarios, the accidental fire, if occur, would impact an area within 258 m radius from the fire point, and could result in 10% fatality and 50% injuries of people in the impact area.

(8) Decommissioning of the Project in future will require a new EIA and a new EMP. The process will be a reverse construction process but will need less workers and shorter timeframe. Its impacts will be similar to those of the construction phase.

(9) The eight communities that public consultation meetings were held did not oppose to the Project. They have high expectations of environmental and social performance of the Project, particularly local employment and community support. Those who will have to be relocated also have concern on the impacts on their livelihood.

1.15.2 Recommendations

To implement the results of this EIA investigation, the Consultant recommends that:

(1) A detailed resettlement action plan should be prepared for the relocation of 20 houses to be affected by the Project. To prepare this plan, detailed surveys of individual households to be relocated will need to be carried out. The RAP will need to include a livelihood development plan. This livelihood development support should be extended to families who lose plantation but will not be relocated.

(2) The proposed environmental mitigation measures and environmental management requirements be clearly stated and incorporated in the TOR for the procurement of EPC contract and construction supervision contract, and in the EPC contract and construction supervision contract.

(3) An environmental management function will need to be established within the Project management organization. This function will manage the management of the construction EMP. During the operational phase, an EHS function will need to be established within the organization for operational management of the refinery.

(4) A detailed risk management plan including an emergency response plan will be needed for the operation of the pipeline. A risk management and emergency response function will need to be established within the organization for operational management of the refinery.

(5) The proposed tri-partite committee in the EMP is set up as soon as possible to serve as a means for continuing public consultation and disclosure. Therefore then will be no need to conduct public consultation with a large number of locals. Some of the committees are representatives of villagers.

(6) In case TIMOR GAP, E.P. wants to maintain its international image, it may consider providing livelihood development assistance to families who require assistance.

(7) As a number of subjects in the outline of EIS as prescribed in the MREIS does not follow a logical sequence, the proponent's endorsement of the EIS should not be included in the Description of the Project.

1.16 NON-TECHNICAL SUMMARY

This chapter summarizes all the findings presented in Chapter 1 to 15 in plain and simple language to enable non-technical readers to see a clear and correct picture of environmental aspect of this Project. The summary is presented in Chapter 16 of Main Report.

CHAPTER 2

DETAILS OF THE PROJECT PROPONENT

CHAPTER 2

DETAILS OF THE PROJECT PROPONENT

The Project Proponent is TIMOR GAP, E.P. This nation oil company was established in 2011 under the Decree Law No. 31/2011. Being the national oil company, TIMOR GAP, E.P. conducts, on behalf of the State, oil and gas businesses covering onshore and offshore, and national to international operations. In addition to doing businesses in oil and gas to protect the interest of the country, TIMOR GAP, E.P. is also mandated to maintain energy security of the nation. In line with this mandate, TIMOR GAP, E.P. is embarking on a major investment in the Tasi Mane Project as already discussed above.

TIMOR GAP, E.P. has a mission to excel in providing services for the industry with *quality, health, safety and environment.* This mission is also extended to its support activities including the development of this Project.

The Project Proponent's contact address is:

Mr. Vicente da Costa Pinto

Director of Refinery & Petroleum Services Unit

TIMOR GAP, E.P.

Level 3, Timor Plaza, Rua President Nicolao Lobato,

Comoro, Dili, Timor-Leste,

Tel No. : +670 3310953, Fax No. : +670 3310952

Email: vicente.pinto@timorgap.com

CHAPTER 3

DETAILS OF THE EIA CONSULTANTS

CHAPTER 3

DETAILS OF THE EIA CONSULTANTS

The Consultant is TEAM Consulting Engineering and Management (TEAM) in association with ATT Consultants Co., Ltd. TEAM is the lead firm.

3.1 TEAM CONSULTING ENGINEERING AND MANAGEMENT (TEAM)

TEAM is one of the key subsidiaries of TEAM Group of Companies (TGC). Through its subsidiaries, TGC provides comprehensive consulting services covering a complete project cycle from project conception through project planning and feasibility study, detailed design, construction supervision, and project management. TGC's services cover various development sectors, including urban mass transit system, highways and expressways, water resources, water supply, wastewater, ports, power plants, housing, urban development, environmental management, and regional development. In addition, TGC also provides services in public event design and organizing, and management planning. TGC has completed assignments not only in Thailand but also in neighbouring countries, particularly Lao PDR, Viet Nam, Cambodia, and Myanmar.

Environmental impact assessment is one of TEAM's key businesses. TEAM's experiences in EIA cover projects in various development sectors including transport, power, water resources, mass transit, mining, ports, and industry. Some of these projects are in Lao PDR, Viet Nam, Cambodia, and Myanmar. Examples of completed EIA projects in Myanmar are: (i) The 400 MW Gas-Fired Combined Cycle Power Plant Project in Hlaing Thar Yar, Yangon, Myanmar; and (ii) Deedoke Hydropower Project in Mandalay, Myanmar.

TEAM's contact address is:

Dr. Sirinimit Boonyuen

Senior Executive Vice President-International

TEAM Building,

151 Nuan Chan Rd., Nuan Chan, Bueng Kum, Bangkok, Thailand 10230

Telephone: +66 2 509 9000 ext. 2304

Fax: +66 2 509 9047

Email: sirinw@team.co.th

3.2 ATT

ATT is one of the affiliated companies of TGC. It was established with the primary objective of providing engineering services for oil and gas related projects, petrochemical facilities, marine facilities, electrical power system, and industrial plants for both public and private sectors. ATT provides services in technical surveys and investigations, CADD drafting, technical due diligence, project preparation and feasibility study, detailed design, and construction supervision.

ATT's contact address is:

Dr. Werapol Thonguthai

Managing Director

TEAM Building,

151 Nuan Chan Rd., Nuan Chan, Bueng Kum, Bangkok, Thailand 10230

Telephone: +66 2 509 9050-6 ext. 117

Fax: +66 2 509 9057 and +66 2 509 9059

Email: werapt@attconsult.com

3.3 THE EIA TEAM

The EIA study for this Project is conducted by a multidisciplinary professional team consisting of a core study and planning group and a technical support group. The Team Leader manages technical aspect of the EIA study. The Environmental Planning Expert will assist the Team Leader in ensuring that the final EIS and environmental management plan (EMP) documents will meet all requirements prescribed by NDPCEI, and that the proposed environmental management plans will be practical and implementable. The Team Coordinator assists the Team Leader in coordination among members of the EIA team, Project Proponent, NDPCEI, and other concerned government agencies.

The core study and planning group of the EIA study team consists of qualified and experienced professionals in various technical areas relevant to environmental and social impacts of the Project, including: environmental impact assessment, pipeline engineering, social impact assessment, and public consultation.

The core study and planning group will be supported by a technical support group consisting of professionals in various disciplines relevant to the environmental and social context of the Project, including: (a) civil engineering; (b) aquatic ecology; (c) water resource engineering; (d) public health; and (e) terrestrial ecology.

A simple organization structure for conducting and managing the EIA study is shown in ***Figure 3.3-1***. Summary of qualification for key staffs are presented in ***Appendix 3A***.

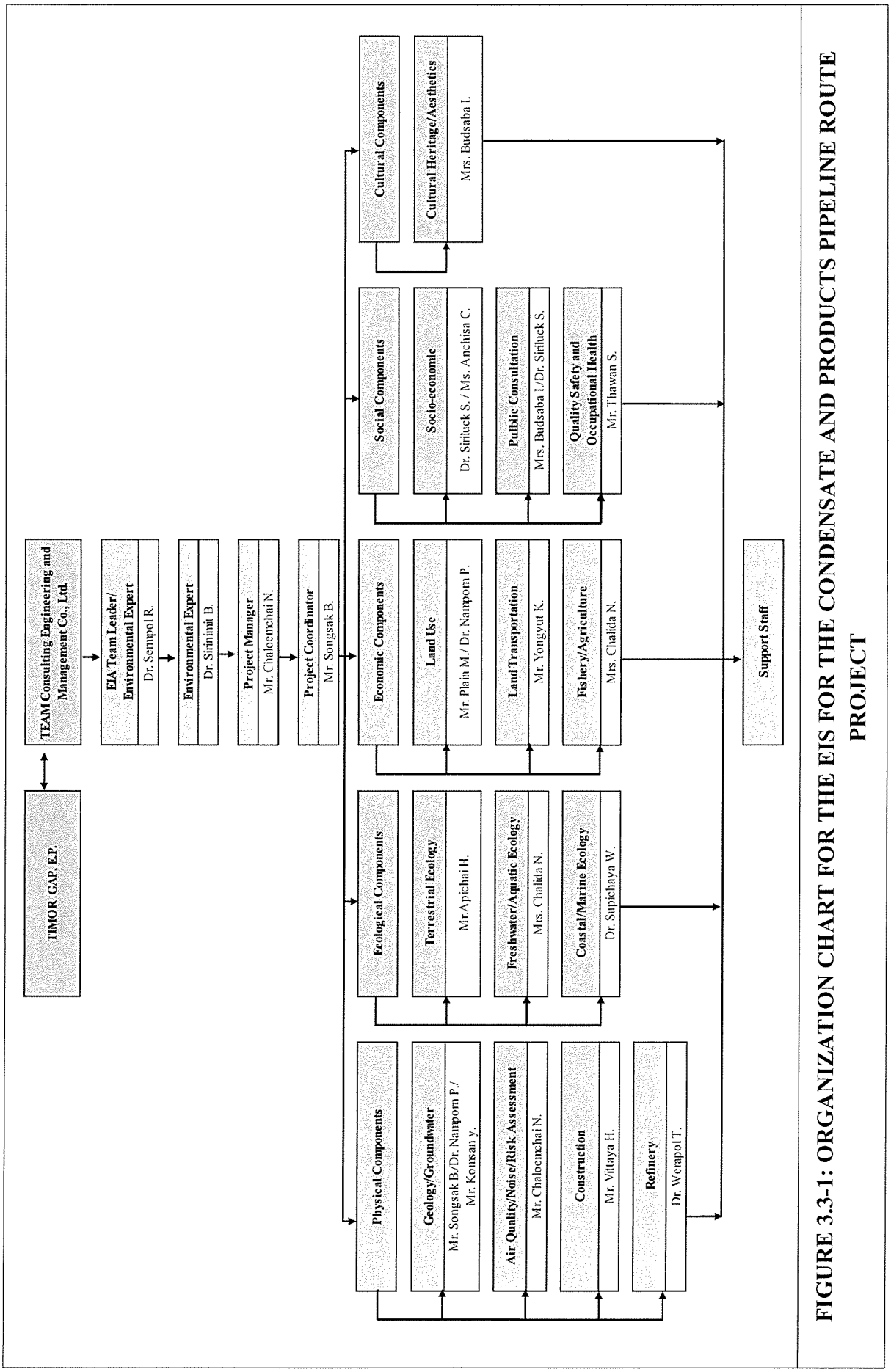


FIGURE 3.3-1: ORGANIZATION CHART FOR THE EIS FOR THE CONDENSATE AND PRODUCTS PIPELINE ROUTE PROJECT

CHAPTER 4

DESCRIPTION OF THE PROJECT

CHAPTER 4

DESCRIPTION OF THE PROJECT

4.1 IDENTIFICATION OF THE PROJECT

The Condensate and Products Pipeline Project is identified as a project to support the Betano Refinery Project-one of the three strategic projects for the development of oil and gas sector of the country. The Project will transport condensate from storage tanks at Suai Supply Base to Betano Refinery, and will transport light naphtha, heavy naphtha, and diesel fuel from storage tanks at the refinery to storage tanks at Suai Supply Base. Therefore, the proposed pipeline will essentially be an associated facility of the refinery as it will supply feed stock to the refinery and transport the three main products of the refinery to market.

4.2 CATEGORY OF THE PROJECT

The environmental category of the Project is category A as it will involve petroleum products. The Condensate and Products Pipeline Route Project will transport onshore oil with the size of 8 inch and 12 inch diameter and 60 km length. This requires the Environmental License as specified in article 4 of the Environmental Licensing Laws (Annexes 1, and 2) under Decree Law No. 5/2011.

4.3 BRIEF DESCRIPTION OF THE NATURE, SIZE AND LOCATION OF THE PROJECT

4.3.1 Project Location

The proposed pipeline is to be laid along the highway being constructed. ***Figure 2.4-1*** is an area map showing the proposed highway and the proposed pipeline alignment.

The pipeline's right-of-way (ROW) is set at 40 m on the south side of the highway. Including the highway width of 30 m, the pipeline's ROW and the highway will form a 90 m land corridor stretching from Betano to Suai Supply Base. Its total length will be about 60 km passing the administrative areas of Manufahi, Ainaro and Covalima districts.

With its length of 60 km and width of 90 m, the combined ROW of the pipeline and the highway will occupy 5.4 km^2 of area including water areas of rivers and streams that the corridor traverses.

4.3.2 Nature and Size of the Project

By its nature and length of the pipeline, the Project could be considered as a medium scale, civil works and mechanical works project. Its scope and technical features taken from the document on "Pipeline Study Design Basis" supplied by the Project Engineering Consultant (PEC) are summarized below:

The Project will construct the following facilities:

(1) Pipeline

The pipeline will consist of 4 pipes designed for the refinery's future capacity of 40,000 barrels per day (BPD). ***Table 4.3-1*** summarizes key design and operating data of the four pipes. The pipe will be carbon steel with adequate coating for corrosion protection. The pipeline designs follow international standards and codes presented in ***Appendix 4A***.

On the 60 km length of pipeline route, it is occupied by 12 sub-villages of Bematan, Lalica, Raifusa, Bobe, Bonuc, Haretain, Raifila, Leonti, Karetamute, Adentiuk, Haemanu, and Meop which are situated in 8 villages. The project affected area is indicated in the map as shown in ***Figure 4.3-1***. Consideration on the land required for the Highway implementation and construction. There were difficulties occurred regarding land title identification and negotiation. However the State shall pay for the land temporary ownership rights, land use and compensations for the existing trees and agricultural crops.

TABLE 4.3-1

KEY DESIGN AND OPERATING DATA OF THE PIPELINES

Fluid Name	Plant Design Flow[1] (m^3/hr)	Density[2] (kg/m^3)	Dp per 100 m (kg/cm^3)	Line Size (inch)	Velocity (m/s)	Pipe Size Selected (line)	Operating Pressure[3] (kg/cm^3)	Design Pressure[4] (kg/cm^3)
Condensate	417	711	0.044	12	1.6	12	55	83
Light Naphtha	156	625	0.043	8	1.3	8	62	93
Heavy Naphtha	106	730	0.026	8	0.9	8	41	62
Diesel	128	800	0.047	8	1.1	8	62	92

Source: TIMOR GAP, E.P., 2016
Remark: (1) Pipeline operating based on 45 hours transferring time, which design based on 10% margin
(2) Density is referred to UOP heat and Mass Balance @ 40°C
(3) 50% Safety Factor was added for pressure lose to represent pipe fitting auxiliary
(4) 50% Margin was added for pipe design pressure

The pipes will be laid at 1-1.5 m below ground measured from its crown to the ground surface.

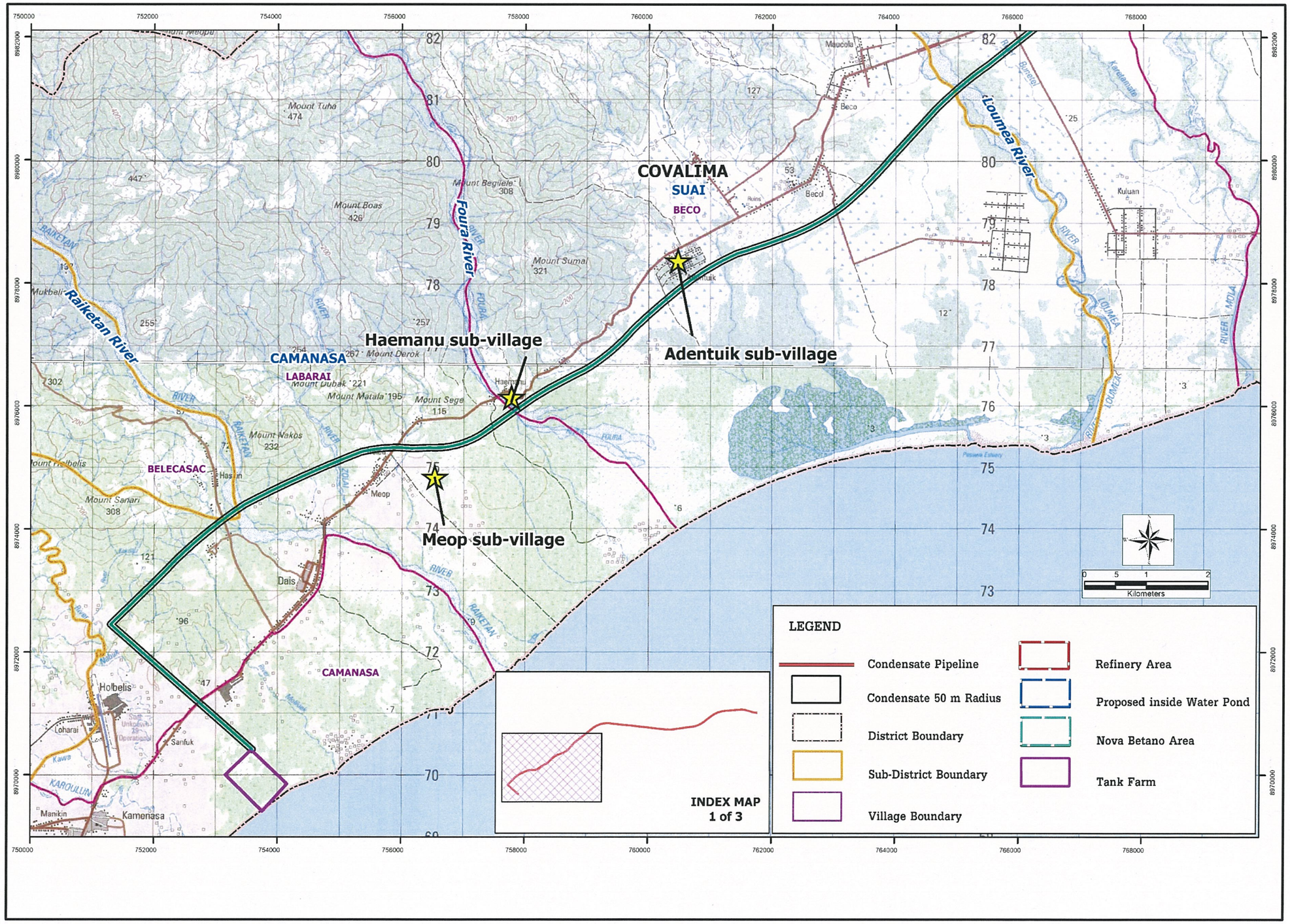


FIGURE 4.3-1 : THE PROJECT AFFECTED AREA ALONG PROPOSED HIGHWAY, PIPELINE ALIGNMENT

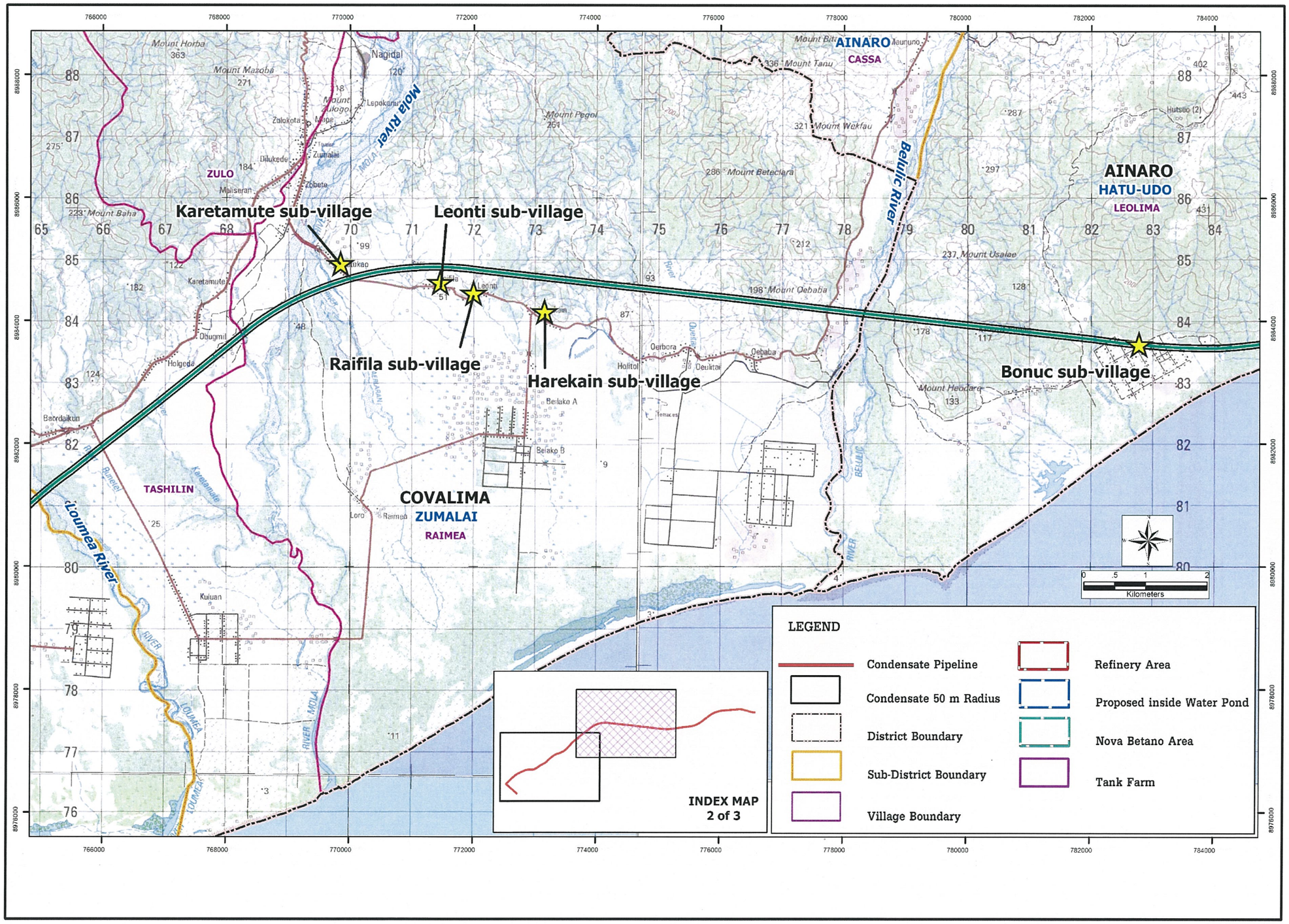


FIGURE 4.3-1 : THE PROJECT AFFECTED AREA ALONG PROPOSED HIGHWAY, PIPELINE ALIGNMENT (CONT'D)

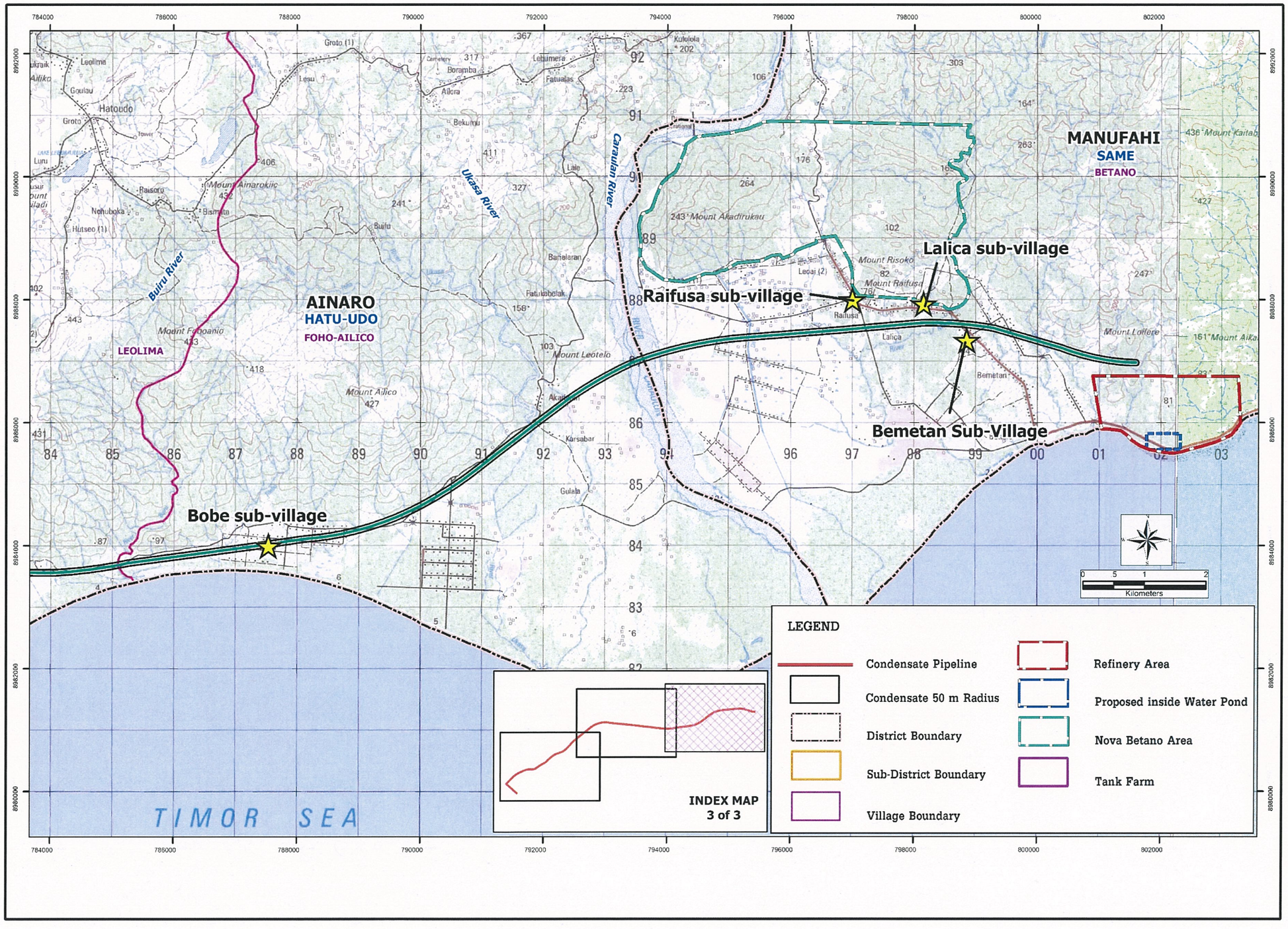


FIGURE 4.3-1 : THE PROJECT AFFECTED AREA ALONG PROPOSED HIGHWAY, PIPELINE ALIGNMENT (CONT'D)

Along its route, the pipeline will cross 25 local roads and trails. ***Table 4.3-2*** shows the positions of the local roads/trails crossing.

TABLE 4.3-2

LOCATION ROADS/TRAILS CROSSING THE PIPELINE CROSSING THE PIPELINE ALIGNMENT

Reference Sections		Reference Sections	
Highway	**Pipeline**	**Highway**	**Pipeline**
14+000	5+575	47+200	38+700
16+200	7+750	48+700	40+200
17+100	8+600	49+600	41+100
18+500	10+000	53+200	44+700
19+300	10+800	55+000	46+500
20+300	11+800	59+800	51+300
22+700	14+200	60+600	52+100
23+100	14+600	61+800	53+300
25+300	16+800	62+500	54+000
29+400	20+900	64+100	55+600
34+600	26+100	64+500	56+000
42+100	33+600	65+000	56+500
46+300	37+800		

Source: TIMOR GAP, E.P., 2016

The pipeline will cross four small rivers with widths less than 50 m and eight large rivers with widths more than 50 m and eight large rivers with widths more than 50 m (***Figure 4.3-1***). Pipe bridges will be used for river crossing. ***Table 4.3-3*** gives information on the large river crossing.

TABLE 4.3-3

LARGE RIVERS CROSSING THE PIPELINE ALIGNMENT

No.	River Name	Effective River Width (m.)
1	Raiketan River	190
2	Zolai River	110
3	Haimanu/Foura River	110
4	Loumea River	240
5	Mola River	400
6	Belulic River	240
7	Ukasa River	60
8	Karaulun River	800

Source: Terms of Reference for Condensate and Products Pipeline Route, p.13.

(2) Instrumentation System

The pipeline will be equipped with appropriate instruments for monitoring and control of pressure, temperature and flow at both ends for the purposes of operational management and safety. The gathered information will be assessed and analyzed using a SCADA system[1] to efficiently and effectively monitor and control the pipeline operation. In addition, the pipeline will be equipped with safety equipment as specified in the design standards, such as pressure reducing valves.

(3) Pumping Stations

One pumping station will be constructed at Suai Supply Base for pumping the condensate. Another pumping station will be constructed at the refinery for pumping the three products. Salient features of the two pumping stations are summarized as follows:

Pumping Station at Suai Supply Base

- Number of pumps
- Type of pumps
- Capacity of each pump
- Power

Pumping Station at Betano Refinery

- Number of pumps
- Type of pumps
- Capacity of each pump
- Power

The need for boosting pump stations will be determined in the detailed design.

(4) Pigging Stations

Pigging will be used for pipeline inspection to perform various maintenance operations without stopping the flow in pipelines.

Two pigging launching/receiving stations will be installed, one close to the pumping station at Suai Supply Base, and another close to the pumping station at the refinery.

(5) Control Buildings

One control building will be required at each end of the pipeline. The two buildings will be small and can be considered minor construction works.

[1] SCADA (Supervisory Control And Data Acquisition) is a system for remote monitoring and control that operates with coded signals over communication channels (using typically one communication channel per remote station)

(6) Block Valve Stations

The Project Proponent does not see the need for block value stations. However, the need of block value stations should be confirmed in the detailed design.

4.4 PROJECT STATUS AND SCHEDULE

Detailed engineering designs of the Project are being prepared by the EPC. The Project will be implemented on a single EPC contract by a qualified and experienced contractor. The contract scope would cover: (i) supply of all pipeline materials and equipment; (ii) construction of the pipeline, pumping stations, pigging stations, and control buildings; and (iii) testing and commissioning of the pipeline system.

The entire distance of 155.7 km had been cleared for highway construction. The area covers pipeline corridor. The required land has already been acquired by GoTL as part of the land acquisition for the highway project. TIMOR GAP, E.P. will coordinate the implementation of this Project with the highway project, the Betano Refinery Project, and the other two support projects of the Betano Refinery Project. Preferably, the pipeline construction will be carried out concurrently with the highway construction. As of the end of March 2016, the highway project has commenced the first phase of the highway from Suai to Zumalai about 31 km before reaching Betano.

Tentatively, TIMOR GAP, E.P. intends to commence the construction around 2017. The construction will take about 36 months to complete. ***Figure 4.5-1*** shows a tentative construction schedule.

No.	Activities	Duration	Construction Period (month)					
			2017		2018		2019	
			6	12	18	24	30	36
1	Site preparation	12						
2	Excavation works	21						
3	Pipeline installation	21						
4	Inspection and testing	21						
5	Earth backfilling works	20						
6	Commissioning	6						

Source: TIMOR GAP, E.P., 2016

FIGURE 4.5-1 : TENTATIVE CONSTRUCTION SCHEDULE

4.5 JUSTIFICATION AND NEED FOR THE PROJECT

Although this Project is not explicitly identified in the SDP, its need is evident as the refinery will need the condensate feedstock from Suai Supply Base and will have to deliver its products to Suai Base for further transport to buyers. Pipeline transport of petroleum product is commonly used as it is normally more economical than transport by tanker trucks. Therefore, the justification and need for this Project is solidly grounded on the justification and need for the Betano Refinery Project which is accorded high importance by GoTL. Without this Project, the Betano Refinery will have to transport its feed stock and products by trucks from and to Suai Supply Base. As the unit cost of transport by pipeline is lower than by tanker trucks, the Project could be justified on and economic ground.

In addition, the pipeline transport is normally more environmentally friendly than the truck transport. Therefore, the Project could also be justified on environmental ground. This subject is discussed in more detail in ***Chapter 8-Alternatives***.

4.6 THE PROPONENT'S ENDORSEMENT OF THE EIS

The Project Proponent's letter of endorsement is prepared to submit to NDPCEI.

4.7 THE STRUCTURE OF THE EIS

The EIS contains all elements prescribed in the draft document on *"Minimum Requirements for an Environmental Impact Statement (MREIS)"* prepared by NDPCEI. The structure of this EIS follows as appropriate the sequence of various sections shown in MREIS.

The EIS consists of 16 chapters and support appendixes while the proposed Environmental Management Plan is presented as a separate document. The main text of the EIS is structured as follows:

Chapter 1-Executive Summary:-This chapter presents a summary of the key findings and conclusion of the EIS.

Chapter 2-Details of the Project Proponent:-This chapter presents details of the Project Proponent (Section 2, MREIS).

Chapter 3-Details of the EIA Consultants:-This chapter corresponds to Section 3, MREIS, it presents details of the EIA consultants who carried out the study and prepared the EIS.

Chapter 4-Description of the Project:-This chapter corresponds to Section 4, MREIS. It presents brief description of the Project while details are presented in appendixes. The information in this chapter is the basis for identification of environmental and social changes that could have impacts on the environment during the construction and operation of the Project. It also presents the proponent's endorsement of the EIS and the structure of the EIS.

Chapter 5-Policy, Legal and Institutional Framework: This chapter covers Section 5, MREIS. It reviews national laws and regulations including environmental guidelines and standards applicable to this Project. International practices and standards relevant to this Project are also discussed and proposed, as appropriate, to fill gaps in the national laws and regulations, if any.

Chapter 6-Description of the Environment: This chapter corresponds to Section 6, MREIS. It defines the study area and limits of the study, and describes various environmental components of the study area, including physical, ecological, economic, social, and cultural components. The information in this chapter is the basis for assessing the significance of environmental and social impacts of the identified environmental and social changes in Chapter 9.

Chapter 7-Climate Change: This chapter corresponds to Section 7, MREIS. It includes relevant climate change considerations relevant to the construction, operation and decommissioning of the Project.

Chapter 8-Alternatives: This chapter corresponds to Section 8, MREIS. It discusses the alternatives for the Project site and justifies the selected site.

Chapter 9-Impact Assessment and Mitigation Measures: This chapter corresponds to Section 9, MREIS. It identifies various environmental impact issues that would be experienced during the pre-construction, construction and operation phases of the Project, assesses their significance, and proposes appropriate management and physical measures for mitigating the identified impacts.

Chapter 10-Social Impact Assessment: This chapter corresponds to Section 10, MREIS. It covers the eight topics in Section 10, MREIS as relevant and applicable to the context of this Project.

Chapter 11-Economic Assessment: This chapter corresponds to Section 11, MREIS. It discusses economic aspects of environmental and social impacts of the Project, Monetary value of the environmental impacts and benefits resulting from the Project are estimated.

Chapter 12-Summary of Environmental Management Plan: This chapter corresponds to Section 12, MREIS. It summarizes the proposed environmental management plan (EMP) which is presented in a separate document.

Chapter 13-Public Consultation and Information Disclosure: This chapter corresponds to Section 13, MREIS. This chapter presents results of public consultation and disclosure conducted as part of the EIA study. The presentation is focused on salient findings relevant to the design of mitigation measures proposed in Chapter 9 and 10.

Chapter 14-Difficulties Encountered:-This chapter corresponds to Section 14, MREIS. It discussed difficulties occurred during the EIA study.

Chapter 15-Conclusions and Recommendations: This chapter corresponds to Section 15, MREIS. It presents major conclusions of the EIA study and recommendations to NDPCEI and the Project Proponent regarding the implementation of the proposed EMP.

Chapter 16-Non-Technical Summary: This chapter corresponds to Section 16, MREIS. It summarizes results of the EIA study in plain and simple language to facilitate understanding of the various key points by non-technical readers.

Appendices: All appendices referred to in various chapters in the main text are presented at the end of the document.

CHAPTER 5

POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

CHAPTER 5

POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

5.1 PURPOSE AND SCOPE OF REVIEW

As prescribed in the Minimum Requirements for an Environmental Impact Statement (MREIS), this chapter reviews the policy, legal, and institutional framework for environmental management in Democratic Republic of Timor-Leste (RDTL). The purpose is to identify laws and regulations in environmental management that this Project will have to comply with. As environmental management in RDTL is still in an early development stage, gaps are expected in guidelines and standards for the management of various environmental and social impact issues of development projects. Consequently, the review in this chapter also covers international guidelines and standards that should be considered to fill gaps in the national guidelines and standards relevant to environmental management of this Project. As this Project is conceived as an integral component of the Tasi Mane Project, for which a strategic environmental impact assessment (SEIA) was completed, the MREIS also requires this review to include the agreement between the proposed guidelines and standards with those recommended in the Tasi Mane SEIA report.

In conducting the review, the Consultant relies on secondary information culled from a variety of sources in the internet and also from the Tasi Mane SEIA report and the Suai Supply Base EIA report.

5.2 FUNDAMENTAL POLICY AND LEGAL FRAMEWORK

Environmental management in the Democratic Republic of Timor-Leste (RDTL) is founded on Timor-Leste's Constitution of 2002, and the Environmental Basic Law, Decree Law No. 26/2012 of 4 July 2012.

5.2.1 The Constitution

The Constitution of 2002 consists of 7 Parts and 170 Articles. Six Articles are relevant to environmental management. Relevant parts of the Articles and their implications on environmental management are presented below:

Article 9: Reception of International Law

1. The legal system of East Timor shall adopt the general or common principles of international law.

2. Norms provided for in international conventions, treaties and agreements shall apply in the internal legal system of East Timor following their approval, ratification or accession by the respective competent organs and after publication in the official gazette.

3. All norms that are contrary to the provisions of international conventions, treaties and agreements applied in the internal legal system of East Timor are invalid.

Implications on Environmental Management: Generally accepted international guidelines and standards for some specific issues may be considered to apply in environmental management of projects if there are no national guidelines or standards for the subjects.

Article 54: Right to Private Property

3. The requisitioning and expropriation of property for public purposes shall only take place following fair compensation in accordance with the law.

Implications on Environmental Management: Land acquisition and involuntary resettlement has to be carried out on a fair compensation basis in accordance with the applicable laws and regulations. However, rights of the affected people to livelihood recovery are not mentioned.

Article 61: Environment

1. All have the right to a humane, healthy, and ecologically balanced environment and the duty to protect it and improve it for the benefit of the future generations.

2. The State recognizes the need to preserve and rationalize natural resources.

3. The State shall promote actions aimed at protecting the environment and safeguarding the sustainable development of the economy.

Implications on Environmental Management: This Article is one of the basic tenets for environmental management for sustainable development.

Article 96: Legislative Authorization

1. The National Parliament may authorize the government to make laws concerning the following matters:

h. definition of the bases for a policy of protection of the environment and sustainable development;

Implications on Environmental Management: The government is expected to take initiatives in formulating environmental policies and proposing draft legislation for implementing the policies.

Article 139: Natural Resources

1. The resources of the soil, the subsoil, the territorial waters, the continental shelf and the exclusive economic zone, which are essential to the economy, shall be owned by the State and must be used in a just and equitable (iqualitáia) manner in accordance with national interests.

2. The conditions for the exploitation of the natural resources referred to in number 1 above must lend themselves to the establishment of obligatory financial reserves, in accordance with the law.

3. The exploitation of the natural resources shall preserve the ecological balance and prevent destruction of ecosystems.

Implications on Environmental Management: This Article complements Article 61. It emphasizes the need to: (i) consider equitable sharing of project benefits, particularly those people affected by the projects (1); (ii) consider establishment of funds for contribution to the development of affected communities; and (ii) consider ecological impacts within the impact assessment of a proposed project (3).

Article 141: Land

Ownership, use and development of land as one of the factors for economic production shall be regulated by law.

Implications on Environmental Management: Land use in a development projects has to conform with applicable land use regulations in the project area.

5.2.2 Environmental Basic Law of 2012

The Environmental Basic Law of 2012 is issued for translating environmental aspirations and commitments in the Constitution into practical realities. As such, it provides an overarching environmental framework that defines environment policy, and provides guiding principles for environmental protection and conservation for sustainable use of natural resources in order to ensure the quality of life of the people of RDTL. Therefore, the Environmental Basic Law is comprehensive containing 71 articles in 10 chapters:

(1) General Provisions (Articles 1 to 8)

(2) Governing Bodies (Articles 9 to 12)

(3) Instruments and Relations with other Sectors (Articles 12 to 21)

(4) Protection, Conservation and Sustainable Use of Environmental Components (Articles 22 to 31)

(5) Pollution and Waste (Articles 32 to 42)

(6) Financial Measures and Economic Instruments (Articles 43 to 47)

(7) Environmental Information and Education (Articles 48 to 53)

(8) Inspections, Emergency Situations, Civil Liability Insurance and Guarantees (Articles 54 to 58)

(9) Liability and Judicial Oversight (Articles 59 to 64)

(10) Final and Temporary Provisions (Articles 65 to 71)

The Environmental Basic Law is essentially an umbrella law covering all modern aspects and contemporary issues of environmental management, such as (i) application of strategic environmental impact assessment (SEIA) as a tool for impact assessment of proposed public policies, legislation, and development plans and programs; and (ii) climate changes. However, the Environmental Basic Law provides only the concept, principles or approach for each aspect of environmental management. Therefore, it has to be supported by specific laws or regulations. For example, sources and ambient environmental standards will have to be established. Progress in the issuance of support laws and regulations is still slow. A draft EIA law and a draft Waste Management Law have been proposed but are still under the legislation process[1].

It should be noted that Decree Law No. 5/2011, Environmental Licensing, dated February 9, 2011, had been issued before the promulgation of the Environmental Basic Law.

5.3 LAW RELATED TO THE EIA PROCESS

Decree Law 5/2011 on Environmental Licensing is currently the only law that establishes procedures and mechanisms for the EIA process and the issuance of Environmental License. This law is enforced on all new private and public development projects. The issuance of environmental license to a proposed project is contingent upon submitted EIA results and environmental management plan (EMP) by the project proponent. It is noted that an EIA report is referred to in this law as Certificate of Environmental Impact. This would be due to the translation of this law. However, the term Environmental Impact Statement (EIS) is currently used.

The Environmental Licensing Law is organized into 13 chapters and 47 articles as follows:

(1) General Provisions (Articles 1)

(2) Environmental Licensing System (Articles 2 to 4)

(3) Information Phase of the Environmental Assessment (Articles 5 to 7)

(4) Procedure for the Environmental Impact Assessment and for Granting the Environmental License (Articles 8 to 14)

(5) Protection of Traditional Customs and Rights (Articles 15 to 16)

(6) Initial Environmental Examination (EAI) and Granting of the Environmental License (Articles 17 to 21)

(7) Environmental License (Articles 22 to 24)

(8) Alterations to the Conditions of the Environmental License (Articles 25 to 28)

(9) Regime Applicable to Previous Projects (Articles 29 to 30)

(10) Inspection and Monitoring (Articles 31 to 33)

(11) Penalties (Articles 34 to 36)

(12) Challenging the Decisions (Articles 37)

(13) Final and Transitory Provisions (Articles 38 to 47)

[1] Draft of Environmental Impact Assessment Legislation Law, 21 March.doc

The Environmental Licensing Law clearly prescribes the EIA process and procedures that are in line with practices in most countries. For examples: (i) development projects are environmentally classified as Categories A, B and C depending on the nature, scope and magnitudes of the projects; and (ii) an EIA is preceded by a scoping exercise. ***Figure 5.3-1*** is an EIA process for Category A projects drawn from the process described in the law. However, the Environmental Licensing Law does not prescribe the required content of EIA reports and EMP documents.

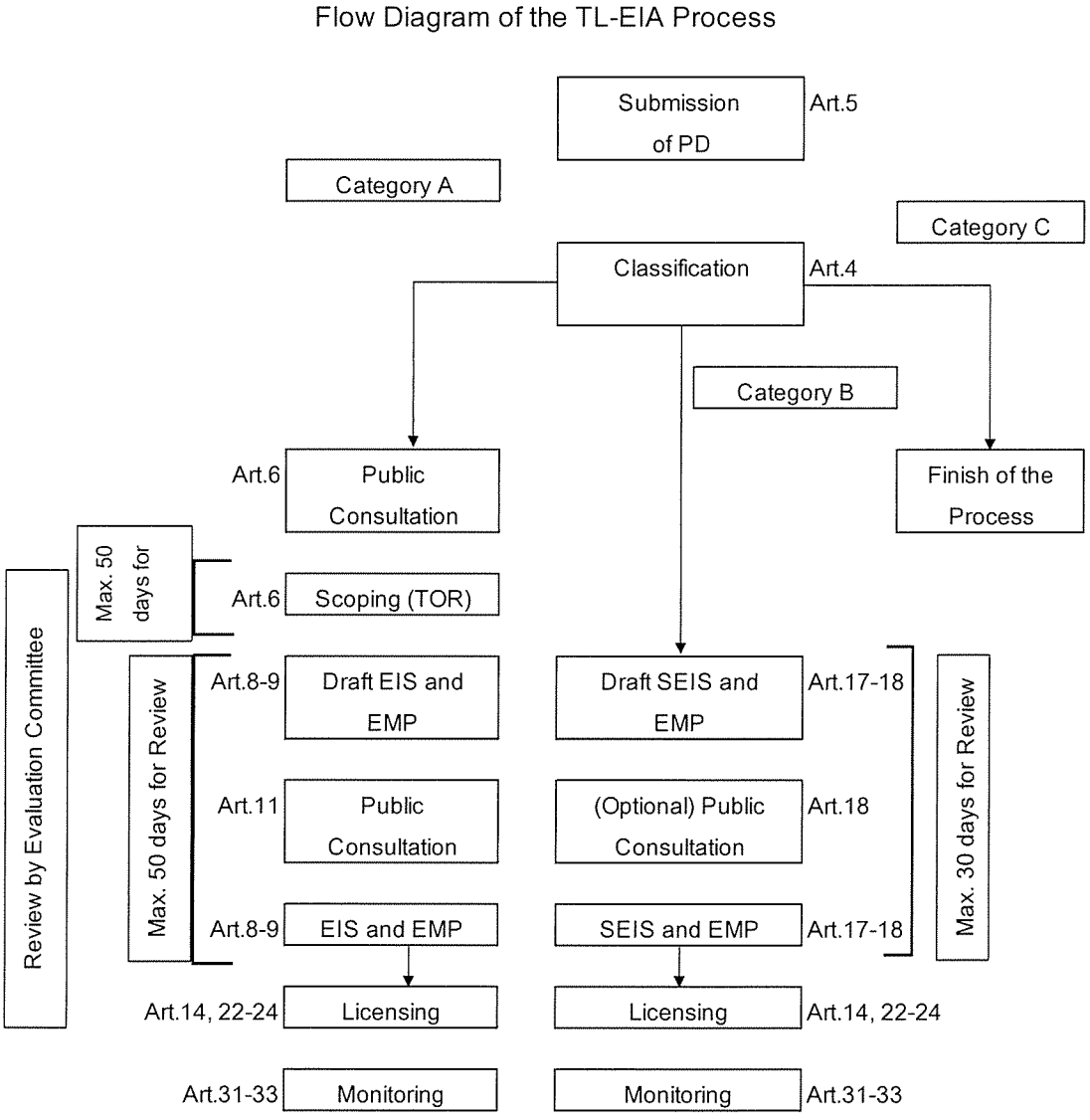


FIGURE 5.3-1 : EIA PROCESS FOR CATEGORY A PROJECT

Of particular interest is the provision for an Impact and Benefits Agreement for protecting traditional customs and rights. This provision is covered in Articles 15 and 16 of Chapter V-Protection of Traditional Customs and Rights. Article 15 provides the concept and the application of the Impact and Benefits as shown below:

Article 15: Impact and Benefits Agreement (IBA)

1. The Impact and Benefits Agreement (IBA) is the legal instrument within the private sphere governed by the Civil Code which defines the rights and obligations between the applicant and the legal representative of the communities under protection, the respect for the traditional use of the land, the customs and rights of this community and compensations compatible with the potential environmental impacts identified in the Certificate of Environmental Impact of the project at hand.

2. The Impact and Benefits Agreement (IBA) is entered into with the communities located around or in the vicinity of the category A project whose traditional use of the land, other customs or traditional rights are likely to be affected.

Article 16 prescribes conditions and mechanisms for negotiation of the AIB between the project proponent and the affected communities.

5.4 LAWS AND REGULATIONS SPECIFIC TO INDIVIDUAL ISSUES

5.4.1 Environmental Guidelines and Standards

In environmental management, sources (emission) and ambient guidelines or standards will be required for monitoring and evaluating environmental performance of projects. The Environmental Basic Law recognizes the need for such standards for all environmental medium, ecosystems, noise, vibration, wastewater, gaseous emissions, and hazardous wastes. However, to date, RDTL still lacks national environmental standards and guidelines.

Consequently, the Consultant will propose suitable international standards and guidelines for application in environmental management of this Project.

5.4.2 Laws Related to Social Impact Management

A. Compensation on Land Acquisition for Tasi Mane Project

Maximum Amount to Pay for the Plots of Land Required for the Tasi Mane Project in Suai was made with reference to Government Resolution No. 20/2014.

The Tasi Mane Project foresees the construction of three industrial clusters in the south of Timor-Leste, namely, Suai Supply Base, Betano Refinery and Petrochemical Complex, and LNG Plant.

Considering the land required for the Suai Supply Base, Suai Airport and Highway implementation and construction, there were difficulties faced during land title identification and negotiation between the State and the land title holders. Hence it is necessary to set forth a maximum amount that the State shall pay for the land temporary ownership rights, land use and compensations for the existing trees and agricultural crops.

Therefore, the Government, through the Resolution No. 20/2014, of 6th August 2014, approved (i) the payment of a maximum amount of ***three dollars*** of the United States of America per square meter for the acquisition of the plots of land required for the construction of the Suai Supply Base (located in Suco Camanasa), Suai Airport and highway for the Tasi Mane Project, and (ii) the maximum amounts to be paid for the loss of agricultural crops and trees (see tables attached with the Resolution in ***Appendix 3A***).

B. Land Acquisition and Resettlement

RDTL has no comprehensive guidelines or laws for land acquisition and resettlement. However, land acquisition has to be based on fair compensation to land owners (Constitution, Article 54). In addition, Decree Law No. 6/2011 of 9 February on *Compensations for Evacuating State Real Property* provides for the granting of compensation for the relocation of unlawful occupants of State property in those cases where the relevant authorities consider that humanitarian reasons exist that justify granting of compensation. The law also defines the criteria for calculating the compensation and prescribes various requirements for the granting of compensations.

These two principles, fair compensation and granting compensations to affected peoples who are not land owners, are in line with the resettlement principles adopted by international development agencies. However, the livelihood restoration aspect has not received attention.

C. Community Health and Safety

Existing public health law and regulations in Timor-Leste have no provisions for safeguarding community health and safety related to impacts of development projects.

D. Occupational Health and Safety

RDTL has not enacted laws or implemented regulations for working conditions, health, and safety. The Occupational Health and Safety Law was drafted in 2004 but has not yet been enacted. The United Nations Transitional Administration in East Timor (UNTAET) Regulation 2002/05, the Labor Code for Timor-Leste, is broadly relevant, but it does not regulate health and safety. The Labor Code creates a National Labor Board with the mandate to provide independent advice on occupational safety and health matters, along with programs on vocational training and skills development, grant exemptions, minimum wages, and other related functions. The National Labor Board, however, has not yet been established.

5.4.3 Law No.13/2005 on Petroleum Activities

This law covers various aspects of the management and administration of petroleum exploration and production activities but not refining and petrochemical production. Article 23-Working Practices requires operational safety, including occupational health and safety, and environmental protection.

5.4.4 Laws Related to Ecological Protection

A. Protected Areas

UNTAET Regulation No 2000/19 declared 15 protected areas and the other 15 locations identified for legislation protected area. A comprehensive law on Establishment and Management of Protected Areas has been under the process of legislation since 2013. It has not yet been enacted into law. This draft law on protected areas is comprehensive covering the process of establishment and management of national protected areas and various aspects of the implementation.

Tara Bandu, an old tradition still being practiced in Timor-Leste, helps to protect natural areas and other sites from destruction by man-made activities. It is an old custom that regulates interactions between man and the environment in Timor-Leste. Communities are reviving this practice to determine where and when it is forbidden to collect sands, cut trees, collect produce from plants in areas where locals consider as sacred.

B. Marine Ecosystem

Decree Law No. 6/2004 of 21 April 2004 on *General Bases of the Legal Regime for the Management and Regulation of Fisheries and Aquaculture* covers various aspects of fisheries management of the country. However, Article 81 (Protection of Aquatic Environment) prohibits the discharge of wastewaters and other wastes into freshwater and marine water if the wastes could be harmful to aquatic species and aquatic ecosystem. However, the enforcement of this Article needs national source standards. This Project will need to discharge treated effluent into the sea. This would require approval of the Minister responsible for the enforcement of this fisheries decree. Text of Article 81 is given below:

Article 81 (Protection of Aquatic Environment)

1. The introduction into national maritime waters and hydrographical basis of the country of any substances or toxic objects susceptible to infection, which poisons and destroys fishing resources, algae or any aquatic flora species, shall be prohibited.

2. Factories or companies, as well as any person or entity established along the coastline or hydrographical basins shall be prohibited from throwing used water originating from industrial or commercial activities into national waters if these are susceptible to stun, poison or provoke the destruction of fishing resources or any other aquatic species.

3. Any facility aimed at or which may result in the evacuation of residual waters into maritime waters or hydrographical basins shall require a prior opinion from the Minister.

5.4.5 Laws Related to Cultural Protection

The Government Resolution No. 25/2011, 14 September Protection of Cultural Heritage is approved, defining the concept of cultural heritage and measures for its support, defense, preservation, and conservation. This resolution then covers the protection of many sacred sites found in the study area, as its type is defines as a cultural heritage.

5.4.6 Summary of Related Laws and Regulations

Relevant Laws and Regulations are summarized in ***Table 5.4-1***.

TABLE 5.4-1
SUMMARY OF RELATED LAWS AND REGULATIONS

Aspects	Laws and Regulations
1. Social Impact Management	1. Government resolution No. 20/2014
	2. Land Acquisition and Resettlement
	- Constitution, Article 54
	- Decree Law No. 6/2011
	3. Occupational Health and Safety
	- Draft Occupational Health and Safety Law (2004)
	- The United Nations Transitional Administration in East Timor (UNTAET) Regulation 2002/05, the Labor Code for Timor-Leste
2. Petroleum Activities	Law No.13/2005 on Petroleum Activities - Article 23 (Working Practices requires operational safety and environmental protection)
3. Ecological Protection	The World Database on Protected Area (WDPA) January 2015
	Decree Law No. 6/2004 of 21 April 2004 - Article 81 (Protection of Aquatic Environment)
4. Cultural Protection	The Government Resolution No. 25/2011

5.5 INTERNATIONAL CONVENTIONS, TREATIES, AND AGREEMENTS

As of the end of 2015, RTDL has signed and ratified four international conventions, that are relevant to environmental management.

(1) Vienna Convention on the Protection of Ozone Layer and its Montreal Protocol on Ozone Depleting Substances (in 1999)

(2) UN Convention on Combat on Desertification (UNCCD) (in 2003)

(3) UN Convention on Biodiversity (UNCBD) (in 2007)

(4) UN Framework Convention on Climate Change (UNFCCC) in 2006 and the Kyoto Protocol in 2008

The first two conventions are not relevant to this Project. The Project will have an opportunity to contribute to last two conventions.

5.6 INTERNATIONAL POLICIES, GUIDELINES AND STANDARDS

International policies, guidelines and standards relevant to environmental and social impacts of projects that are referred to by most countries are those issued by the World Health Organization (WHO), the U.S. Environmental Protection Agency (EPA), the World Bank, and the International Finance Corporation (IFC). The policies, guidelines and standards of the World Bank and IFC are cross referenced and complementary as the IFC is an organization of the World Bank Group. They are also adopted by most development organizations such as the Asian Development Bank. It should be noted that the guidelines and standards recommended by the World Bank and IFC, especially those related to environmental pollution, also gave due consideration to the guidelines and standards of the EPA and WHO.

Only those international policies, guidelines and standards relevant to this Project are discussed herein.

5.6.1 IFC's Standards and Guidelines

IFC's standards and guidelines relevant to this Project are described in three documents:

(1) Performance Standards on Environmental and Social Sustainability, January 1, 2012;

(2) Environmental, Health, and Safety-General Guidelines, April 30, 2007; and

(3) Environmental, Health, and Safety Guidelines for Petroleum Refining (April 30, 2007).

(4) Workers' accommodation: processes and standards, August 2009.

The first document describes eight performance standards on environmental and social sustainability which IFC requires its clients to apply throughout the project life cycle.

The second document provides general guidelines for environmental, health and safety (EHS) for development projects.

The third document provides EHS guidelines specific to petroleum refining projects.

The fourth document provides the processes and standards that should be applied to the provision of workers' accommodation.

Essential requirements in the three IFC documents pertaining to this Project are summarized below.

A. Performance Standards on Environmental and Social Sustainability, January 1, 2012

IFC prescribes eight Performance Standards (PS) to which its clients will need to comply throughout the investment life of IFC. The eight PSs are:

(1) Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

(2) Performance Standard 2: Labor and Working Conditions

(3) Performance Standard 3: Resource Efficiency and Pollution Prevention

(4) Performance Standard 4: Community Health, Safety, and Security

(5) Performance Standard 5: Land Acquisition and Involuntary Resettlement

(6) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

(7) Performance Standard 7: Indigenous Peoples

(8) Performance Standard 8: Cultural Heritage

The eight PSs cover all environmental and social aspects of development projects.

Major requirements of each PS are summarized as follows:

PS1-Asessment and Management of Environmental and Social Risks and Impacts: PS1 requires the client, in coordination with other responsible government agencies and third parties as appropriate, to conduct a process of environmental and social assessment, and establish and maintain an environmental and social management system (ESMS) appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts. The ESMS will incorporate the following elements: (i) policy; (ii) identification of risks and impacts; (iii) management programs; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement; and (vii) monitoring and review. These requirements are explained in details in the PS document and associated guidelines.

PS2-Labor and Working Conditions: PS2 requires the client to: (i) formulate and implement human resources policies and procedures appropriate to its size and workforce that set out its approach to managing workers consistent with the requirements of this Performance Standard and national law; (ii) provide reasonable working conditions and terms of employment; (iii) treat migrant workers on substantially equivalent terms and conditions to non-migrant workers carrying out similar work; (iv) establish grievance mechanism; (v) refrain from using child labor and forced labor; and (v) provide a safe and healthy work environment, taking into account inherent risks in its particular sector and specific classes of hazards in the client's work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women. These requirements will also be applied to workers of the contractors through effective contractual arrangements between the client and the contractors.

PS3-Resource Efficiency and Pollution Prevention: PS3 requires the client's project to: (i) efficiently use energy and water; and (ii) use best available techniques (BAT) in pollution control.

PS4-Community Health, Safety, and Security: This PS requires the client to: (i) evaluate the risks and impacts to the health and safety of the Affected Communities during the project life-cycle; and (ii) establish preventive and control measures consistent with good international industry practice (GIIP), such as in the World Bank Group Environmental, Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognized sources. The requirements are elaborated in the PS document. Some of the requirements, such as hazardous materials management, are similar to those in PS3. In essence, safety aspects to the communities and operators will need to be fully considered in engineering design, construction and operations of all Project facilities, including support facilities or infrastructure. Health risks will also be included.

PS5-Land Acquisition and Involuntary Resettlement: This PS requires the client to avoid land expropriation, physical displacement, and adverse impacts on livelihoods and ways of life of people in the project area. The process of land acquisition has to ensure community engagement, fair compensation for loss of land, properties, and livelihood; grievance mechanism, and appropriate resettlement and livelihood restoration planning and implementation.

PS6-Biodiversity Conservation and Sustainable Management of Living Natural Resources: PS6 requires the EIA to consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts. As a matter of priority, the client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented. Given the complexity in predicting project impacts on biodiversity and ecosystem services over the long term, the client should adopt a practice of adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the project's lifecycle.

PS7-Indigenous Peoples: PS7 requires the EIA to identify all communities of Indigenous Peoples within the project area of influence who may be affected by the project, as well as the nature and degree of the expected direct and indirect economic, social, cultural (including cultural heritage), and environmental impacts on them. Adverse

impacts on Affected Communities of Indigenous Peoples should be avoided where possible. Where alternatives have been explored and adverse impacts are unavoidable, the client will minimize, restore, and/or compensate for these impacts in a culturally appropriate manner commensurate with the nature and scale of such impacts and the vulnerability of the Affected Communities of Indigenous Peoples.

PS8-Cultural Heritage: PS8 requires the client to: (i) protect cultural heritage from the adverse impacts of project activities and support its preservation; and (ii) promote the equitable sharing of benefits from the use of cultural heritage. The EIA will need to identify sites of cultural heritage and assess their value or importance at the community, provincial and national levels.

The eight PSs are based on best practices in environmental and social management. They should be considered for application in this Project as appropriate although IFC is not involved in financing the Project.

B. Environmental, Health, and Safety-General Guidelines, April 30, 2007

This publication provides general EHS guidelines covering the following subjects:

Environment: (i) air emissions and ambient air quality; (ii) energy conservation; (iii) wastewater and ambient water quality; (iv) water conservation; (v) hazardous materials management; (vi) waste management; (vii) noise; and (viii) contaminated land.

Occupational Health and Safety: (i) general facility design and operation; (ii) communication and training; (iii) physical hazards; (iv) chemical hazards; (v) biological hazards; (vi) radiological hazards; (vii) personal protective equipment; (viii) special hazard environments; and (ix) monitoring.

Community Health and Safety: (i) water quality and availability; (ii) structural safety of project infrastructure; (iii) life and fire safety (L&FS); (iv) traffic safety; (v) transport of hazardous materials; (vi) disease prevention; and (vii) emergency preparedness and response.

Construction and Decommissioning: (i) environment; (ii) occupational health and safety; and (iii) community health and safety.

The Guidelines present best practices in the management of the four subjects and recommend environmental standards. As there are no national environmental standards, the standards in this EHS Guidelines should be adopted for this Project as appropriate.

C. Environmental, Health, and Safety Guidelines for Petroleum Refining (April 30, 2007)

This publication provides EHS guidelines and standards specific to petroleum refining projects during the operational phase. It covers the following subjects:

Environment: covering (i) air emissions; (ii) wastewater; (iii) hazardous materials; (iv) wastes; and (v) noise.

Occupational Health and Safety: covering issues described in the General EHS Guidelines and additional issues specific to oil refineries thermal power plants, including: (i) process safety; (ii) oxygen-deficient atmosphere; (iii) chemical hazards; and (iv) fire and explosions.

Community Health and Safety: covering issues described in the General EHS Guideline and additional issues specific to petroleum refining, including major hazards.

Performance Indicators and Monitoring Guidelines for Environment, including: (i) emissions and effluent guidelines, (ii) environmental monitoring, and (iii) resource use, energy consumption, emission and waste generation, and Occupational Health and Safety including: (i) occupation health and safety guidelines, (ii) accident and fatality rates, and (iii) occupational health and safety monitoring.

D Workers' accommodation: processes and standards, August 2009

This publication provides the processes and standards that should be applied to the provision of workers' accommodation during construction and operational phases. It covers the following subjects:

Process: covering:

Assessing the Need for Workers' Accommodation: covering (i) availability of workforce, and (ii) availability of existing housing.

Assessing Impacts of Workers' Accommodation on Communities: covering (i) specific impacts during the construction phase, (ii) community infrastructure, (iii) community services and facilities, (iv) local businesses and local employment, (v) community health and safety, (vi) community cohesion, (vii) land acquisition and resettlement, and Dismantling and reinstatement.

Types of Workers' Accommodation: covering criteria of (i) temporary or permanent facilities, (ii) location, (iii) size, (iv) economic sector, (v) project phases, and (vi) accommodation for single or family.

Standards: covering:

National/local Standards: covering issues of (i) building construction, (ii) housing and public housing, (ii) general health, (iv) safety and security, (v) fire safety, and (vi) electricity, plumbing, water and sanitation.

General Living Facilities: covering (i) Drainage, (ii) air conditioning, ventilation and light, (iii) Water, (iv) Wastewater, (v) solid waste, (vi) Room/dormitory facilities, (vii) Sanitary and toilet facilities, (viii) canteen, cooking and laundry facilities, (ix) standards for nutrition and food safety, (x) medical facilities, and (xi) leisure, social and telecommunication facilities.

Managing workers' accommodation: covering Management and staff, Charging fees for accommodation and services, Health and safety on site, Security of workers' accommodation, Workers' rights, rules and regulations on workers' accommodation, Consultation and grievance mechanisms, Management of community relations.

5.6.2 World Bank's Pollution Prevention and Abatement Handbook 1998

The World Bank's Pollution Prevention and Abatement Handbook (PPAH) is a comprehensive document providing guidelines for industrial pollution control and recommends emission and ambient standards to be applied in environmental management. The recommended standards have taken into account the standards enforced by the EPA and recommended by WHO. They are referred to in the IFC's EHS Guidelines.

The PPAH has several sector-specific guidelines. This is one specific section of "Petroleum Refining", pages 377 to 381 which is relevant to the project.

5.7 GUIDELINES AND STANDARDS PROPOSED FOR THIS PROJECT

Environmental management of the Project during construction and operation will comply with appropriate international standards as appropriate unless the local legislation supersedes the international standards. The international ambient standards proposed for the Project are given in ***Table 5.7-1*** and ***Table 5.7-2*** while the emission or source standards are given in ***Table 5.7-3***.

It should be noted that the proposed standards are mostly IFC/WB standards which are in general less strict than the corresponding standards enforced by the U.S.EPA.

TABLE 5.7-1
PROPOSED AMBIENT ENVIRONMENTAL STANDARDS

Subjects	Parameters	Values	References
Ambient Air Quality	TSP 24-hour average[1/] PM_{10} 24-hour average[2/] PM_{10} annual[2/] NO_2 1-hour average[2/] NO_2 annual[2/] SO_2 24-hour average[2/] $SO_2$10-minute average[2/]	230 µg/m^3 150 µg/m^3 (Interim target-1) 70 µg/m^3 (Interim target-1) 200 µg/m^3 40 µg/m^3 125 µg/m^3 (Interim target-1) 500 µg/m^3	[1/] Pollution Prevention and Abatement Handbook, WHO, 1998 [2/] WHO Air Quality Guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide, 2005
Ambient Noise Levels - Industrial and commercial area - Residential areas	Leq (24 hrs) Leq (1 hr) Lmax	70 dB(A)[1/,2/] 70 dB(A)daytime [3/] 70 dB(A) nighttime [3/] 55 dB(A)daytime [3/] 45 dB(A) nighttime [3/] 110 dB(A) [2/]	[1/] Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, US EPA (United States Environmental Protection Agency), 1974 [2/] Notification of Guidelines for Community Noise, World Health Organization (WHO), 1999 [3/] Environmental, Health, and Safety (EHS) Guidelines: General EHS GUIDELINES: ENVIRONMENTAL NOISE MANAGEMENT of International Finance Corporation, 2007
Vibration for industrial buildings and residential building	Peak Particle Velocity	5 mm/s	DIN4150
Coastal and Marine Water Quality	DO pH Ammonia Nitrate Nitrogen Nitrite Nitrogen Phosphates as P Chromium Lead Copper Cadmium Mercury Temperature (incremental increase) Total suspended solids	not less than 4 mg/L 5.0-9.0 70 µg/L 60 µg/L 55 µg/L 15 µg/L for coastal 45 µg/L for estuarine water 50 µg/L 8.5 µg/L 8 µg/L 10 µg/L 0.16 µg/L Increase not more than 2° C above the maximum ambient temperature Permissible 10% maximum increase over seasonal average concentration	ASEAN MARINE WATER QUALITY Management Guidelines and Monitoring Manual, 2008
Marine Water Quality	DO pH Phosphorus	≥ 2.3 mg/L 6.5-8.5 [b/] 0.1 g/L [b/]	National Recommended Water Quality Criteria, United States Environmental Protection Agency (EPA), 2009

TABLE 5.7-1
PROPOSED AMBIENT ENVIRONMENTAL STANDARDS (CONT'D)

Subjects	Parameters	Values	References
	Mercury	1.8 g/L [a]	
		0.94 g/L [b]	
	Cadmium	40 g/L [a]	
		8.8 g/L [b]	
	Chromium	1,100 g/L [a]	
		50 g/L [b]	
	Copper	4.8 g/L [a]	
		3.1 g/L [b]	
	Lead	210 g/L [a]	
		8.1 g/L [b]	
	Nickel	74 g/L [a]	
		8.2 g/l [b]	
	Zinc	90 g/L [a]	
		81 g/L [b]	
Freshwater Quality	Dissolved oxygen	≥ 3.5 mg/L	National Recommended Water Quality Criteria, United States Environmental Protection Agency (EPA), 2009
	pH	6.5-9	
	Turbidity	≤ 25 ppm (Upstream)	Quality Criteria for Water, 1986
		≤ 390 ppm (Downstream)	
	Suspended solids	80 mg/L	
Sediment Quality		Maximum limits	International Association for Impact Assessment (IAIA) NOAA Screen Quick Reference Table, 2004
	Total Chromium	81 mg/kg	
	Total Arsenic	8.2 mg/kg	
	Total Lead	46.7 mg/kg	
	Total Cadmium	1.2 mg/kg	
	Total Nickel	20.9 mg/kg	
	Total Zinc	150 mg/kg	
	Total Copper	34 mg/kg	
	Total Mercury	0.15 mg/kg	
Groundwater Quality	pH at 25° C	6.5-8.5	WHO's Guidelines for Drinking Water Quality, 2011
	Nitrate	50 mg/L	
	Nitrite	3 mg/L	
	Cadmium	0.003 mg/L	
	Lead	0.01 mg/L	
	Arsenic	0.01 mg/L	
	Copper	2 mg/L	
	Mercury	0.006 mg/L	
	Cyanide	0.17 mg/L	
	Chloride	250 mg/L	

TABLE 5.7-1

PROPOSED AMBIENT ENVIRONMENTAL STANDARDS (CONT'D)

Subjects	Parameters	Values	References
Land Stability	Industrial, Commercial and residential areas		Environmental Land Use Planning and Management, 2004
	Stable:	Areas of 0-5% slope that are not underlain by land slide deposits	
	Generally stable:	Areas of 5-15% slope that are not underlain by landslide deposits	
	Generally stable to marginally stable:	Areas of greater than 15% slope that are not underlain by landslide deposits or bedrock units susceptible to landsliding	
	Moderately unstable:	Areas of greater than 15% slope that are underlain by bedrock units susceptible to landsliding but not underlain by landslide deposits	
	Unstable:	Areas of any slope that are underlain by or immediately adjacent to landslide deposits	

Note : [a] Criteria Maximum Concentration is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect

[b] Criterion Continuous Concentration is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect

TABLE 5.7-2

SOIL CONTAMINANT STANDARDS

Scenario	Unit	Arsenic	Benzo(a) pyrene	Cadmium	Boron	Chromium III	Chromium VI	Copper	DDT	Dieldrin	Dioxines	Inorganic Mercury	PCB[3]	PCP[4]
Standard residential 10% produce[1]	mg/kg dry weight	0.39	0.062	70	16,000	120,000	0.29	3,100	0.062	0.03	0.0045	23	0.094	3
Residential 0% produce-High density residential[2]	mg/kg dry weight	0.39	-	70	16,000	120,000	0.29	3,100	0.062	0.03	0.0045	23	0.094	3
Agriculture (no residence)	mg/kg dry weight	-	0.15	-	-	-	-	-	-	-	-	-	-	-
Nature	mg/kg dry weight	-	-	-	-	-	-	-	-	-	-	-	-	-
Other green, berms, industry, infrastructure	mg/kg dry weight	1.6	0.21	800	200,000	1,500,000	5.6	41,000	0.25	0.11	0.018	310	0.018	9

Remark: [1] standard residential lot, for single dwelling site with gardens, including home grown produce consumption (10%)

[2] Urban residential with limited soil contact, including small ornamental gardens but no vegetable garden (no home-grown produce consumption); applicable to urban townhouses, flats and ground-floor apartments with small ornamental gardens, but not high-rise apartments.

[3] Polychlorinated biphenyls

[4] Pentachlorophenol

Source: US EPA Region 9 Serving Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations. Direct exposure pathways. General information and background, http://www.epa.gov/region09/waste/sfund/prg/index.html

TABLE 5.7-3
PROPOSED EMISSION STANDARDS

Subjects	Parameters	Values	References
Effluent Levels		Maximum value	Environmental, Health, and Safety Guidelines for Petroleum Refining of International Finance Corporation, 2007
	pH	6-9 S.U.	
	BOD_5	30 mg/L	
	COD	150 mg/L	
	TSS	30 mg/L	
	Oil and Grease	10 mg/L	
	Chromium (total)	0.5 mg/L	
	Chromium (Hexavalent)	0.05 mg/L	
	Copper	0.5 mg/L	
	Iron	3 mg/L	
	Cyanide (total)	1 mg/L	
	Cyanide (free)	0.1 mg/L	
	Lead	0.1 mg/L	
	Nickel	0.5 mg/L	
	Mercury	0.02 mg/L	
	Vanadium	1 mg/L	
	Phenol	0.2 mg/L	
	Benzene	0.05 mg/L	
	Benzo (a) pyrene	0.05 mg/L	
	Sulfides	1 mg/L	
	Total Nitrogen	10 mg/L [a]	
	Total Phosphorus	2 mg/L	
	Temperature increase	$\leq 3^{o}C$ [b]	
Resource and Energy Consumption	Land use based in part on EC BREF for Refineries	Industry Benchmark 200-500 hectares	Environmental, Health, and Safety Guidelines for Petroleum Refining of International Finance Corporation, 2007
	Total energy based in part on EC BREF for Refineries	2,100-2,900 MJ per Metric Ton of processed crude oil	
	Electric power based in part on EC BREF for Refineries and greenfield facilities	25-48 KWh per Metric Ton of processed crude oil	
	Fresh Make-up Water	0.07-0.14 m^3 per Metric Ton of processed crude oil	

Note :

a. The effluent concentration of nitrogen (total) may be up to 40 mg/l in processes that include hydrogenation

b. At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity.

CHAPTER 6

DESCRIPTION OF THE ENVIRONMENT

CHAPTER 6

DESCRIPTION OF THE ENVIRONMENT

This chapter describes existing environmental conditions in the Project area and its surrounding areas. As prescribed in Section 6 of the MREIS, the description covers: (i) physical components; (ii) ecological components; (iii) economic components; (iv) social components; and (v) cultural components. The information was mostly collected from secondary sources. However, additional information collected from primary sources. It derived through field measurements and field surveys, comprising:

(i) Physical components

- Topography
- Geology
- Groundwater Quality
- Surface Water Quality

(ii) Biological Components

- Wetlands
- Mangroves
- Fisheries
- Protected area and natural parks
- Wildlife, especially any rare, endangered or vulnerable species or habitats
- Forests

(iii) Economic Components

- Employment sectors
- Infrastructure facilities
- Land use
- Use of forests and other natural resources
- Fishing
- Agriculture
- Tourism
- Other industries
- Land Transportation

(iv) Social Components

- Population and communities
- Health profiles of communities
- Institutions, schools and health facilities
- Communities structures , family structures
- Land Ownership
- Any types of common or individual rights on natural resources

(v) Cultural Components

- Cultural heritage
- Archeological sites
- Historic sites
- Scared sites
- Unique landscape

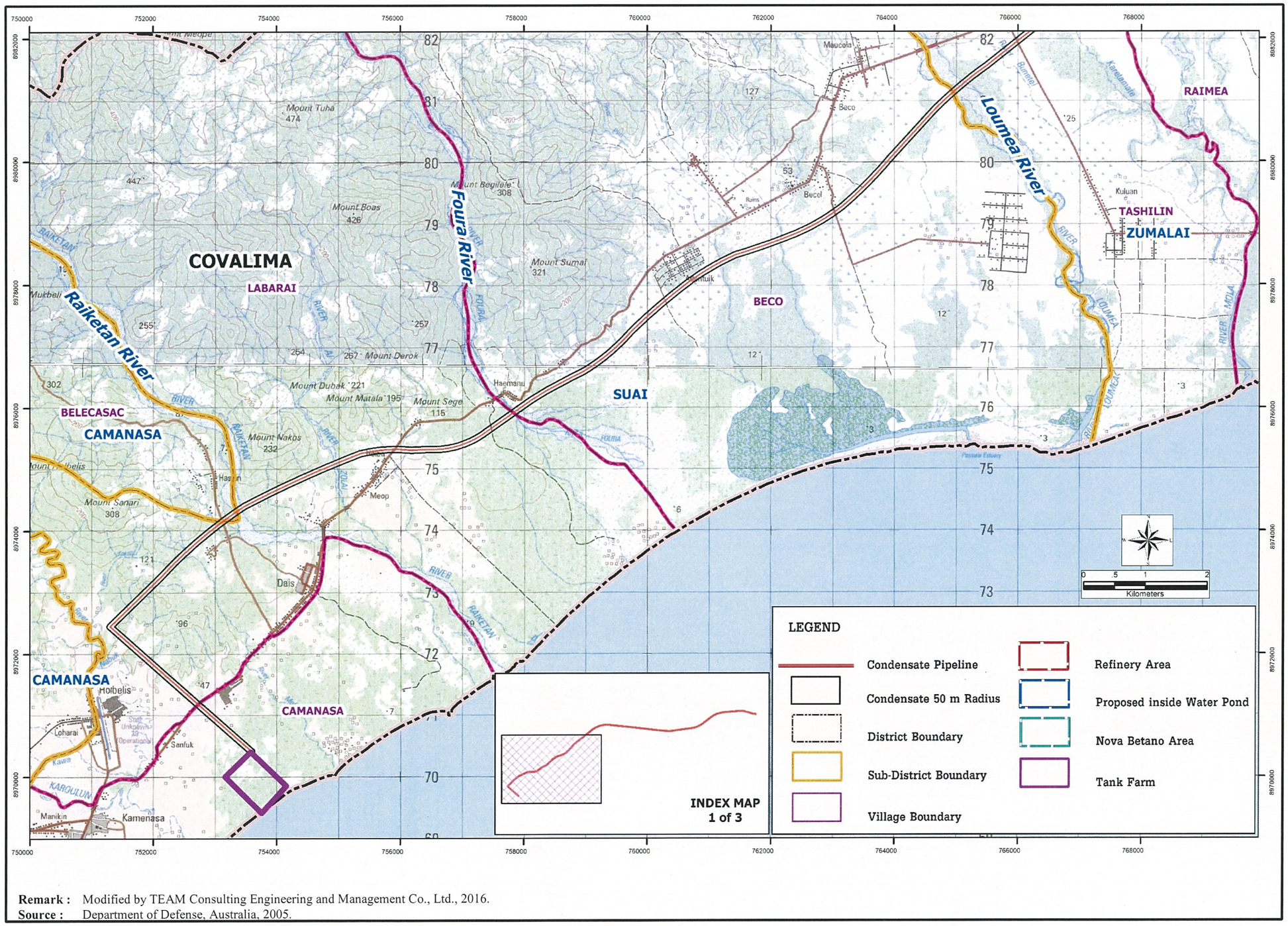
6.1 SETTING THE STUDY LIMITS

In the Environmental Impact Statement (EIS) study, it is necessary to establish baseline information on the environmental and socio-economic settings of an area which could receive directly and indirectly impacts from the Project at each phase i.e. pre-construction, construction, operation, and deactivation phases. The baseline information serves two purposes. Firstly, it is used, in conjunction with the information on the Project, for identification of potential impacts of the Project and assessment of their significance. Secondly, it serves as the benchmark for evaluating environmental and social management performance of the Project construction and operation.

For the purpose of establishing baseline information on the environment, geographical limit and contextual limit of the EIS study are defined to guide the baseline information collection.

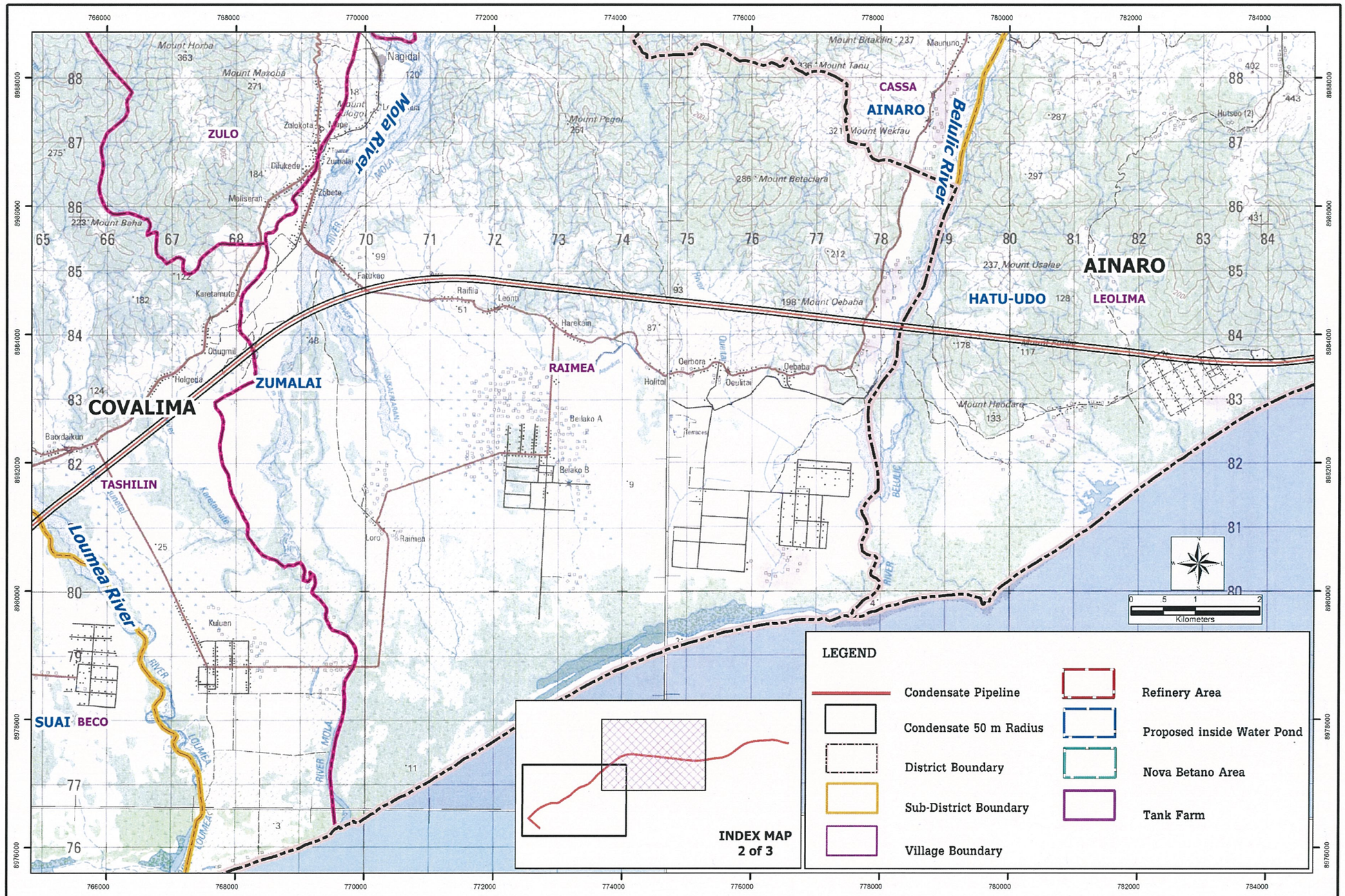
6.1.1 Geographical Study Limit

The geographical study limit is defined as an area along the pipeline route from which the Project impacts could reach and, thus, baseline environmental information should be collected. In this Study, the geographical study limit is approximately 50 m strips on both sides of the centre line within the south of Right-of-Way (ROW) of highway where defined as project study area. This geographical study limit covers 6 km^2 of rectangular area along the project alignment as shown in a map in ***Figure 6. 1-1***. This area is referred to in subsequent sections of this Report as "the study area". The study area should cover sensitive receptors of environmental impacts of the Project during project construction and operations.



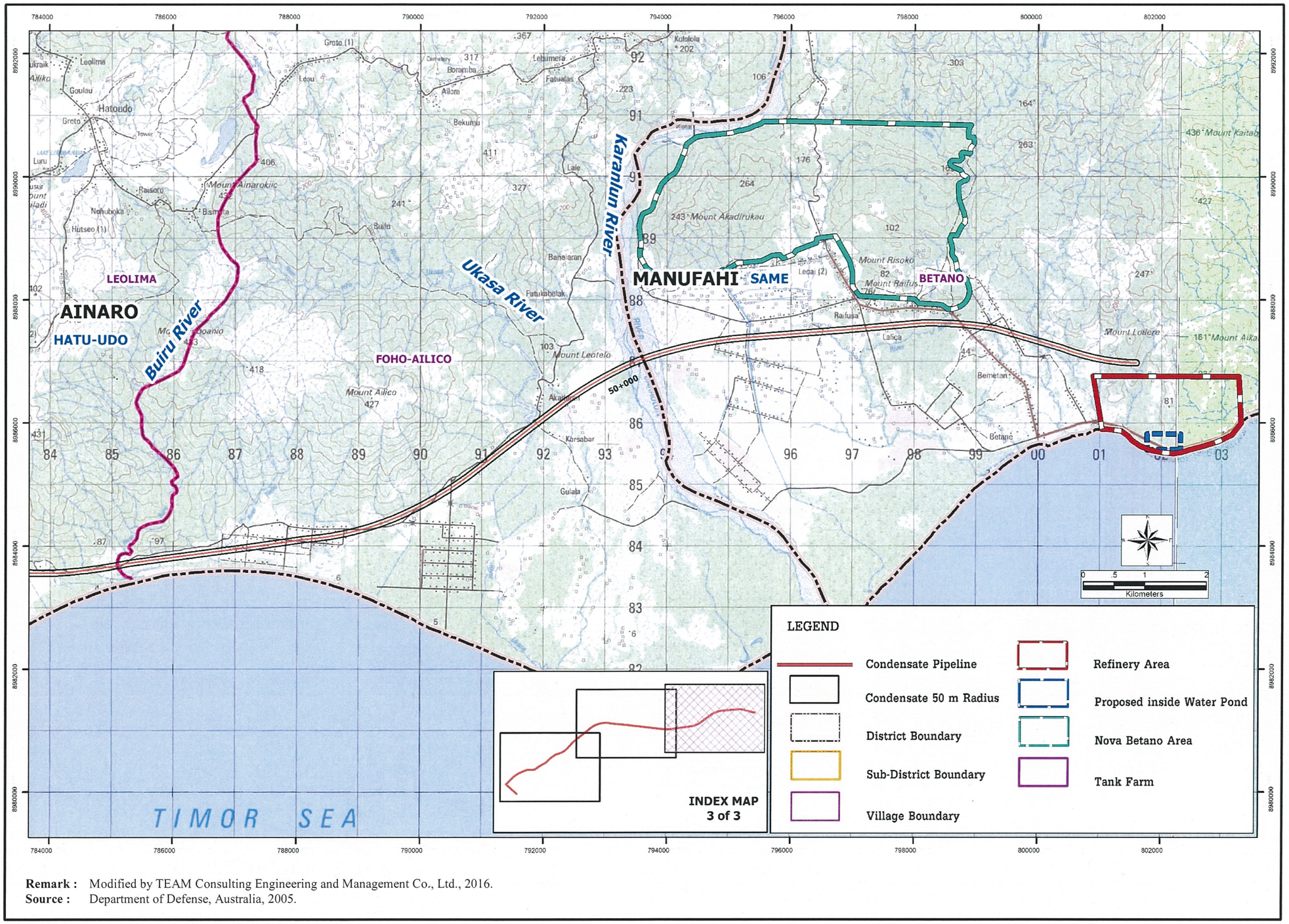
Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.1-1 : PROJECT STUDY AREA OF THE CONDENSATE AND PRODUCTS PIPELINE ROUTE PROJECT



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.1-1 : PROJECT STUDY AREA OF THE CONDENSATE AND PRODUCTS PIPELINE ROUTE PROJECT (CONT'D)



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.1-1 : PROJECT STUDY AREA OF THE CONDENSATE AND PRODUCTS PIPELINE ROUTE PROJECT (CONT'D)

6.1.2 Contextual Study Limit

The MREIS defines the contextual study limit to consist of five groups of components: (i) physical components; (ii) ecological components; (iii) economic components; (iv) social components; and (v) cultural components. These five groups of components cover 40 components as indicated in the MREIS. The composition of each main component is presented below:

(1) Physical Components

- Climate and Meteorology
- Topography
- Geology
- Geotechnical and Soil Engineering
- Groundwaters
- Seismology
- Air Quality
- Noise
- Surface Waters
- Coastal Waters
- Marine Waters
- Sediment Quality

(2) Ecological Components

- Wetlands
- Mangroves
- Corals
- Fisheries
- Protected area and natural parks
- Wildlife, especially any rare, endangered or vulnerable species or habitats
- Forests
- Coastal resources

(3) Economic Components

- Employment sectors
- Infrastructure facilities
- Land use
- Use of forests and other natural resources
- Fishing
- Agriculture
- Tourism
- Other industries
- Land Transportation

(4) Social Components

- Population and communities
- Health profiles of communities
- Institutions, schools and health facilities
- Communities structures , family structures
- Land Ownership
- Any types of common or individual rights on natural resources

(5) Cultural Components

- Cultural heritage
- Archeological sites
- Historic sites
- Scared sites
- Unique landscape

The following sections briefly describe each component with details in appendices as appropriate. The methods of information collection are also described as deemed necessary.

6.2 OVERVIEW OF THE STUDY AREA

The study area is in the Manufahi, Ainaro and Covalima districts (see map in ***Figure 6.1-1***). A brief profile of the three districts is presented below:

District	Manufahi	Ainaro	Covalima
Number of sub-districts	4	4	7
Number of villages	29	21	30
Total population (census 2015)	52,246	66,397	64,550
Area (km^2)	1,323	804	1,203
Borders			
• North:	Aileu district	Aileu district	Bobonaro district
• East	Manatuto district	Manufahi district	Ainaro district
• West	Ainaro district	Covalima district	Belu district
• South	Timor Sea	Timor Sea	Timor Sea
Latitude	9°00′S	9°05′S	9°19′S
Longitude	125°47′E	125°29′E	125°15′E
Ethnicities	Austronesian (Malayo-Polynesian), Papuan, small Chinese	Austronesian (Malayo-Polynesian), Papuan, small Chinese	Austronesian (Malayo-Polynesian), Papuan, small Chinese
Main economic activities	Fisheries and Agriculture	Fisheries and Agriculture	Fisheries and Agriculture

Source : Timor-leste Demographics Profile, 2014
Population and Housing Census, 2015, Timor-Leste

The four sub-districts of Manufahi are: Same, Alas, Turiscai, and Fatuberlio, and those of Ainaro are: Ainaro, Hatu-Udo, Hatu Builico, and Maubisse, and those of Covalima are: Fatalulic, Fatumean, Fohorem, Zumalai, Maucatar, Suai, and Tilomar. The sub-districts that are in the study area are: Same sub-district of Manufahi district, Hatu-Udo and Cassa sub-districts of Ainaro district, and Suai and Zumalai sub-districts of Covalima district. Of the total 6 km^2 of the study area [1], about 1.66 km^2 are in Ainaro district, 0.83 km^2 in Manufahi district and 3.51 km^2 in Covalima district [2]. The three districts are sparsely populated as indicated by the overall population density of 39.5 persons/km^2 for Manufahi, 82.6 persons/km^2 for Ainaro, and 53.6 persons/km^2 for Covalima.

1 Calculation based on the geological study limit of 50 m strips on both sides of the center line by 60 km length of the pipeline route. So, 0.1 km*60 km = 6 km^2

2 Calculation is the same basis as footnote 1, and in accordance with pipeline length in each district (16.6 km, 8.3 km and 35.1 km in Ainaro district, Manufahi district and Covalima district, respectively). Therefore calculations are 0.1 km*16.6 km = 1.66 km^2, 0.1 km*8.3 km = 0.83 km^2 and 0.1 km*35.1 km = 3.51 km^2, respectively.

The affected villages along the Project alignment in the three districts are shown in ***Figure 6.1-1*** and ***Table 6.2-1***.

TABLE 6.2-1

VILLAGES IN THE STUDY AREA

District	Sub-district	Villages
Manufahi	Same	Betano
Ainaro	Hatu-Udo	Leolima
		Foho-Ailico
Covalima	Suai	Beco
		Labarai
		Raimea
		Zulo
		Tashilin

6.3 PHYSICAL COMPONENTS

6.3.1 Climate and Meteorological Condition

Climate and meteorological factors govern the dispersion pattern of air pollutants for given emission load and emission height. Information on the climate and meteorological conditions of the study area was collected from the following sources:

- Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant (TIMOR GAP, E.P., 2012)[3]
- Ministry of Agriculture, 2016), Betano Weather Station's records for the period 2004-2015 and Suai Weather Station during 2008-2015 on the following:
    - Maximum, minimum and mean air temperatures (˚C.).
    - Maximum, minimum and mean relative humidities (%).
    - Rainfalls (mm).
    - Mean wind speeds (m/s).
    - Evaporation rates (mm).
- www.timoragri.fhost.com.au, 2016, Betano Weather Station's wind data

[3] Prepared by WorleyParsons

Based on the secondary information from the above sources, salient climate and meteorological conditions of the study area could be briefly described as follows:

Section 1 KP 0+000 to 30+000

The area in this section starts at Betano refinery until the km 30+000 of the pipeline route, located in Manufahi and Ainaro districts.

General Climate Pattern: The climate of the region is governed by the West Pacific Monsoon with distinct wet and dry seasons. The wet season is from December to August and the dry season from September to November. However, annual variation of the climate is normally experienced caused by the effects of El Niño–Southern Oscillation and the Indian Ocean Dipole. The climate of the study area follows that of the region. Specific conditions of the study area should be correctly reflected by records collected at Betano Weather Station presented in ***Table 6.3-1*** (see the location of this weather station in ***Figure 6.3-1***).

Air Temperature: The average daily temperature vary little within the range of 23.9-28.1˚C throughout the year. The minimum daily temperature range from 14.3-22.2˚C while the maximum daily temperature range from 31.9-37.2˚C. The minimum and maximum daily temperature are found in August and January, respectively.

Relative Humidity: The average daily relative humidity (RH) range from 73.3-85.6 percent. The minimum daily RH range from 20.5-41.0 percent and the maximum daily RH range from 98.5-103.0 percent. The minimum and maximum RH are normally recorded in September and June, respectively.

Rainfall: The study area has an average annual rainfall of 1,376 mm. The average monthly rainfall in the summer range from 4.0-26.0 mm. and in the rainy season range from 54.8-266.8 mm. The minimum and maximum monthly rainfalls are found in September and May, respectively.

Wind Speed and Direction: The average daily wind speed vary little throughout the year and range from 0.8-1.0 knots. The prevailing wind directions are southeast and northeast, respectively.

Evaporation: The average annual evaporation is 1,633.7 mm above the average annual rainfall of 1,376 mm. The monthly evaporation range from 75.6-167.7 mm with the minimum and maximum monthly evaporation found in July and October, respectively.

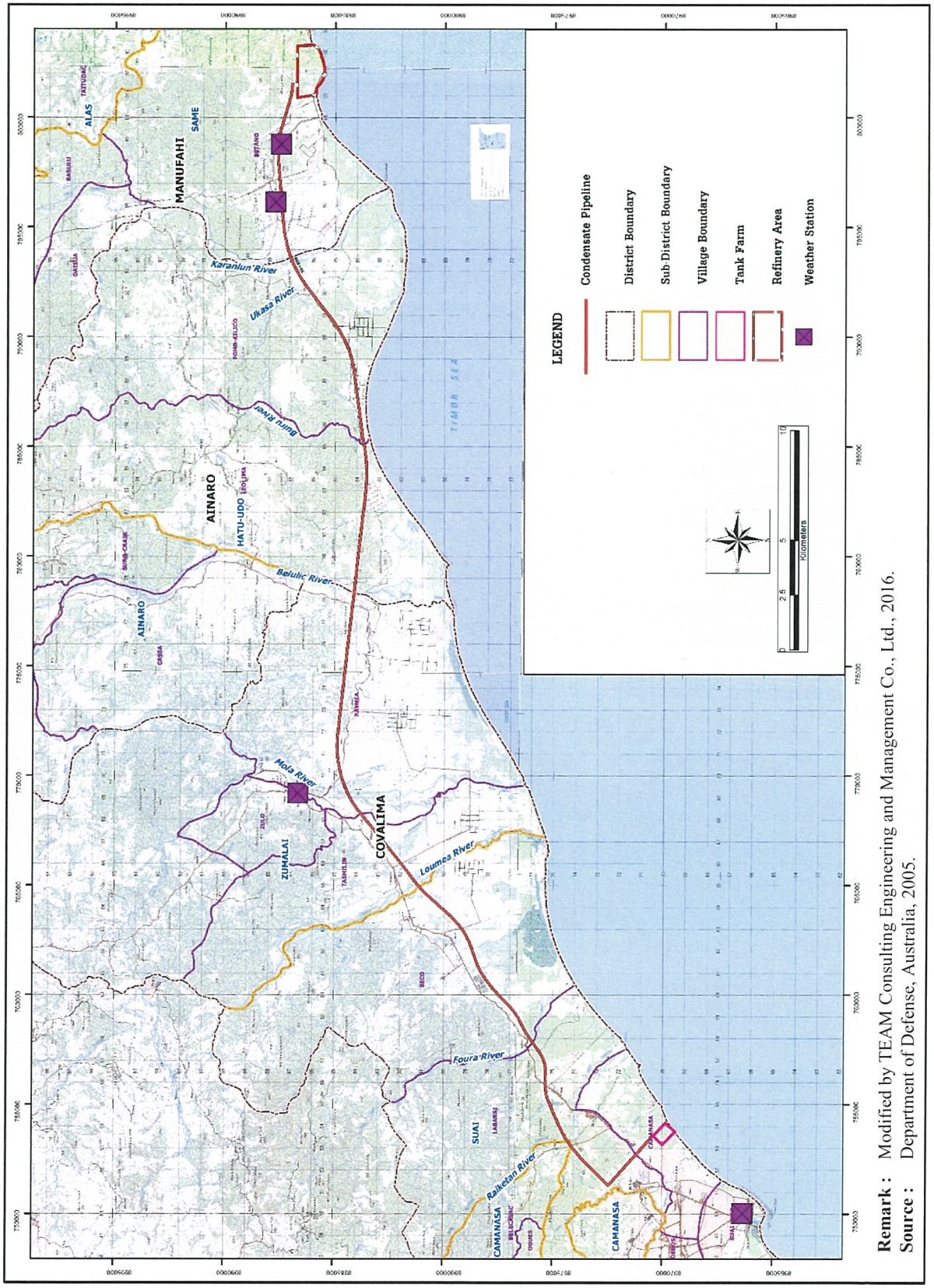
TABLE 6.3-1

METEOROLOGICAL DATA OF BETANO WEATHER STATION DURING 2004-2015

Month	Temperature (°C)			Humidity (%)			Total Rainfall (mm)	Wind Speed (m/s)	Wind Direction[1/]	Total Evaporation (mm)
	Min	Max	Mean	Min	Max	Mean				
January	21.6	37.2	27.5	33.0	100.5	82.7	165.3	0.9	SE	156.9
February	21.3	35.9	27.4	41.0	100.5	82.3	100.3	0.9	SE	139.6
March	20.7	35.9	27.1	39.5	100.5	82.5	99.3	0.8	SE	141.9
April	20.5	34.6	26.7	29.5	101.0	82.3	95.9	0.9	SE	134.4
May	17.9	33.5	25.3	40.5	101.5	85.6	226.8	1.0	SE,NE	104.3
June	17.2	32.0	24.1	36.5	103.0	84.5	123.3	0.8	NE	75.6
July	15.5	32.2	24.0	34.0	101.0	83.3	82.6	0.8	SE	108.1
August	14.3	31.9	23.9	28.0	102.0	78.3	54.8	0.8	SE	135.9
September	14.7	34.6	25.0	20.5	102.0	75.1	4.0	0.8	SE	150.0
October	15.9	35.6	26.6	21.5	101.0	73.3	21.9	0.8	SE	167.7
November	15.8	36.6	28.1	23.5	98.5	73.3	26.0	0.9	SE	159.0
December	22.2	36.2	28.1	25.5	100.0	77.8	169.0	0.9	SE	160.2
Annual	**14.3**	**37.2**	**26.1**	**20.5**	**103.0**	**80.1**	**1169.2**	**0.9**	-	**1633.7**

Remark: 1/ www.timoragri.fhost.com.au, 2016

Source: Ministry of Agricultural, 2016



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.3-1 : LOCATION OF WEATHER STATIONS IN STUDY AREA

Section 2 KP 30+001 to 60+000

The area in this section starts at km 30+001 until the end of the pipeline route, located in Ainaro and Covalima districts.

General Climate Pattern: The climate of the region is governed by the West Pacific Monsoon with distinct wet and dry seasons. The wet season is from December to July and the dry season from August to November. However, annual variation of the climate is normally experienced caused by the effects of El Niño-Southern Oscillation and the Indian Ocean Dipole. The climate of the study area follows that of the region. Specific conditions of the study area should be correctly reflected by records collected at Suai Weather Station presented in ***Table 6.3-2*** (see the location of this weather station in ***Figure 6.3-1***).

***Temperature*:** The average daily temperature vary little within the range of 24.1-29.0 °C throughout the year. The minimum daily temperature range from 14.1-22.7 °C, and the maximum daily temperature range from 31.2-37.6 °C. The minimum and maximum daily temperature are found in September and January, respectively.

Relative Humidity: The average daily relative humidity (RH) range from 72.0-88.6 percent. The minimum daily RH range from 24.0-39.0 percent and the maximum daily RH range from 106.5-120.0 percent. The minimum and maximum daily RH are normally recorded in September and December, respectively.

Rainfall: The study area has an average annual rainfall is 1,032.0 mm. The average monthly rainfall in summer range from 9.6-26.9 mm. and in the rainy season range from 35.6-194.9 mm. The minimum and maximum monthly rainfall are found in August and June, respectively.

Wind Speed and Direction: The average daily wind speed vary little throughout the year and range from 0.4-7.0 m/s. Furthermore, there are no wind direction records in Suai Weather Station, The nearest weather station which recorded the wind direction is Sumalai Weather Station, the prevailing wind directions are southwest (SW) and southeast (SE), respectively.

Evaporation: The average annual evaporation is 1,217.3 mm above the average annual rainfall of 1,032.0 mm. The monthly evaporation range from 55.5-142.1 mm. with the minimum and maximum monthly evaporation found in June and March, respectively.

TABLE 6.3-2

METEOROLOGICAL DATA OF SUAI WEATHER STATION DURING 2008-2015

Month	Temperature (°C)			Humidity (%)			Total Rainfall (mm)	Wind Speed (m/s)	Wind Direction	Total Evaporation (mm)
	Min	Max	Mean	Min	Max	Mean				
January	21.4	37.6	29.0	30.0	108.0	75.0	36.6	0.4	NW	65.9
February	20.2	36.7	27.5	36.0	119.5	83.2	109.4	0.5	NW,SW	99.4
March	19.9	36.6	27.5	38.5	108.0	83.5	127.8	0.5	SW	142.1
April	20.8	34.6	27.4	36.5	110.0	83.6	105.9	0.6	SW	106.6
May	17.8	33.2	26.0	37.5	120.0	88.6	182.3	0.5	SW	93.1
June	18.0	33.1	24.9	46.0	110.0	86.4	194.9	0.6	SW	55.5
July	16.3	31.2	24.1	34.5	110.0	84.2	47.6	0.7	SE,SW,NW	91.4
August	15.0	31.4	24.1	36.5	109.5	80.1	9.6	0.7	SE	79.7
September	14.1	34.7	26.6	24.0	106.5	72.0	26.9	0.6	SE	103.2
October	17.7	35.9	27.0	27.0	108.5	79.0	20.4	0.7	SW	123.7
November	17.5	36.8	28.3	30.5	106.5	77.6	35.6	0.7	SW	135.0
December	22.7	37.1	28.7	39.0	120.0	79.2	135.1	0.5	SW	121.9
Annual	**14.1**	**37.6**	**26.7**	**24.0**	**120.0**	**81.0**	**1032.0**	**0.6**	-	**1217.3**

Remark: 1/ www.timoragri.fhost.com.au, 2016

Source: Ministry of Agricultural, 2016

6.3.2 Topography

The Consultant used topographic maps of Timor-Leste prepared by the Department of Defence, Australia, 2005, scale 1:50,000, with contour interval 40 m. for the topographic study of overall area. Detailed strip topographic survey covering the new highway produced in the year 2013 by PT.Wirama Karya, an Indonesia consultant was collected and reviewed.

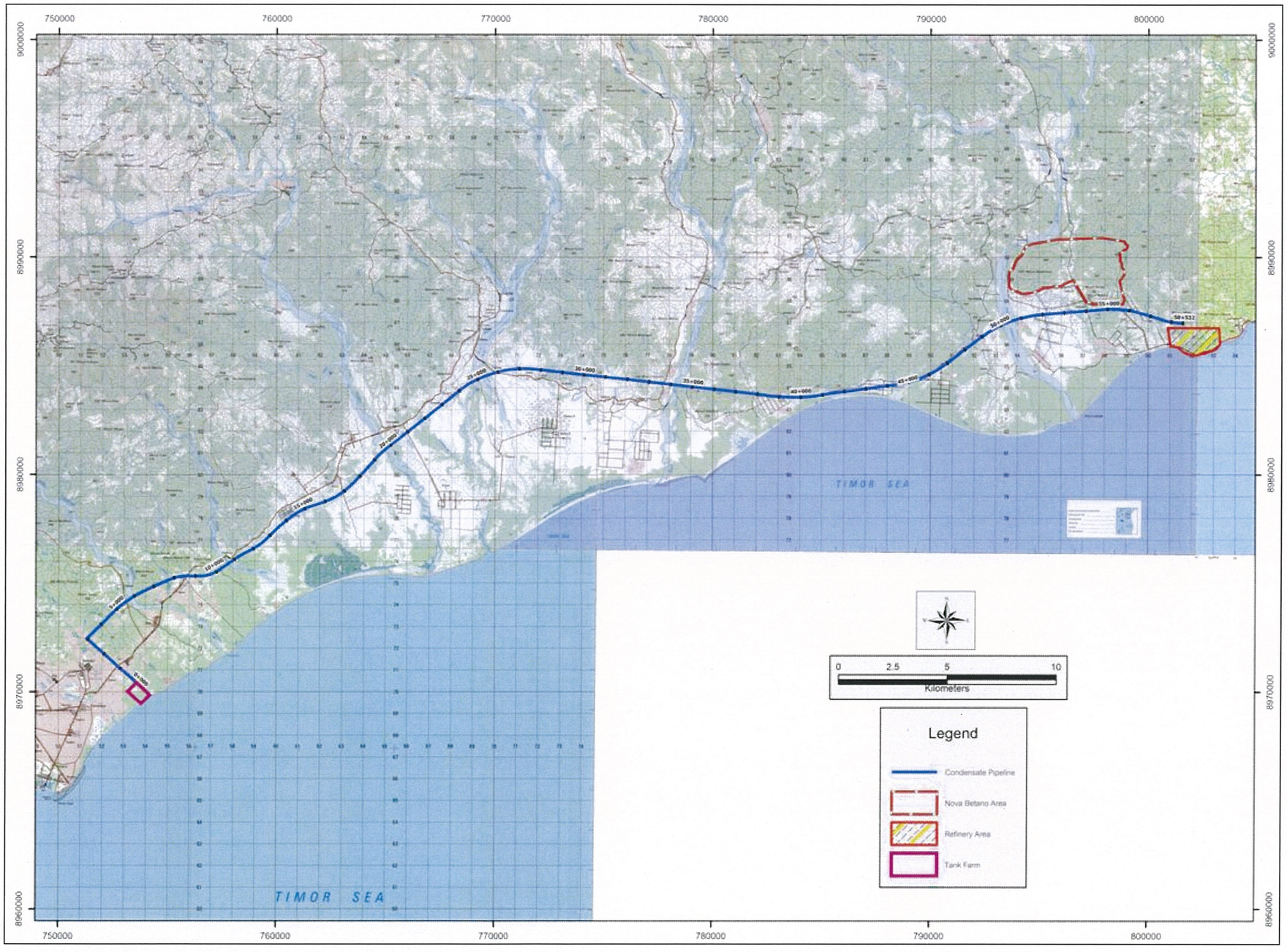
The review result of the strip topographic map carried out from the tank farm at Suai to the refinery at Betano by PT.Wirama Karya was divided into three sections as follows:

- **The first section from Sta. 16+750 (Labarai village which is close to tank farm) to Sta. 33+350 (Mola River):** condensate pipeline is mainly located at river flood plain with gentle slope area where the pipeline crosses the main river, Raiketan River, Foura River, Loumea River, and crosses the community area; Haemanu sub-village and Holba sub-village at Labalai village. The average elevation is between 140 m. local datum to 80 m. local datum.

- **The second section from Sta. 33+350 to Sta. 54+600 (Bobe Sub-Village, Foho-Ailico Village):** Topography is mainly hilly slope to mountainous area with river flood plain. The condensate pipeline crosses the main river, Mola River and Belulic River, and crosses the community area; Fatukao Sub-Village at Raimea Village. The average elevation is between 80 m. local datum to 180 m. local datum with peak elevation of 318 m. local datum. In Bonuc sub-village at Leolima, and Bobe sub-village at Foho-Ailico the condensate pipeline cross is laid on coastal plain area with Buiru River. The average elevation is between 60 m. local datum to 40 m. local datum.

- **The third section from Sta. 54+600 to Sta. 68+050 (The Betano Refinery):** This area is mainly flood plain of Karaulan River, and the pipeline cross the community area namely Rai-fussa sub-village and Lalica Sub-Village at Betano Town. The average elevation is between 40 m. local datum to 60 m. local datum. The area close to the refinery is gentle slope and the average elevation is between 40 m. local datum to 65 m. local datum.

Topographic along the condensate pipeline is illustrated in ***Figure 6.3-2***.



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.3-2 : STRIP TOPOGRAPHIC MAP OF THE CONDENSATE PIPELINE FROM THE REFINERY TO THE TANK FARM AREA AT SUAI

Field survey of the condensate pipeline was conducted in February 2016. The inspection was made at the following localities and results of the inspection are as follows:

- **Station 0+000 to 3+000 :** This area is close to Suai Supply Base (Tank farm area) which is mainly coastal plain area. The average elevation is between 35 m. local datum to 70 m. local datum.




Suai Tankfarm Area

Source : Field Survey by ATT, February 2016.

- **Station 3+000 to 27+600** : This area is mainly gentle slope with some river flood plain area and the condensate pipeline crosses the community area namely Fatukao sub-village at station 25+880, Baordaikun sub-village at station 21+000, Beco sub-village at station 17+000, Adentuik sub-village at station 14+250, Haemanu sub-village at 11+000, Holba sub-village at station 8+300 and the condensate pipeline crosses the Mola River at station 24+800 to25+580, Loumea River at station 19+650 to 19+900, Foura River at station 8+780 to 8+860 and Raiketan River at station 5+700 to 5+950. The average elevation is between 20 m. local datum to 40 m. local datum.




Mola River | Loumea River

	
Foura River	Raiketan River

Source : Field Survey by ATT, February 2016.

- **Station 27+600 to 33+600 :** This area is mainly gentle slope to hill slope and mountain. The condensate pipeline crosses the Oebaba mountain at Station 31+900 to 33+600. The average elevation is between 45 m. local datum to 150 m. local datum.

	
Oebaba Mountain	

Source : Field Survey by ATT, February 2016.

- **Station 33+600 to 38+000 :** This area is mainly hill slope to mountain with some river flood plain area and the condensate pipeline crosses the Foelic mountain and Belulic river at station 33+600 to 34+450. The average elevation is between 50 m. local datum to 150 m. local datum.



Foelic Mountain



Belulic River

Source : Field Survey by ATT, February 2016.

- **Station 38+000 to 45+100 :** This area is close to the shoreline where it is mainly coastal plain area and the condensate pipeline crosses the community area namely Bobe sub-village at station 42+800 to 45+000 and Bonuc sub-village at station 38+000 to 39+500. The average elevation is between 35 m. local datum to 45 m. local datum.





Coastal Flat Plain between Bobe to Bonuc sub-villages

Source : Field Survey by ATT, February 2016.

- **Station 45+100 to 49+000 :** This area is mainly gentle slope to hilly slope and the condensate pipeline crosses the community area namely Akarlaran sub-village. The average elevation is between 35 m. local datum to 50 m. local datum.



Akarlaran Sub-Village

Source : Field Survey by ATT, February 2016.

- **Station 49+000 to 56+700 :** This area is mainly river flood plain and plain area where it crosses main river, Karaulan River and the condensate pipeline crosses the community area namely Rai-fussa sub-village and Lalica sub-village Betano Town. The average elevation is between 20 m. local datum to 40 m. local datum.



Karaulan River

Source : Field Survey by ATT, February 2016.

- **Station 56+700 to 58+532 :** The area is close to the Power plant and the refinery where it is gentle slope to hilly slope with the average elevation between 40 m. local datum to 75 m. local datum.




Gentle Slope to Hilly Slope Closely the Power Plant and the Refinery

Source : Field Survey by ATT, February 2016.

6.3.3 Geology

The study of the geological characteristics of the condensate pipeline including; physical characteristics of rock and soil formations, geological structures such as bedding plane, joint and fault, aims to assess the potential of geological problems that may affect project component foundations. Geological information was collected from the existing sources for the study which are shown below;

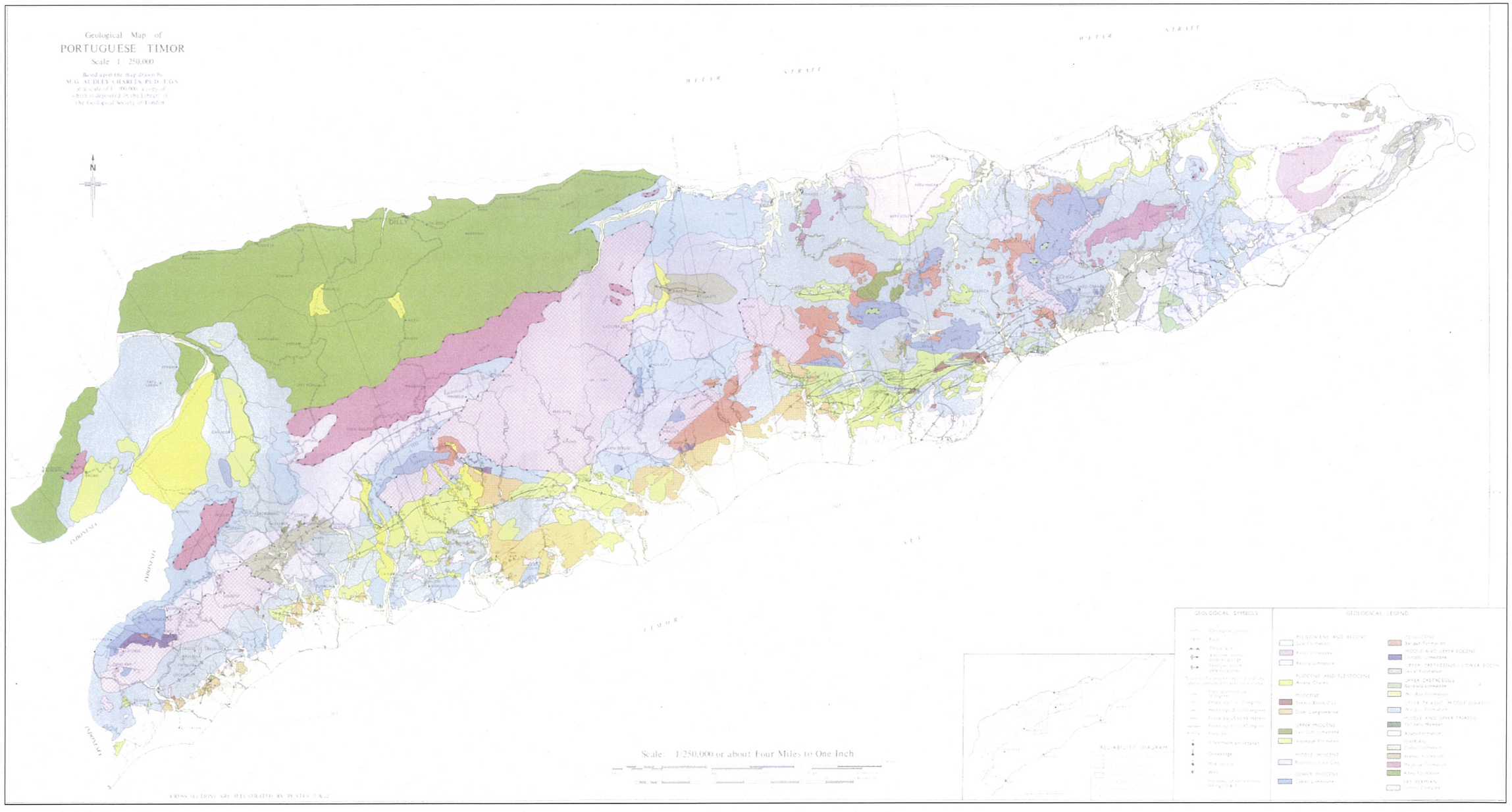
- Geological map of scale 1:250,000, Geological Society of London, 1968.
- Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant , TIMOR GAP, E.P., 2012 [4].
- Ministry of Agriculture Geotechnical Investigation Report for Groundwater Study and Design, Betano Refinery Project, Timor-Leste, TIMOR GAP, E.P., 2014 [5].

The review result of the geological characteristics of the condensate pipeline are as follows:

The condensate pipeline is underlain by geological formations as shown in ***Figure 6.3-3***. Characteristics of each formations can be described as follows:

[4] Prepared by WorleyParsons.

[5] Prepared by ATT's Consultants, Co., Ltd.



Source : Geological Society of London, 1968.

FIGURE 6.3-3 : GENERAL GEOLOGIC MAP ALONG THE CONDENSATE PIPELINE

- **Suai Formation**

The formation is late Pliocene to Quaternary Age and overlies the Viqueque Formation and the Dilor Conglomerate Formation. It is developed in widely coastal plain that extends from Aliambata in East to the frontier with Indonesia in West. The maximum thickness is approximately 1,000 m. under the plain between Betano and Aliambata.

Suai Formation was deposited in a marine environment and may be considered to be a molasse deposit. It is generally poorly exposed and typically without relief. The beds are either horizontal or gently dipping to the south (seawards) and outcrop is mostly covered by dense vegetation.

- **Baucau Limestone Formation**

This formation generally comprises hard, vuggy, cavernous, massive, white coral-reef limestone, which weathers to a pale grey colour, often characterized by karst topography and a dark reddish soil. Four main lithologies are recognized as coral reef limestone, calcirudites, calcarenites, and sub-mature greywacke and pebbly sandstone.

The thickness of this formation is difficult to estimate because it is composed of a series of terraces that are either horizontal or dip at approximately 2 degrees. The terraces rise from sea-level to approximate 500 m.

- **Bobonaro Scaly Clay Formation**

Lithologically, the Bobonaro Scaly Clay Formation has two principal constituents, namely a scaly clay matrix and a wide variety of unsorted, angular, an sub-angular exotic blocks from older formations.

- Scaly clay matrix: The matrix is remarkably uniform in character, being always soft, scaly, and variegated. The clay is generally dark reddish-brown in colour, but a dark olive-green variety is also common, along with black, grey, yellow and bright red clays. Slickenside is commonly observed. Montmorillonite is the predominant clay mineral, forming up to 35% of the whole.
- Exotic blocks: More than 90% of the exotic material seems to have been derived from formations that outcrop in Timor-Leste. The size of the blocks is highly variable, most of which are angular to sub-angular in shape, and chaotically distributed with random orientations.

It appears as if this scaly clay was emplaced by sliding or slumping due to the high proportion of montmorillonite (bentonite) which is generally highly colloidal and plastic. The accurate thickness of this formation is not possible to be determined but the thickness beneath the south coastal plains may locally exceed 3,000 m. It is noted that the formation increases in thickness from north to south across the island.

- **Viqueque Formation**

This formation is light-toned with well-defined ridges which is easily identified in the field and on aerial photographs. It consists of massive white marls and grey claystone interbedded with chalky limestone and two beds of vitric tuff. Most of the rocks in this formation weather white, forming a white puggy soil. This formation is also characterized by a rugged relief owing to deeply dissected valleys.

The average thickness of this formation is about 500 m., although the maximum thickness is probably about 800 m. under the wide southern coastal plain. It is noted that the limestone of this formation was observed along the pipeline route near Selihasan.

- **Wai Bua Formation**

This formation consists of a succession of brittle radiolarites, radiolarian marls and shales, most of which have been subjected to intense folding and faulting. The principal rock-types are finely laminated radiolarian shales, multi-coloured bedded chert, brightly coloured brittle radiolarites, bio-calcarenites composed essentially of Foraminifera and Radiolaria with a micrite matrix, and calcilutites. Thickness of the formation is about 500 m. It is noted that the rocks of this formation cover most parts of the water supply system and underlain the younger sediments of Suai Formation. Anyhow, along the pipeline route, shales and other rocks of the formation are observed.

- **Wai Luli Formation**

In general, this rock formation is divided into three rock-units as:

- Base unit is composed of well-bedded, spotted blue-grey marls and calcilutites with ammonites.

- Middle unit is micaceous shales and thinly-bedded calcilutites occur, which become less common upwards and give way to marls, shales and quartz-arenites,

- Top unit is coarse conglomerates containing pebbles (some well-rounded) up to 25 cm. in diameter occur. Most of the pebbles are either calcilutites or calcarenites.

It is noted that throughout Timor-Leste, shales form approximately 70% of this formation. The thickness of this formation is about 800-1,000 m. and appears to be entirely of marine origin.

Geologic field inspection was conducted in February and April 2016. Anyhow, the general geology from the collected map was used as the basic information while field inspection was mainly carried out along highways and access roads. Eighteen (18) rock and soils observation points (See ***Figure 6.3-4***) were conducted which can be briefly described as follows:



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.3-4 : LOCATION OF GEOLOGICAL FIELD CHECK ALONG THE CONDENSATE PIPELINE

- **Stop#1: Alluvium Deposits**

This formation consists of a succession of brittle radiolarites, radiolarian marls and shales, most of which have been subjected to intense folding and faulting. The principal rock-types are finely laminated radiolarian shales, multi-coloured bedded chert, brightly coloured brittle radiolarites, bio-calcarenites composed essentially of Foraminifera and Radiolaria with a micrite matrix, and calcilutites. Thickness of the formation is about 500 m. It is noted that the rocks of this formation cover most parts of the water supply system and underlain the younger sediments of Suai Formation. Anyhow, along the pipeline route, shales and other rocks of the formation are observed.



Alluvium Deposits

Source : Field Survey by ATT, February 2016.

- **Stop#2: Limestone**

Exposures of grey limestone of Wai Luli Formation



Limestone of Wai Luli Formation

Source : Field Survey by ATT, February 2016.

- **Stop#3: Alluvium Deposits**

This formation consists of a succession of brittle radiolarites, radiolarian marls and shales, most of which have been subjected to intense folding and faulting. The principal rock-types are finely laminated radiolarian shales, multi-coloured bedded chert, brightly coloured brittle radiolarites, bio-calcarenites composed essentially of Foraminifera and Radiolaria with a micrite matrix, and calcilutites. Thickness of the formation is about 500 m. It is noted that the rocks of this formation cover most parts of the water supply system and underlain the younger sediments of Suai Formation. Anyhow, along the pipeline route, shales and other rocks of the formation are observed.



Alluvium Deposits

Source : Field Survey by ATT, February 2016.

- **Stop#4: Coastal Deposits**

This lithologic unit was found at the shoreline until the flat area along condensate pipeline. The composition of this soil unit is composed of sand, fragments of shell and coral that influenced from shoreline deposits.



Coastal Deposit

Source : Field Survey by ATT, February 2016.

- **Stop#5: Limestone**

Exposures of grey limestone of Wai Luli Formation



Limestone of Wai Luli Formation

Source : Field Survey by ATT, February 2016.

- **Stop#6: Crystalline Sandstone Coordinate (778011 E, 8984863N)**

Crystalline Sandstone: Grayish brown, very fine – fine grained, well sorted, rounded - well rounded, hard, fresh - slightly weathered, calcareous cementing which reaction with hydrochloric acid0.1 %, bedding thickness about 30-50 cm., show anticline fold by left hand site strike/dip = 40°/15° and right hand site strike/dip = 150°/60°.



Outcrop of Crystalline Sandstone

Source : Field Survey by ATT, February 2016.

- **Stop#7: Colluvium Deposits**

This lithologic unit was found at the foot of hills along the condensate pipeline, and it is composed of various sizes of loose sediments, fragments and boulders, with mainly sand and silty sand.



Colluvium Deposits

Source : Field Survey by ATT, February 2016.

- **Stop#8: Alluvial Deposits Coordinate (777707 E, 8983830 N)**

Alluvial Deposits: Outcrop location at station 33+350 along the existing road and close to Belulic river, composed of very find grained – boulder, poorly sorted, angular – sub rounded.



Alluvial Deposits

Source : Field Survey by ATT, February 2016.

- **Stop#9: Limestone intercalated with Shale Coordinate (776148 E, 8983489 N)**

Limestone: Grayish brown, non-clastic texture, hard, fresh - slightly weathered, composed of calcite vain which reaction with hydrochloric acid 0.1 %.

Shale: pale brown – brownish yellow, very fine grained, well sorted, soft – stiff, highly - moderately weathered, calcareous cemented and reaction with hydrochloric acid 0.1 %, slightly fissile, bedding thickness about 10-15 cm., both of rocks show condition of resistance and non-resistance to each other and direction of strike/dip = 205°/30°.



Outcrop of Limestone intercalated with Shale

Source : Field Survey by ATT, February 2016.

- **Stop#10: Mudstone Coordinate (775775 E, 8983375 N)**

Mudstone: pale gray- gray, homogeneous, stiff to very stiff, moderately - slightly weathered.



Mudstone

Source : Field Survey by ATT, February 2016.

- **Stop#11: Alluvial Deposits Coordinate (771656 E, 8984509 N)**

Alluvial Deposits: composed of find grained –cobble, poorly sorted.





Alluvial Deposits

Source : Field Survey by ATT, February 2016.

- **Stop#12: Sandstone Coordinate (768471E, 8985488N)**

Sandstone: Yellowish brown–reddish brown, very fine – fine grained, well sorted, rounded, highly – completely weathered.





Sandstone

Source : Field Survey by ATT, February 2016.

- **Stop#13: Alluvial Deposits Coordinate (768322 E, 8985284 N)**

Alluvial Deposits: Yellowish brown –brown, very fine grained - cobble, poorly - moderately sorted, sub angular- sub rounded.



Alluvial Deposits

Source : Field Survey by ATT, February 2016.

- **Stop#14: Arkosic Sandstone Coordinate (767300 E, 8983652 N)**

Arkosic Sandstone: Pale grayish brown, medium – very coarse grained, poorly- moderately sorted, sub angular- sub rounded, moderately – highly weathered, locally cross-bedded, bedding thickness about 30-50 cm., direction of strike/dip = 7°/37°.



Arkosic Sandstone

Source : Field Survey by ATT, February 2016.

- **Stop#15: Silicified Shale intercalated with Sandstone Coordinate (762820 E, 8980269 N)**

Silicified Shale :Pale reddish purple- dark reddish purple, very fine grained, well sorted, hard, fresh, slightly fissile, bedding thickness about 5 cm.,

Sandstone : Pale brownish yellow – pale yellow, very fine grained, well sorted, hard, fresh - slightly weathered, bedding thickness about 5-10 cm., both of rocks show of strike/dip = 125°/58°.







Silicified Shale intercalated with Sandstone

Source : Field Survey by ATT, February 2016.

- **Stop#16: Colluvium Deposits**

Colluvium Deposits**:** This lithologic unit was found at the foot of hills along the condensate pipeline, and it is composed of various sizes of loose sediments, fragments and boulders, with mainly sand and silty sand.



Colluvium deposits

Source : Field Survey by ATT, February 2016.

- **Stop#17: Alluvial Deposits Coordinate (755677 E, 8975064 N)**

Alluvial Deposits: Alluvial Deposits: composed of find grained – boulder, poorly sorted.



Alluvium Deposits

Source : Field Survey by ATT, February 2016.

- **Stop#18: Coastal Deposits**

Coastal Deposits: This lithologic unit was found at the shoreline until the flat area along condensate pipeline. The composition of this soil unit is composed of sand, fragments of shell and coral that influenced from shoreline deposits



Coastal Deposits

Source : Field Survey by ATT, February 2016.

6.3.4 Geotechnical and Soil Engineering

The geotechnical investigation along condensate pipeline was performed by Geotechnical Survey Report Volume 1: Survey Results and Analysis, PT. Virama Karya – Multi Arch, LDA, 2011. Total of seventy-four (74) boreholes were excavated by using deep drilling method which was conducted in accordance with ASTM D1452 and Standard Penetration Test (SPT) which was conducted in accordance with ASTM D1586. Thirty-five (35) boreholes were located inner the study area.

Due to soil profile for each borehole, soil characteristic along the condensate pipeline can be summarized based on the topography which consists of 1) coastal and flat plain, 2) hilly or mountainous area, and 3) river flood plain. The coastal plain is underlain mainly by coastal sediment which consists of clay, silt and sand mixture. The hilly or mountainous area is underlain mainly by clayey to sandy silt with layer of sand and gravel. Moreover, some boreholes for the hilly area show medium to heavy weathered of limestone. The river flood plain is underlain by alluvial sediment which consists of silt, sand, and gravel. The result of soil profile from report is shown by thirty-five boreholes which were excavated along highway from Suai to Betano. One borehole, BH-1, located on coastal plain. Three boreholes, BH-18 to BH-20, are located on flat plain. Twelve boreholes, BH-2 to BH-4, BH-4A, BH-11, BH-42 to BH-46, and BH-49 to BH-50 are located at hilly or mountainous area. Nineteen boreholes, BH-5 to BH-10, BH-12 to BH-17, BH-21 to BH-25 and BH-47 to BH-48 are located on river flood plain.

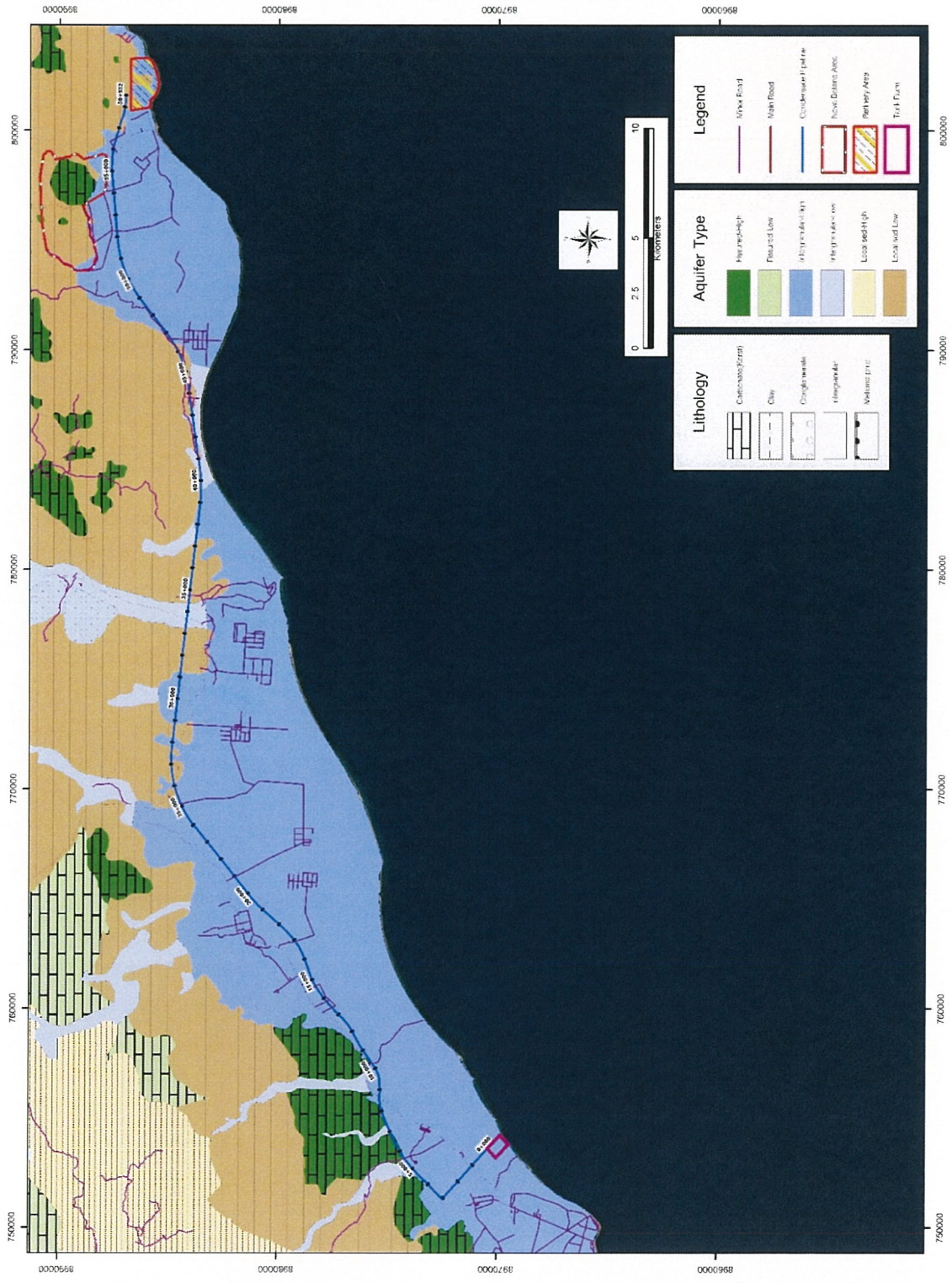
The result of soil profile is classified following the condensate pipeline ranging from Suai to Betano and geological logs of these boreholes are shown in ***Appendix 6A***.

6.3.5 Groundwater

6.3.5.1 Hydrogeology

The hydrogeological map produced under the "Assessment of Climate Change Impacts on Groundwater in Timor-Leste Project, 2012" by the sponsor of the Australian Agency for International Development (AusAID) was collected and used as the base map for the EIA study. The report covers the outcomes which presents in five (5) sets of reports including 1) the hydrology of Timor-Leste, 2) groundwater monitoring and sampling guidelines, 3) geophysical survey of three case study, 4) GIS methodology training guide to reproduce the outputs of the project, and 5) catalogue of datasets and data records.

General information was obtained from the collected hydrological map scale 1:250,000 and report of Aus AID, and shows that along the condensate pipeline there are two main aquifer types as: 1) an intergranular aquifer type with high productive, and 2) a low productive localized aquifer of Wai Bua Formation. It was noted that a high productive carbonate (karst-fissured) was found between Sta. 5+000 to 10+000 (see ***Figure 6.3-5***).



Source : Assessment of Climate Change Impacts on Groundwater in Timor-Leste Project, 2012.

FIGURE 6.3-5 : DETAILED HYDROGEOLOGIC MAP OF CONDENSATE PIPELINE (GEOSCIENCE AUSTRALIA, 2012)

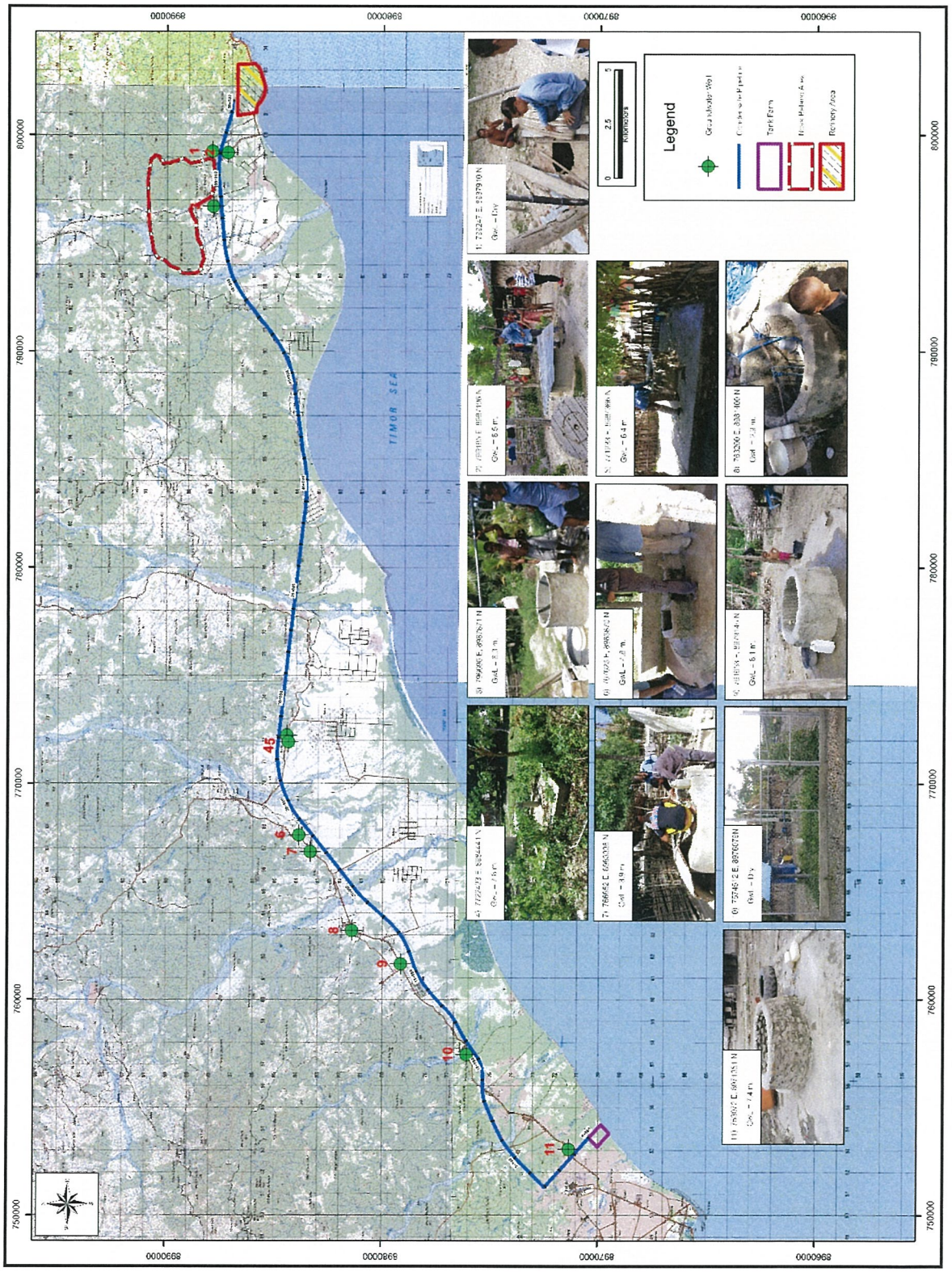
During the field inspection, the groundwater levels of some shallow dug wells were recorded, and more were measured during the field trip in April 2016. Location of the groundwater well was illustrated in ***Figure 6.3-6*** while result of groundwater measurement is presented in ***Table 6.3-3***. It is noted that two aquifer types were noticed during the field inspection. The first one is carbonate aquifer which found near Cassa and Beaço where spring water is trapped and transported to communities by pipeline. Concrete water tanks were constructed by the Ministry of Public Works for community uses. The second type is sand and gravel aquifer, Suai Formation, and observed groundwater depth is between 3 to 10 m.

TABLE 6.3-3

GROUNDWATER MEASUREMENT ALONG THE CONDENSATE PIPELINE

No.	Village	Sub-Village	E	N	Groundwater Level (m. from surface)
1	Betano	Bemetan	799247	8987910	Dry
2		Bemetan	799185	8987196	8.5
3		Rai-fussa	796696	8987871	6.3
4	Raimea	Leonti	772242	8984441	7.8
5		Raifila	771933	8984366	6.4
6	Tashilin	Obugmil	767623	8983870	4.8
7		Holgeda	766852	8983336	3.9
8	Beco	Maucolo	763200	8981400	2.9
9		Ruins	761653	8979145	8.1
10	Labarai	Haemanu	757452	8976079	Dry
11	Camanasa	Samfuk	753072	8971351	7.4

Source : Field Survey by ATT, April 2016.



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.3-6 : LOCATION MAP OF GROUNDWATER OBSERVATION WELLS ALONG THE CONDENSATE PIPELINE

6.3.5.2 Groundwater Quality

Groundwater is an important water resource for communities around the project area. It is utilized mostly for domestic purposes. Although groundwater contamination would not be the main concerns considering the nature of construction and operations of project facilities, the Consultant has conducted surveys of groundwater quality to establish baseline quality of groundwater for the record and for possible use in planning social development supports activities.

(1) Methodology

The baseline groundwater quality information was established by collected and reviewed the secondary information and field measurement, include:

- **Secondary Data Review**

Review the groundwater quality study from the Final Report of the Strategic Environmental Impact Assessment-The Tasi Mane Project-Betano Petroleum Refinery and Beaco LNG Plant (TIMOR GAP, E.P., 2012)

- **Field Measurement**

Groundwater quality survey was conducted in February and April 2016. Water samples were collected from five wells in villages located within the study area. The locations of all sampling wells are shown on a map in ***Figure 6.3-7***. All wells are drilled wells with case, located outdoor with no shade. The depth of these wells informed by locals is approximately 6.0-13.0 meters. The water in five wells is used for consumption such as drinking, cooking, washing and agriculture.

The sample collectors have to wear starch-free rubber gloves at all time while collecting water samples. The bottles for keeping the water samples were rinsed with the sampling water before use. At each station, sampling of groundwater was done by bore purging method. Since all well is frequently used by the owner, purging is not need prior sampling. However, the pumped groundwater in first five minutes was removed before sampling to ensure representativeness of the sampled groundwater. Sampling activities at each sampling station were recorded and photographed as shown in ***Photo 6.3-1***.

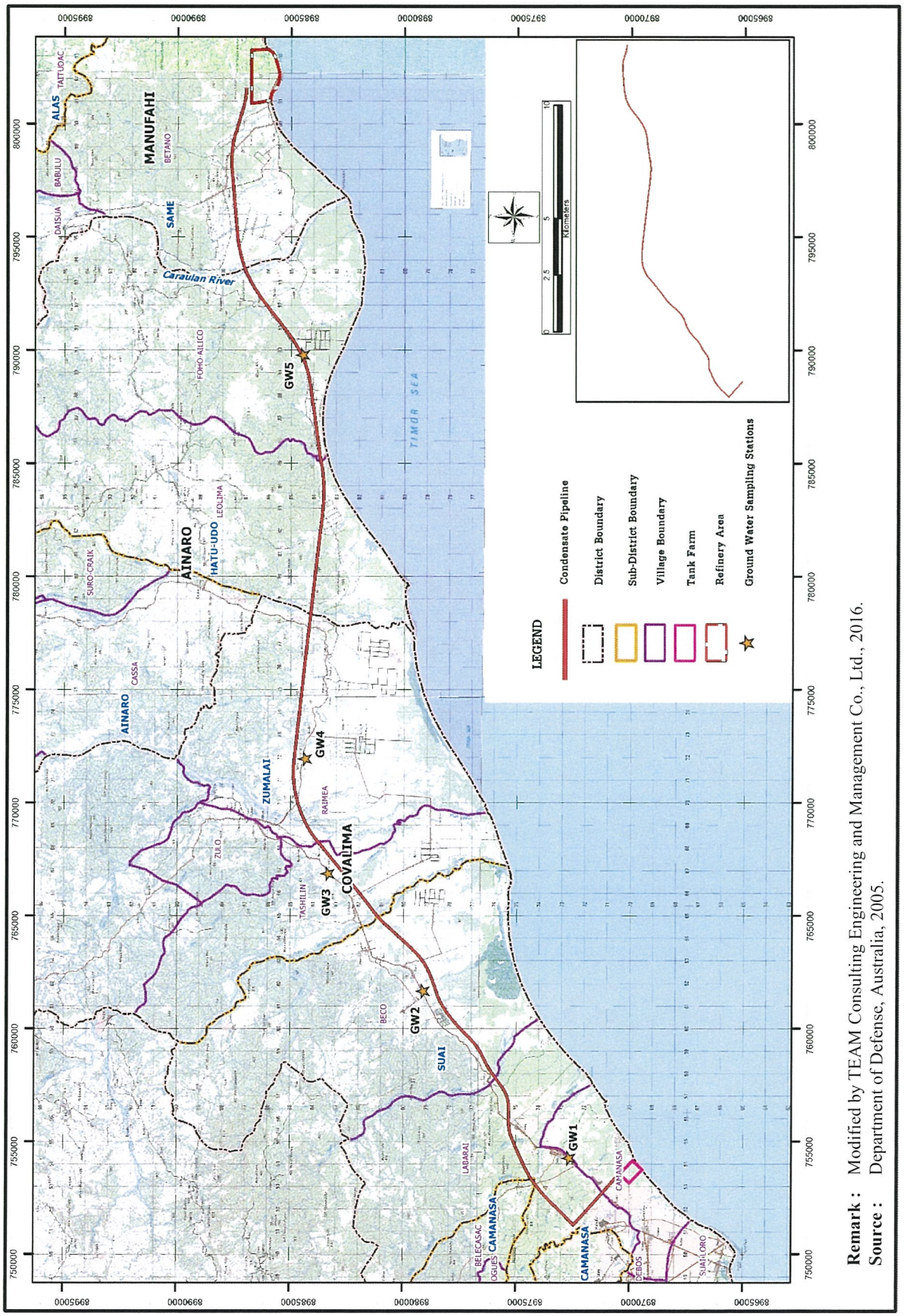
In situ measurement was made for conductivity, temperature, pH, salinity and total dissolved solids (TDS) and the groundwater quality measurement equipment are shown in ***Photo 6.3-2***. Details of the analytical methods for each parameter are shown in ***Table 6.3-4***.

TABLE 6.3-4

SUMMARY OF ANALYSIS METHODS AND DETECTION LIMIT FOR GROUNDWATER

Parameter	Unit	Measuring Method [1/]	Analysis Method [1/]
Depth	m.	Measure at Site	*In situ*
Conductivity	µS/cm	Measure at Site	*In situ* / Electrical Conductivity Method
pH	-	Measure at Site	*In situ* / Electrometric Method
Water Temperature	°C	Measure at Site	*In situ* / Thermometer
Salinity	ppt	Measure at Site	*In situ* / Electrical Conductivity Method
Total Dissolved Solids	g/L	Measure at Site	*In situ* / Electrometric Method

Remark: [1/] American Public Health Association (APHA), American Water Works Association (AWWA) and Water Pollution Control Federation (WEF). 2012. Standard Methods for the Examination of Water and Wastewater. 22nd Edition



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.3-7 : LOCATION OF GROUNDWATER SAMPLING STATIONS



GW1: Labarai village



GW2: Beco village



GW3: Tashilin village



GW4: Raimea village



GW5: Bobe village

Remark : Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February and April 2016.

PHOTO 6.3-1 : GROUNDWATER SAMPLING ACTIVITIES AT EACH STATION

	
Thermometer	**pH Meter**
	
Salinity and Conductivity Meter	**Dissolved Oxygen (DO) meter**

Source: Field survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016

PHOTO 6.3-2 : GROUNDWATER QUALITY MEASUREMENT EQUIPMENT

(2) Results of the Study

The data indicates that groundwater quality at five stations were analyzed in-situ field measurement for conductivity, pH, salinity and Total Dissolved Solids (TDS). The analytical results are presented in ***Table 6.3-5***. The groundwater quality data was interpreted based on WHO Guidelines for drinking-water quality, 4th Edition, 2011. The conductivity values between 713 to 26,131 microSiemen (µS/cm) which are much higher than standard of WHO guidelines for drinking-water quality. That mean the condition of groundwater within the study area is not good for drinking, but still applicable for domestic uses. The pH values ranged 6.77-9.06 which are within the standard of WHO guidelines for drinking-water quality. Salinity values range from 0.3 to 14.5 ppt and Total Dissolved Solids (TDS) values range from 0.66 to 24.08 g/l. There are currently no WHO drinking water guideline for salinity and Total Dissolved Solids TDS.

All heavy metal parameters in site-specific groundwater quality characterization has not been performed, as collection of a geochemical site of groundwater samples from water wells at the area has not been possible in the study period.

TABLE 6.3-5
RESULTS OF GROUNDWATER ANALYSIS AT EACH STATION

Characteristic	Parameter	Unit	GW1	GW2	GW3	GW4	GW5	WHO Guidelines for Drinking-Water Quality
			UTM 754264E 8972674N	UTM 761657E 8979140N	UTM 766857E 8983348N	UTM 771933E 8984365N	UTM 789792E 8984481N	
1. Physical	Depth	m	13	7	7	6	-	-
	Temperature	°C	29.0	29.5	29.4	29.7	29.5	-
	Conductivity	µS/cm	713	2,064	26,131	1,752	1,452	250
2. Chemical	pH	-	7.21	9.06	7.73	6.99	6.77	6.5-8.5
	Salinity	ppt	0.3	0.5	14.5	0.9	0.7	-
	Total Dissolved Solids	g/L	0.66	1.901	24.08	14.49	1.30	-

Remark: Station GW1: Labarai village (UTM 51S 754264E 8972674N)
Station GW2: Beco village (UTM 51S 761657E 8979140N)
Station GW3: Tashilin village (UTM 51S 766857E 8983348N)
Station GW4: Raimea village (UTM 51S 771933E 8984365N)
Station GW5: Bobe village (UTM 51S 789792E 8984481N)
WHO Guidelines for Drinking-water Quality, 4th Ed, 2011.

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February and April 2016.

6.3.6 Seismology

Earthquake is the most critical risk factor which needs to be assessed for any type of project construction. Seismology data was collected from the following sources

- Disaster Risk and Hazard Map Analysis for Timor-Leste: An overview of existing risk maps, Disaster Risk Management Institutional and Operational Systems Development in Timor-Leste Project, UNDP (2010),
- Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant , TIMOR GAP, E.P., 2012 [6],
- Probabilistic Seismic Hazard Assessment for Betano Refinery Project by AIT Consulting under sub-contract agreement of TOYO-THAI, 2013.

Based on the secondary information from the above sources, seismology data conditions of the study area could be briefly described as follows:

Timor-Leste is classified as high to very high level for disaster prone areas, and earthquake intensity is level VIII on the Modified Mercalli Scale. However, Level VIII

[6] Prepared by WorleyParsons

intensity will inflict less damage to good constructions with only partial damage to building, whereas heavy damage will be inflicted to poor constructions such as movement of heavy furniture, collapse of wails and columns of building. The earthquake data that was recorded during May 1998 to July 2010 for four areas around Betano (onshore and offshore) was shown in the TIMOR GAP, E.P., 2012 WorleyParsons' report. Moreover, the areas were located on the coastal plain where soil liquefaction plays major impacts to structures.

The Probabilistic Seismic Hazard Assessment (PSHA) for Betano Refinery Project as well as Suai Supply Base Project which covers the whole study area of the condensate pipeline are presented in terms of PGA at 43, 475 and 2475-year return periods as:

(1) Spectral Acceleration (Sa) at 0.2, 0.5, 1.0, 2.0 and 4.0 sec at 43, 475 and 2475-year return periods,

(2) Uniform Hazard Spectra (UHS) at 43, 475 and 2475-year return periods.

Results are illustrated in ***Table 6.3-6***.

TABLE 6.3-6

UNIFORM HAZARD SPECTRUM AT BETANO AND SUAI

T (sec)	43-year	475-year	2475-year
	Sa (g)		
0.0	0.26	0.47	0.80
0.2	0.47	1.05	1.75
0.5	0.28	0.65	1.10
1.0	0.15	0.35	0.60
2.0	0.08	0.18	0.30
4.0	0.02	0.06	0.10

Source: Probabilistic Seismic Hazard Assessment by AIT Consulting, 2013

6.3.7 Air Quality

The ambient air quality will indicate the emission carrying capacity of study area for assessment the impacts on the air quality, caused by project activities during construction and operation period and can be used for formulation of proper preventive and mitigation measures.

(1) Methodology

This study has been designed to establish the baseline ambient air quality of the study area for assessment the air quality impacts, caused by project activities during construction and operation period. The following secondary documentation has been gathered and reviewed;

- **Sensitive Receptors within the Study Area**

– Topographic Maps of Timor-Leste prepared by the Department of Defense, Australia, 2005, scale 1:50,000

– Satellite images of from www.google.earth.com

– On-site visual inspection

- **Ambient Air Quality**

– Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant , TIMOR GAP, E.P., 2012[7]

(2) Results of Study

- **Sensitive Receptors within the Study Area**

The location of sensitive receptors was identified in desktop assessment and on-site visual inspection. According to the desktop assessment and on-site visual inspection, the project study area comprise of Manufahi, Ainaro and Covalima districts. Majority is agricultural and un-developing areas, some residential premises have been also identified. The sensitive receptors, for example; children and the elderly, tend to congregate (i.e., Schools and Hospitals/Medical Clinics) are listed in ***Table 6.3-7*** and ***Figure 6.3-8***.

TABLE 6.3-7

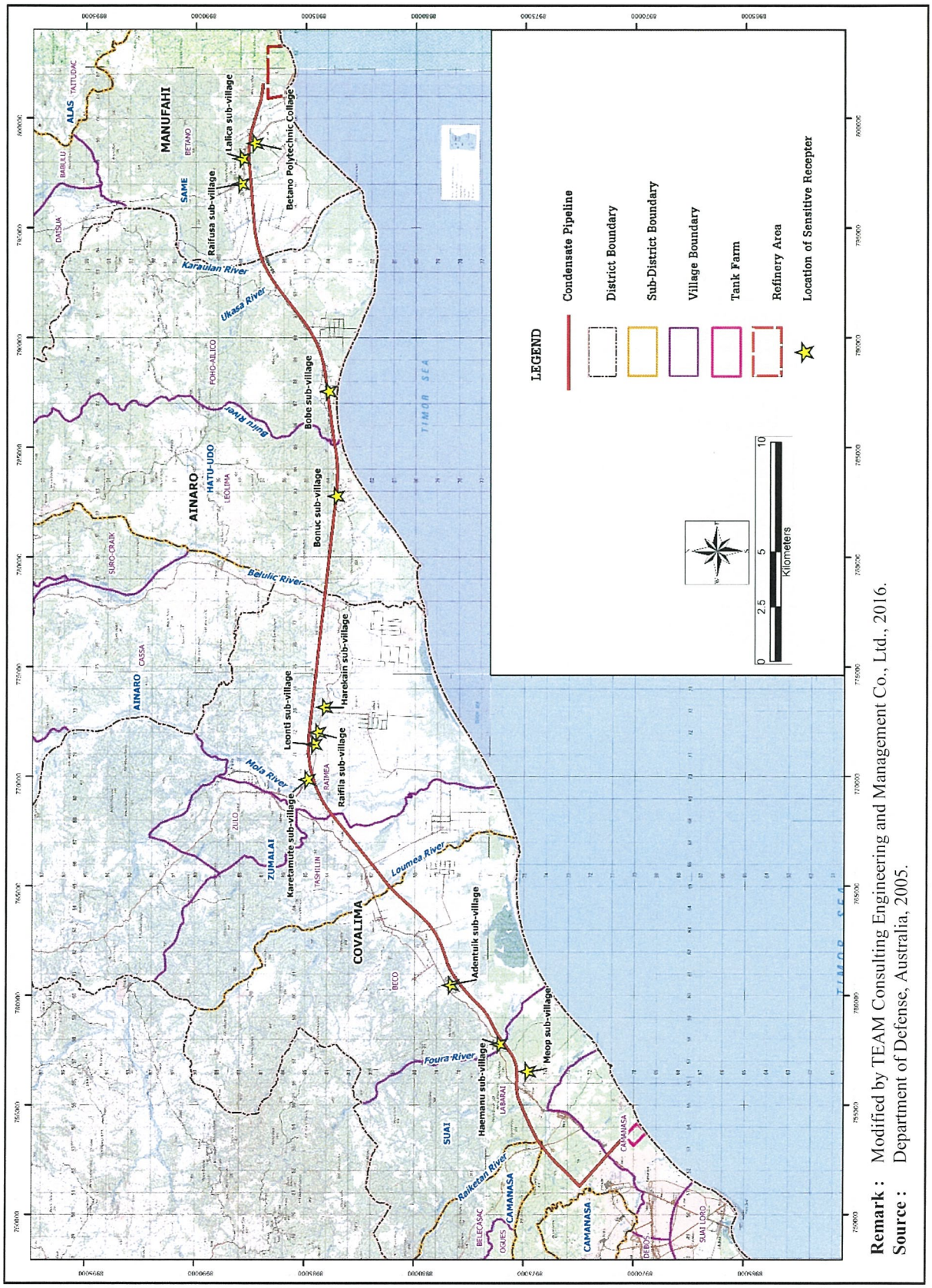
LIST OF SENSITIVE RECEPTORS IN THE STUDY AREA

Location	Coordinates		Distance (m)	Direction from Project Site
	E	N		
Betano Polytechnic (Bemetan sub-village)	798784	8987473	20	S
Lalica sub-village	798150	8987937	300	N
Raifusa sub-village	797000	8988000	475	N
Bobe sub-village	787540	8984000	0	Traversed
Bonuc sub-village	782780	8983625	0	Traversed
Harekain sub-village	773150	8984150	500	S
Leonti sub-village	772000	8984450	390	S
Raifila sub-village	771460	8984625	300	S
Karetamute sub-village	769850	8984930	150	N
Adentuik sub-village	760460	8997840	500	N
Haemanu sub-village	757780	8976150	300	N
Meop sub-village	756540	8974850	460	S

Remark : The pipeline and highway corridor will traverse two community areas.

Source : Base on 1. Topography Map, Department of Defense, Australia, 2005.
2. Confirmed by Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

[7] Prepared by WorleyParsons



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.3-8 : LOCATION OF SENSITIVE RECEPTORS

- **Ambient Air Quality**

According to the secondary data reviewed, there is no ambient air quality measurement in the vicinity area. However, the nearest ambient air quality at Betano Chefe Suco Office which has the majority of land-use characteristics as agricultural and un-developing areas, and some residential premises like project study area has been applied for the representative of study area. The measurement parameters comprise of Volatile Organic Compounds (VOCs), Nitrogen Oxides (NO_x), Sulfur Oxides (SO_x), and Particulate Matter Less than 10 micron (PM10) are shown in ***Table 6.3-8*** and described as below;

TABLE 6.3-8

AIR QUALITY MEASUREMENT AND EQUIPMENT LOCATIONS

Measurement Station	Measurement Equipment	Measurement Parameters
Betano Chefe Suco Office	Summa canister	– Volatile Organic Compounds (VOCs) – Nitrogen Oxides (NOx) – Sulfur Oxides (SOx)
	DustTrak™	– Particulate Matter less than 10 micron (PM10)

Source: Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant. TIMOR GAP, E.P., 2012

1) ***Volatile Organic Compounds (VOCs), Nitrogen Oxides (NO_x), and Sulfur Oxides (SO_x)***

Volatile Organic Compounds (VOCs), Nitrogen Oxides (NO_x), and Sulfur Oxides (SO_x), were examined at Betano Chefe Suco Office (Betano CSO). The analytical results are presented in ***Table 6.3-9.*** Most of analytical results are less than the limit of reporting, only Freon 12 which had been previously used as a refrigerant and now under the banned list of chlorofluorocarbon, was found greater than the limit of reporting, with the concentration of 0.8 ppbv or 4 $\mu g/m^3$.

TABLE 6.3-9

LABORATORY ANALYSIS RESULTS OF VOCS AND NO_X

Compound	Limit of Reporting	Betano CSO
		05/01/2012
Freon 12	0.5 ppbv	0.8 ppbv
	2 $\mu g/m^3$	4 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	0.0001%	<0.0001%
Nitric Oxide (NO)	0.0001%	<0.0001%

Source: Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant, TIMOR GAP, E.P., 2012

2) *Particulate Matter Less than 10 micron (PM10)*

Particulate Matter Less than 10 micron (PM10) were examined at Betano Chefe Suco Office (Betano CSO). The average PM10 concentration over the examination period was approximately 29 $\mu g/m^3$ which was less than the 24-hour average concentration of U.S. EPA. Standard. (Standard value = 150 $\mu g/m^3$).

6.3.8 Noise

The study on current noise level in the study area is reflecting quality of life of local people. The result is used in combination with the study of noise caused by the project activities in order to formulate proper preventive and mitigation measures.

(1) Study Method

This study has been designed to establish the baseline noise level of the study area for assessment the noise impacts caused by project activities during construction and operation period. The following secondary documentation have been gathered and reviewed;

- **Sensitive Receptors within the Study Area**

  - Topographic Maps of Timor-Leste prepared by the Department of Defense, Australia, 2005, scale 1:50,000
  - Satellite images from www.google.earth.com
  - On-site visual inspection

- **Existing Noise Level**

  - Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project - Betano Petroleum Refinery and Beaço LNG Plant , TIMOR GAP, E.P., 2012[8]

(2) Results of Study

<u>Section 1 KP 0+000 to 30+000</u>

- **Sensitive Receptors within the Study Area**

The location of sensitive receptors was identified in desktop assessment and on-site visual inspection. According to the desktop assessment and on-site visual inspection, the project study area within 50 m. strips along the pipeline comprises of Manufahi, Ainaro, and Covalima sub-districts. Majority is agricultural and un-developing areas, some residential premises have been also identified. The sensitive receptors, for example; children and the elderly, tend to congregate (i.e., Schools and Hospitals/Medical Clinics) are listed in ***Table 6.3-10*** and ***Figure 6.3-8***.

[8] Prepared by WorleyParsons

TABLE 6.3-10

LIST OF SENSITIVE RECEPTORS IN THE STUDY AREA

Location	Coordinates		Distance (m)	Direction from Project Site
	E	N		
Betano Polytechnic (Bemetan sub-village)	798784	8987473	20	S
Lalica sub-village	798150	8987937	300	N
Raifusa sub-village	797000	8988000	475	N
Bobe sub-village	787540	8984000	0	Traversed
Bonuc sub-village	782780	8983625	0	Traversed
Leonti sub-village	772000	8984450	390	S
Raifila sub-village	771460	8984625	300	S
Karetamute sub-village	769850	8984930	150	N
Adentuik sub-village	760460	8997840	500	N
Haemanu sub-village	757780	8976150	300	N
Harekain sub-village	773150	8984150	500	S
Leonti sub-village	772000	8984450	390	S

Remark: The pipeline and highway corridor will traverse two communities.

- **Noise Level**

According to the secondary data reviewed, there is no noise level measurement in the vicinity area. However, majority of project study area is agricultural and un-developing areas, some residential premises have been also identified. The nearest Noise Level measurement stations are 4 measurement stations in Betano Town Center as shown in ***Table 6.3-11***. The results finding show that the primary noise source were associated with weather and vehicular traffic. In addition, the $L_{linear, peak}$ values was above 96 dB and were associated with vehicles passing the sound level meter in close proximity. Furthermore, the noise level within the measurement period of 15 minutes (L_{Aeq}) ranged from 45.5-56.1 dB. Details are shown in ***Table 6.3-11***.

TABLE 6.3-11

BASELINE NOISE MEASUREMENT RESULTS

Station	Date	Time			Measurements (dB)		Primary Noise Source
		Start	End	Duration (min)	L_{Aeq}	$L_{linear, peak}$	
Betano Town Centre (Chefe Suco Office)	10/12/2011	1514	1529	15	47.2	101.8	Vehicle Traffic
Betano Town Centre (Monument)	10/12/2011	1540	1555	15	56.1	96.9	Vehicle Traffic
Betano Town Centre (Western Boundary)	10/12/2011	1614	1629	15	45.5	97.4	Wind/Animals
Betano Town Centre (Refinery Western Boundary)	10/12/2011	1640	1655	15	54.7	100.7	Ocean Vehicle Traffic

Source: Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant. TIMOR GAP, E.P., 2012

6.3.9 Surface Waters

6.3.9.1 Hydrology

Hydrological study of the Betano Refinery area was conducted in 2012, prepared for TIMOR GAP, E.P.[9] for the design of storm water collection and diversion system which was part of the land development package. Based on ATT's design report, the estimated runoff for rivers in each catchment area were concluded and used for the drainage system design as follows:.

Along the pipeline route, there are about 12 catchment areas in which four of them are very large rivers of width >500m. These rivers have water runoff throughout the year. ***Table 6.3-12*** shows estimated flow of rivers which is calculated by using catchment area and rainfall intensity which is derived from the meteorological station in Bali.

TABLE 6.3-12

CALCULATED FLOW RUNOFF OF RIVERS ALONG THE CONDENSATE PIPELINE

No.	Catchment Name	Area (sq.km.)	Q (m^3/sec)	Sta.
1	Sui	152.1	16,732	0+000 to 5+300
2	Mota Raiketan	105.9	11,652	5+300 to 8+100
3	Holba	11.3	1,245	8+100 to 9+900
4	Mota Foura	76.8	8,446	9+900 to 11+400
5	Zol Peri	55.8	6,136	11+400 to 18+400
6	Mota Loumea	265.7	29,227	18+400 to 20+300
7	Mota Molo	231.5	25,465	20+300 to 25+900
8	Raimea	74.7	8,212	25+900 to 32+400
9	Mota Be Lulic	381.5	41,970	32+400 to 35+200
10	Mota Buita	104.9	11,535	35+200 to 49+200
11	Mota Caraulun	585.6	64,418	49+200 to 51+200
12	Betano	80.2	8,823	51+200 to 58+532

Source : TIMOR GAP, E.P., 2012.

[9] By ATT's Consultants, Co., Ltd.

For hydrological study, the following activities were conducted at most of main rivers and waterways in February, 2016 including water flow measurement and width measurement (see ***Table 6.3-13 and Figure 6.3-9 in Item 6.3.10 Surface Water Quality***).

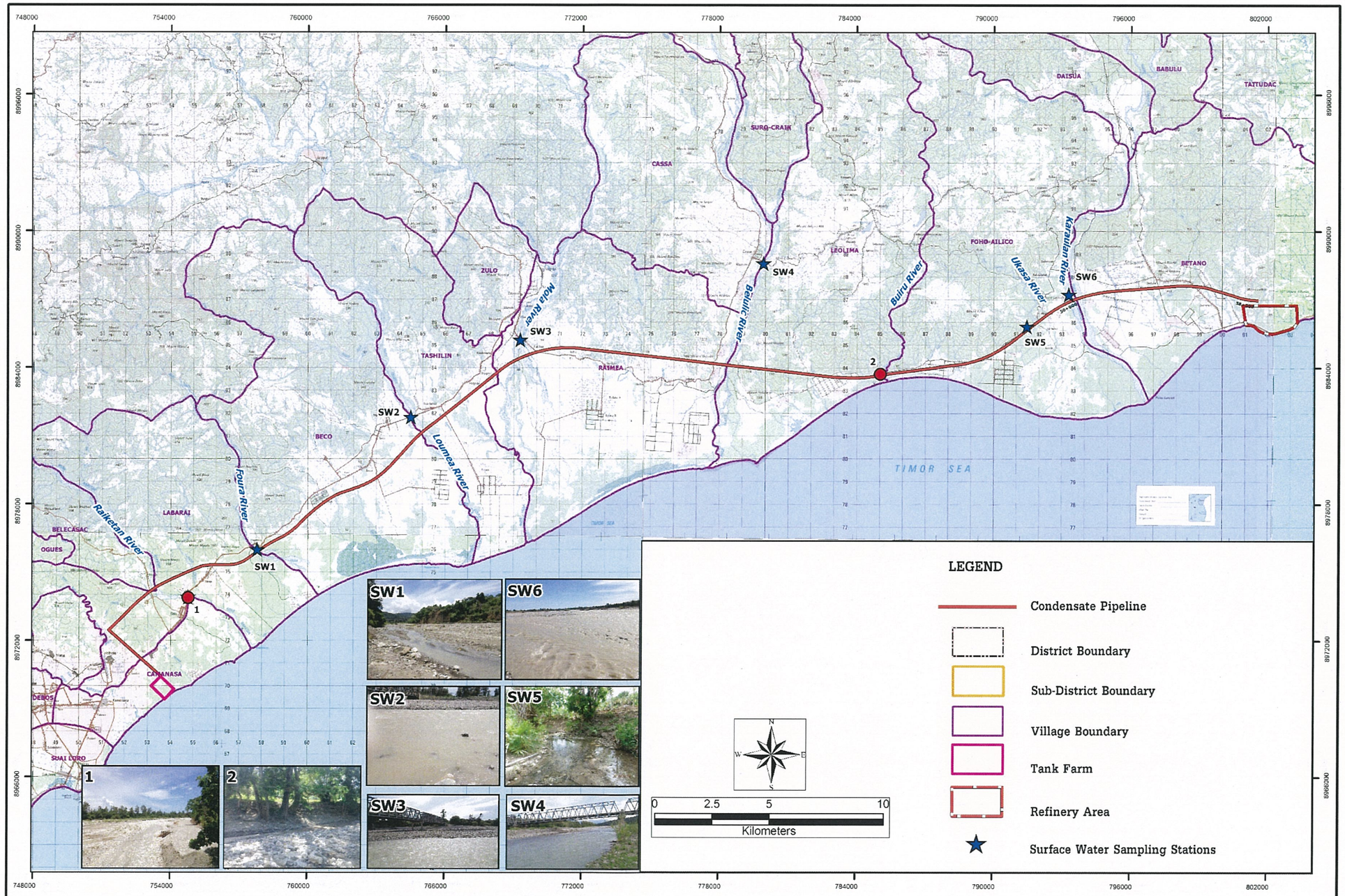
TABLE 6.3-13

WIDTH AND VELOCITY OF SOME RIVERS

Name of the River	Width (m.)	Velocity (m/sec)
SW1 : Foura River	110	N/A*
SW2 : Loumea River	240	0.84
SW3 : Mola River	400	0.68
SW4 : Belulic River	240	1.55
SW5 : Ukasa River	60	N/A*
SW6 : Caraulun River	800	1.60

Remark : Station SW1 : Foura River (UTM 757786E, 8976006N)
SW2 : Loumea River (UTM 764490E, 8981825N)
SW3 : Mola River (UTM 769285E, 8985217N)
SW4 : Belulic River (UTM 779923E, 8988589N)
SW5 : Ukasa River(UTM 791453E, 8985831N)
SW6 : Caraulun River (UTM 793290E, 8987225N)
* = The water was dried during measurement time.

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

FIGURE 6.3-9 : SURFACE WATER SAMPLING STATIONS

6.3.9.2 Surface Water Quality

(1) Methodology

The field survey for surface water quality was conducted in February, 2016. There are 8 rivers to be crossed by condensate pipeline from the Suai Supply Base to refinery in Betano village namely the Raiketan River, the Foura River, the Loumea River, the Mola River, the Belulic River, the Ukasa River, the Buiru River and Karaulun River. (See ***Figure 6.3-9***). Surface water samples were collected at six stations for water sources to be crossed by the pipeline alignment as shown in ***Figure 6.3-9*** and ***Photo 6.3-3***.

SW 1 : In the Foura River (757786E, 8976006N)

SW 2 : In the Loumea River (764490E, 8981825N)

SW 3 : In the Mola River (769285E, 8985217N)

SW 4 : In the Belulic River (779923E, 8988589N)

SW 5 : In the Ukasa River (791453E, 8985831N)

SW 6 : In the Karaulun River (793290E, 8987225N)

All parameters were measured in situ. In situ measurement was made for water depth, temperature, pH, salinity, dissolved oxygen (DO), conductivity and total dissolved solids (***Table 6.3-14***). The surface water quality measurement equipment are shown in ***Photo 6.3-4***.

TABLE 6.3-14

STANDARD METHODOLOGY USED FOR SURFACE WATER QUALITY ANALYSIS

Parameters	Unit	Analysis Method	Detection Limit
Temperature	°C	Thermometer[1/]	-
pH	-	Electrometric Method (pH Meter) [1/]	1.0
Salinity	ppt	Electrical Conductivity Method[1/]	0.1
Dissolved Oxygen (DO)	mg/L	Membrane Electrode Method [1/]	0.1
Total Dissolved Solids (TDS)	mg/L	Conductivity Meter	5.0
Conductivity	µS/cm	Conductivity Meter[1/]	0.05

Remark: [1/] American Public Health Association (APHA), American Water Works Association (AWWA) and Water Pollution Control Federation (WEF). 2012. Standard Methods for the Examination of Water and Wastewater. 22nd Edition. Washington, DC: American Public Health Association.



SW 1 : In the Foura River



SW 2: In the Loumea River



SW 3 : In the Mola River



SW4 : In the Belulic River



SW 5 : In the Ukasa River



SW6 : In the Karaulun River

Source : Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.3-3 : SURFACE WATER SAMPLING ACTIVITIES

	
Thermometer	**pH Meter**
	
Salinity and Conductivity Meter	**Dissolved Oxygen (DO) meter**

Source: Field survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016

PHOTO 6.3-4 : SURFACE WATER QUALITY MEASUREMENT EQUIPMENT

(2) Results of the Study

The results of the surface water quality analysis of six sampling stations in February, 2016 are shown in ***Table 6.3-15*** and compared with National Recommended Water Quality Criteria, United States Environmental Protection Agency (US EPA) (2009). DO and pH of all stations were within the Standard with values of 6.83-7.33 mg/L and 7.84-8.24. The overall water quality in the Rivers is suitable to be used as freshwater preservation, livestock and irrigation. In brief, the surface water quality in each station can be described as follows:

- **Station SW 1** : In the Foura River (757786E, 8976006N)

The width of this water sampling station was about 110 m. Water quality was turbid without odor and salinity was 0.2 ppt. The water depth was 0.30 m. DO and pH were within National Recommended Water Quality Criteria (US EPA, 2009) with values of 6.47 mg/L and 8.18. Water temperature, conductivity and total dissolved solids (TDS) were 34 ^{o}C, 964 µS/cm and 471 mg/L, respectively.

- **Station SW 2** : In the Loumea River, 804 m to the north of the pipeline route (764490E, 8981825N)

The width of this water sampling station was about 240 m. Water quality was turbid without odor and salinity was 0.2 ppt. The water depth was 0.45 m. DO and pH were within National Recommended Water Quality Criteria (US EPA, 2009) with values of 7.03 mg/L and 8.11. Water temperature, conductivity and total dissolved solids (TDS) were 30.2 °C, 483.2 µS/cm and 439.3 mg/L, respectively.

- **Station SW 3** : In the Mola River, 743 m to the north of the pipeline route (769285E, 8985217N)

The width of this water sampling station was about 400 m. Water quality was turbid without odor and salinity was 0.2 ppt. The water depth was 1.0 m. DO and pH were within National Recommended Water Quality Criteria (US EPA, 2009) with values of 7.19 mg/L and 8.06. Water temperature, conductivity and total dissolved solids (TDS) were 29.5 °C, 468.8 µS/cm and 430.3 mg/L, respectively.

- **Station SW 4** : In the Belulic River, 4.6 km to the north of the pipeline route (779923E, 8988589N)

The width of this water sampling station was about 240 m. Water quality was turbid without odor and salinity was 0.1 ppt. The water depth was 1.0 m. DO and pH were within National Recommended Water Quality Criteria (US EPA, 2009) with values of 7.33 mg/L and 8.24. Water temperature, conductivity and total dissolved solids (TDS) were 25.6 °C, 291 µS/cm and 289.5 mg/L, respectively.

TABLE 6.3-15

RESULTS OF SURFACE WATER QUALITY SAMPLING, FEBRUARY 2016

Characteristic	Parameter	Unit	Limit of Detection	SW1	SW2	SW3	SW4	SW5	SW6	Standard
										US EPA* 2009
Sampling Date				16/02/2016	16/02/2016	16/02/2016	16/02/2016	15/02/2016	14/02/2016	
1. Physical Characteris	Temperature	°C	-	34	30.2	29.5	25.6	32.6	31.4	-
	Conductivity	µS/cm	0.05	964	483.2	468.8	291	1,175	34	-
2. Chemical Characteristic	pH	-	1.0	8.18	8.11	8.06	8.24	7.84	8.06	6.5-9.0
	DO	mg/L	0.1	6.47	7.03	7.19	7.33	6.83	7.13	3.5
	Salinity	ppt	0.1	0.2	0.2	0.2	0.1	0.2	0.1	-
	TDS	mg/L	5.0	471	439.3	430.3	289.5	1,019	311	-

Remark: Station SW1 : Foura River (UTM 757786E, 8976006N)

SW2 : Loumea River (UTM 764490E, 8981825N)

SW3 : Mola River (UTM 769285E, 8985217N)

SW4 : Belulic River (UTM 779923E, 8988589N)

SW5 : Ukasa River (UTM 791453E, 8985831N)

SW6 : Karaulun River (UTM 793290E, 8987225N)

* National Recommended Water Quality Criteria, 2009 US EPA-822-R-02-047, November 2009

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

- **Station SW 5** : In the Ukasa River (791453E, 8985831N)

The width of this water sampling station was about 60 m. Water quality was turbid without odor and salinity was 0.2 ppt. The water depth was 0.4 m. DO and pH were within National Recommended Water Quality Criteria (US EPA, 2009) with values of 6.83 mg/L and 7.84. Water temperature, conductivity and total dissolved solids (TDS) were 32.6 °C, 1,175 µS/cm and 1,019 mg/L, respectively.

- **Station SW 6** : In the Karaulun River, (793290E, 8987225N)

The width of this water sampling station was about 800 m. Water quality was turbid without odor and salinity was 0.1 ppt. The water depth was 0.4 m. DO and pH were within National Recommended Water Quality Criteria (US EPA, 2009) with values of 7.13 mg/L and 8.06. Water temperature, conductivity and total dissolved solids (TDS) were 31.4 °C, 34 microsiemens/cm (µS/cm) and 311 mg/L, respectively.

6.3.10 Coastal Water Quality

Information about this subject derived from the coastal water quality survey, reported in Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant, TIMOR GAP, E.P., 2012[10] which conducted the coastal water quality sampling for 3 station nearby the proposed Betano Refinery area. A calibrated multi-parameter water quality logger (Hydrolab Multiparameter DSx5) was used to measure physicochemical properties. A physicochemical water quality profile was obtained by recording measurement at 1 m intervals from the water surface to the seabed at each of the sampling station.

Physiochemical parameters were measured for temperature, pH, conductivity, salinity, turbidity, and dissolved oxygen. Chemical substances and heavy metals including ammonia, nitrite and nitrate, total kjeldahl nitrogen, total nitrogen, total phosphorus, chlorophyll a, BOD, mercury, cadmium, chromium, copper, lead, nickel, zinc, total petroleum hydrocarbon, total recoverable hydrocarbon, total polycyclic aromatic hydrocarbon were measured.

The results showed water temperature were within similar ranges of between 30.7°C and 31.8°C, with pH values ranged between 7.9-8.1. Conductivity value ranged between 53.2-53.6 mS/cm. Salinity varied around 35.2-35.5 ppt. The level of turbidity was in range 0.1-3.0 NTU and dissolved oxygen was relatively high, 6.11-6.62 mg/L.

The concentration of chemical substances and heavy metals were lower than the maximum concentration prescribed in ASEAN MARINE WATER QUALITY Standards[11] and National Recommended Water Quality Criteria[12].

[10] Prepared by WorleyParsons
[11] ASEAN MARINE WATER QUALITY Management Guidelines and Monitoring Manual (2008)
[12] National Recommended Water Quality Criteria, United States Environmental Protection Agency (US EPA) (2009)

Total petroleum hydrocarbons (TPH), total recoverable hydrocarbon (TRH) and Polycyclic Aromatic Hydrocarbon (PAH) were detected at low concentration.

This would be due to no industrial activities in this area. Data on background levels of heavy metal would benefit in the management of coastal water to protect the marine ecosystem.

6.3.11 Marine Waters

6.3.11.1 Oceanography

Detailed study of the oceanography of the area is available in the Land Development Design and Estimate Contract for the Betano Refinery Project by ATT's Consultants Co., Ltd., 2013. The study aims to identify any impacts that may occur from coastal sources including sea water level, tide, wave, and other related phenomena. One additional study, Assessment of Tsunami Risk, performed by Regional Integrated Multi-Hazard Early Warning System (RIMES), 2013, which is a subsidiary of AIT Consulting, was collected and reviewed. Results of data review of these reports will be described in the following clauses.

The result of RIMES's tsunami assessment using earthquake source along Timor Trough shows that most parts of the southern coast will be impacted by tsunami wave with the maximum inundation depth of 6 m. and maximum distance from shoreline of about 500 m. especially at the flat area. Anyhow, there are two argued points on this tsunami model as:

- For geological point of view, the normal source of large earthquakes that generate tsunami wave is normally related to one of global subduction zones. So Timor Trough is not that case.
- From the historical observed tsunami of Timor Island, only the northern shoreline was impacted by the tsunami wave. This is conformed to the earthquake source and location of subduction zone.

6.3.11.2 Marine Water Quality

Information about this subject derived from the marine water quality survey, reported in Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant, TIMOR GAP, E.P., 2012 [13] which conducted the marine water quality sampling for 3 station nearby the proposed Betano Refinery area. A calibrated multi-parameter water quality logger (Hydrolab Multiparameter DSx5) was used to measure physicochemical properties. A physicochemical water quality profile was obtained by recording measurement at 1 m intervals from the water surface to the seabed at each of the sampling station.

[13] Prepared by WorleyParsons

Physiochemical parameters were measured for temperature, pH, conductivity, salinity, turbidity, and dissolved oxygen. Chemical substances and heavy metals including ammonia, nitrite and nitrate, total kjeldahl nitrogen, total nitrogen, total phosphorus, chlorophyll a, BOD, mercury, cadmium, chromium, copper, lead, nickel, zinc, total petroleum hydrocarbon, total recoverable hydrocarbon, total polycyclic aromatic hydrocarbon were measured.

Water temperature ranged between 29.4-31.9 °C, with pH values ranged between 8.0-8.1. Conductivity value ranged between 53.2-53.8 mS/cm. Salinity varied around 35.2-35.6 ppt. The level of turbidity was in range 0.2-7.9 NTU and dissolved oxygen was 5.87-6.64 mg/L which exceeded Standards.

The concentrations of ammonia were in range 0.03-0.1 mg/L which were below ASEAN Marine Water Quality Standards (0.07 mg/L)[14] except BTO1 (0.1 mg/L). The concentration of chemical substances were lower than the maximum concentration prescribed in ASEAN MARINE WATER QUALITY Standards and National Recommended Water Quality Criteria[15]. Heavy metal concentrations were below ASEAN Marine Water Quality Standards and National Recommended Water Quality Criteria.

Total petroleum hydrocarbons (TPH), total recoverable hydrocarbon (TRH) and polycyclic aromatic hydrocarbon (PAH) were detected at low concentration.

This would be due to no industrial activities in this area. Data on background levels of heavy metal would benefit in the management of marine water to protect the marine ecosystem.

6.3.12 Sediment Quality

Information about this subject derived from the sediment water quality survey, reported in Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant, TIMOR GAP, E.P., 2012 [16] which conducted the sediment quality sampling for 2 station nearby the proposed Betano Refniery area by using a Van Veen grab sampler at 0-0.3 meters of depth. The sample was then homogenised in a stainless steel mixing bowl before being transferred into a sterilised 250 ml glass jar and a 250 ml plastic bag. Each sample was then stored at 4°C and couriered to laboratory for analysis.

Sediment samples were analysed namely metals (cadmium, chromium, copper, lead, nickel, zinc and mercury), nutrients (ammonia, NOx, total nitrogen, total phosphorus, total kjeldahl nitrogen), hydrocarbon (total petroleum hydrocarbons, total recoverable hydrocarbons, poly-aromatic hydrocarbons) and particle size distribution.

Nearshore sediment mostly consisted of sand and gravel while offshore sediment mostly consisted of sand and fines. Sediment nutrient quality was slightly low. The heavy metals including cadmium, chromium, copper, lead, nickel, zinc and mercury were within NOAA standard[17]. That means the sediment is suitable for ecosystem.

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14 ASEAN MARINE WATER QUALITY Management Guidelines and Monitoring Manual (2008)
15 National Recommended Water Quality Criteria, United States Environmental Protection Agency (US EPA) (2009)
16 Prepared by WorleyParsons
17 NOAA Screening Quick Reference Table, from "Sediment quality criteria in use around the world" Limnology (2002) 3: 65-75

6.4 BIOLOGICAL COMPONENTS

6.4.1 Wet Land

Field survey on wet land within condensate pipeline alignment and within 50 meters strips along both sides of the condensate pipeline was conducted in February 2016. There are no significant wetlands within condensate pipeline alignment and within 50 meters strips along both sides of the condensate pipeline

6.4.2 Mangroves

Field survey on mangroves within condensate pipeline alignment and within 50 meters strips along both sides of the condensate pipeline was conducted in February 2016. There are no mangroves within condensate pipeline alignment and within 50 meters strips along both sides of the condensate pipeline since the area is on high evaluation beyond influence of sea water.

6.4.3 Corals

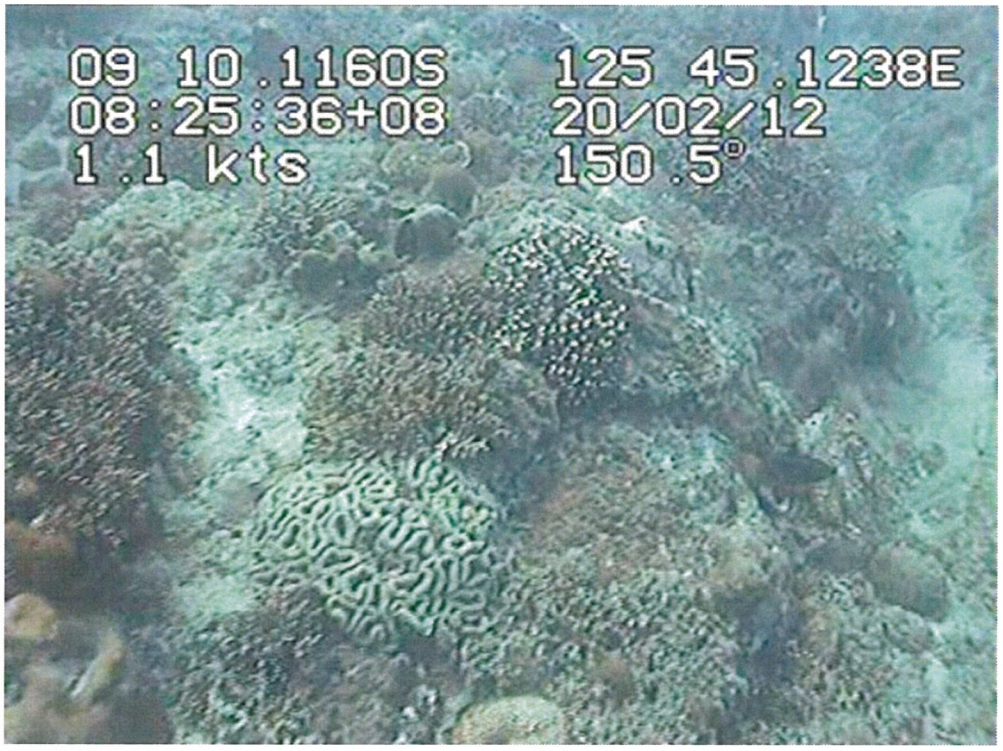
Information about this subject derived from video transect method, the remotely operated video camera was towed behind a vessel travelling at a speed of 1 knot or less, reported in Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project- Betano Petroleum Refinery and Beaço LNG Plant, TIMOR GAP, E.P., 2012.[18] and the secondary information reviewed including published results of past survey of coastal resource.

Five coral families were found, consisting of Acroporidae, Favviidae, Poritidae, Fungiidae and Dendrophyllidae. The reef flat was low in diversity and appeared to have a higher cover of sponges, hydroids, algal groups, ascidians, and Montipora corals. The reef flat drops steeply into deep water (1 to 25 m). During heavy rains, sediments are mobilised from the surrounding catchment and enter the ocean causing large sediment plumes. Related to this phenomenon, the benthic habitat within the study area is dominated by sediment although, some corals and algae in various forms are also present. Therefore, the greatest diversity of corals was generally found within 3 to 8 m of the surface. The band of rich coral growth is very narrow, being approximately 150 m wide (See ***Photo 6.4-1***). The dense coral cover gradually changes into a mix of algae and invertebrates found growing on a mosaic of weathered limestone and sand from approximately 8 to 25 m.

In addition, status on diversity of coral reefs was collected from Burke et al. (2002)[19]. Timor-Leste is near the center of the global region with the highest coral species diversity (the Wallacea region). A high diversity of coral reefs exist in southern Timor-Leste with 301-500 species identified.

[18] Prepared by WorleyParsons
[19] Burke, L., E. Selig and M. Spalding. 2002. Reefs at Risk in Southeast Asia. World Resources Institute.

A number of coral reefs identified along the Timor-Leste coast including five distinct communities along the south coast of Timor-Leste indicate that there would be medium to high risk of impact from the combined effects of coastal development, marine-based pollution, sedimentation, overfishing and destructive fishing.



Source: Tasi Mane Project-Betano Petroleum Refinery and Beaço LNG Plant Strategic Environmental Impact Statement, TIMOR GAP, E.P. (2012)

PHOTO 6.4-1: CORAL REEF ADJACENT TO THE FOOTPRINT AREA

6.4.4 Fisheries

(1) Methodology

Field investigation on existing fisheries within 50 m strips on both sides of pipeline route was conducted in February and April, 2016. The results could be used as the baseline information on fisheries for the Project.

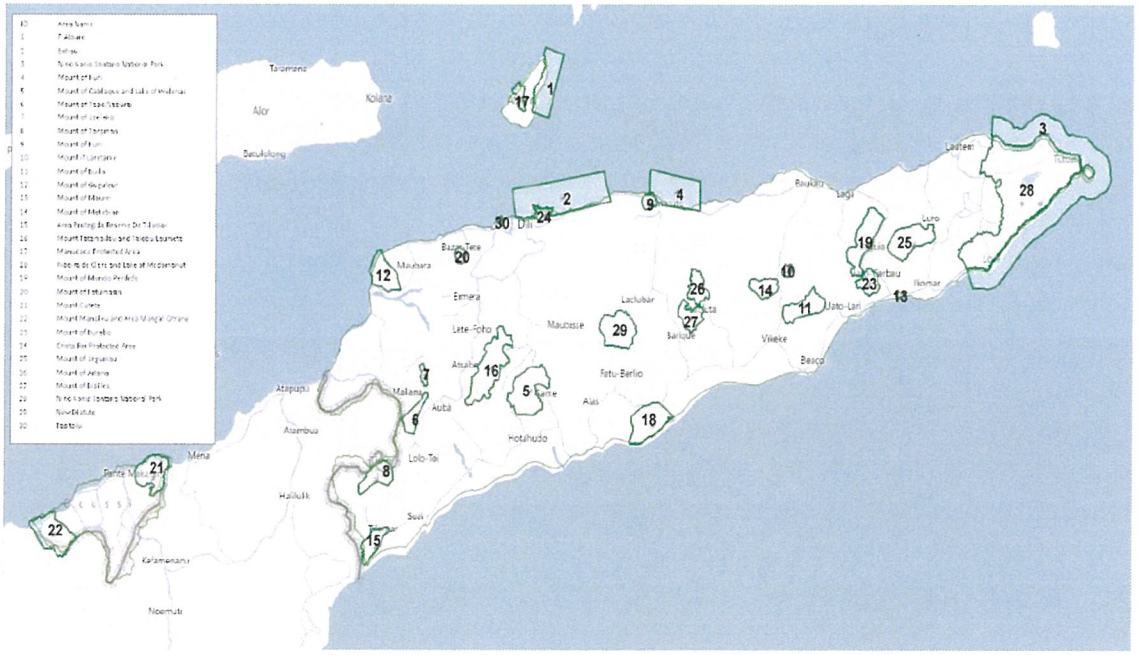
(2) Results of the Study

Results of field investigation reveal that the pipeline route runs mostly underground within the south of Right-Of-Way (ROW) of the Tasi Mane South coast highway. Most of land use within the ROW of the proposed highway are forest and agricultural land. The location of the coastline is quite distant to the south of the pipeline route. Therefore, there is no fisheries zone adjacent to the proposed project.

6.4.5 Protected Areas and National Parks

Based on the literature review about Protected Areas and National Parks in Timor-Leste, protected areas are sites identified due to their high national or international biological value and managed to protect natural and cultural values. In Timor-Leste, protected areas are seen as integral to the strategy to address fundamental priorities for sustainable management of the environment, natural resources and biological diversity, as guaranteed under the Constitution. The Government of Timor-Leste has declared 30 protected areas of which 15 are legislated and another 15 identified and will be put under legislation (DPANP, National Directorate of Forests, 2011) are shown in ***Figure 6.4-1***. Its first national park is the Nino Konis Santana National Park that encompasses the easternmost tip of the country, including the Jaco Island Marine National Park and the Lake Iralalaru National Park. Nino Konis Santana National Park was declared in August 2008. Located in the Monte Paitchau-Iralalaru area, the Park covers 680 square kilometers and includes the best "undeveloped tropical evergreen forest in Timor Leste" (Grantham,et al. 2011). The forest is continuous, with primary and secondary drier tropical forests in the vicinity of Tutuala, Mehara, and Com (Trainor, etal. 2008). The Park also incorporates the Jaco Island, Lore Reserve, and the Tutuala Beach outlined in Regulation 2000/19. A marine section was added to the Park in 2007 (Grantham et al. 2011). Delineation of the boundaries is ongoing, as of this writing.

Like other land management categories in Timor-Leste, the Protected Area Network will be under joint government and community-based management. Its new establishment provides an opportunity to apply best practices from the outset to deliver local and national benefits alongside conservation of biodiversity and natural heritage.



Source : Timor-Leste's Fourth National Report to the UN Convention on Biological Diversity, Democratic Republic of Timor-Leste, October 2011.

FIGURE 6.4-1 : LOCATION OF THE 15 LEGISLATED AND 15 IDENTIFIED FOR LEGISLATION PROTECED AREAS IN TIMOR-LESTE

Regulation No. 2000/19 On Protected Places was passed by the UN Transitional Administration in East Timor (UNTAET) in 2000. It declared 15 'Protected Wild Areas' among other important conservation measures and was adopted by the new Government under the Constitution of Timor-Leste upon the transfer of administration from the UN when independence was restored in 2002. UNTAET (2000) provided generally defined boundaries for these areas via a series of low resolution maps. By 2007, much progress had been made in identifying candidate sites for protection, and in declaring the creation of the country's first national park, Nino Konis Santana National Park, at the country's eastern extremity. This includes a highly significant area of terrestrial and adjacent marine ecosystems.

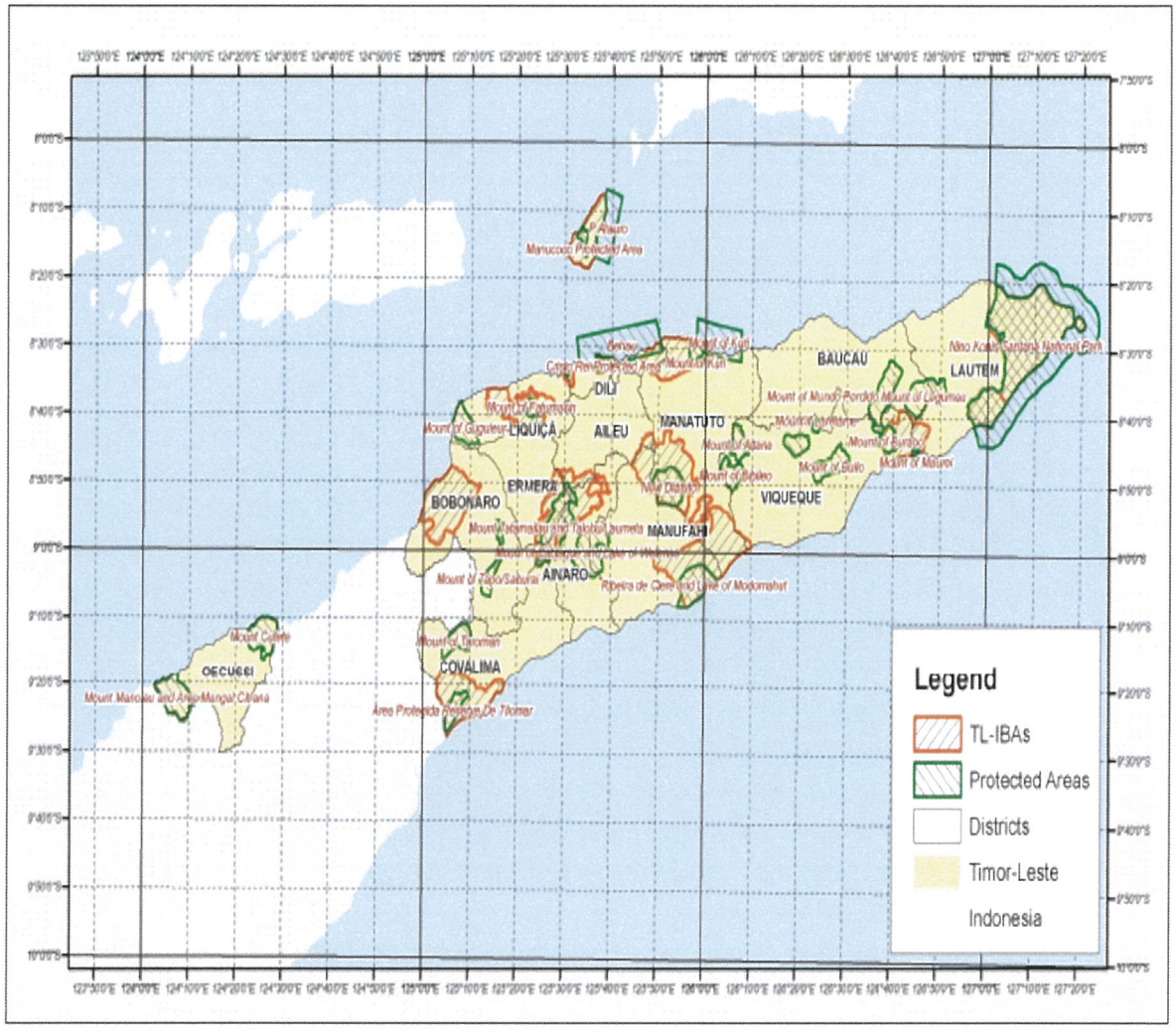
Currently, 15 locations are legislated as protected area, and the other 15 locations are identified for legislation protected area. Sixteen locations have been implemented and legislated as Important Bird Areas (IBAs), counting up to 261 identified bird species ***(Figure 6.4-2).*** These IBAs and protected areas are listed in ***Tables 6.4-1 and 6.4-2***, respectively.

1. Atauro Island
2. Behau
3. Nino Konis Santana National Park (Marine)
4. Lamsanak
5. Mount Cablaque and Lake Welenas
6. Mount of Tapo / Saburai
7. Mount Loelako
8. Mount Taroman
9. Mount Kuri
10. Mount Laretami
11. Mount Builo
12. Mount Guguleur
13. Lake Maurei
14. Mount Matebian
15. Area Protegida Reserva De Tilomar
16. Mount Tatamailau and Talobu / Laumeta
17. Manucoco Protected Area
18. Ribeira De Clere and Lake Modomahut
19. Mount Mundo Perdido
20. Mount Fatumasin
21. Mount Cutete
22. Mount Manoleu and Area Mangal Citrana
23. Mount Burabo
24. Cristo Rei Protected Area

25. Mount Legumau
26. Mount Altana
27. Mount Bibileo
28. Nino Konis Santana National Park (Terrestrial)
29. Mount Diatuto
30. Tasitolu

The UNTAET had identified all these protected areas from 2000 to 2011. Now, the Department of Protected Areas and National Parks (DPANP) put 15 legislated Protected Areas under the Regulation No.2000/19. Furthermore, all mangrove forests are specifically granted full protection from cutting, removal or other damage.

All of the protected area are outside the condensate pipeline alignment and the study area of 50 meter strips long both sides of the condensate pipeline alignment.



Source : Timor-Leste's Fourth National Report to the UN Convention on Biological Diversity, Democratic Republic of Timor-Leste, October 2011

FIGURE 6.4-2 :. LOCATION OF IMPORTANT BIRD AREAS AND PROTECTED AREAS (EXISTING AND PROPOSED) IN TIMOR-LESTE

TABLE 6.4-1

IMPORTANT BIRD AREAS IN TIMOR-LESTE AND THEIR AREA COVERAGE

IBa No.	Site	Area (hectares)
1.	Tilomar	22,708
2.	Tata Mailau	30,372
3.	Fatumasin	13,616
4.	Atauro Island Manucoco	14,118
5.	Sungai Clere	42,266
6.	Lore	10,906
7.	Monte Paitchao and Lake Iralalaru	55,797
8.	Jaco Island	1,099
9.	Mount Diatuto	34,462
10.	Be Malae-Atabae	27,848
11.	Maubara	5,292
12.	Mount Mak Fahik and Mount Sarim	2,961
13.	Tasitolu	1,540
14.	Areia Branca Beach and Hinteriand	2,994
15.	Mount Curi	20,086
16.	Irabere estuary and Tilomar forest	16,564

Source : Timor-Leste's Fourth National Report to the UN Convention on Biological Diversity, Democratic Republic of Timor-Leste, October 2011.

TABLE 6.4-2
PROTECTED AREAS IN TIMOR-LESTE AND THEIR DESIGNATION STATUS

Protected Area	Basic Designation	Observation	Stage
Area Protegida Reserva De Tilomar	Regulamento UNTAET 19/2000	Complete demarcation	Implemented
Diatuta and Lian Bau Protected Area	Regulamento UNTAET 19/2000	Preliminary survey was conducted; held consultation with the community	Implemented
Manucoco Protected Area	Regulamento UNTAET 19/2000	Preliminary survey was conducted; held consultation with the community	Implemented
Nino Konis Santata National Park	Resolusaun do Govervo, no. 8/2008 Kria PNNKS, Regulamento UNTAET 19/200	Declared August 1, 2008, includes Reserva de Lore, Jaco Island, and Tutala	Implemented
Mount Matebian	Regulamento UNTAET 19/2000	Definitive	Implemented
Mount Mundo Perdido		Definitive	Implemented
Ribeira de Clere	Regulamento UNTAET 19/2000	Definitive	Implemented
Mount Fatumasin	Regulamento UNTAET 19/2000	Definitive	Implemented
Mount Cablaque	Regulamento UNTAET 19/2000	Definitive	Implemented
Mount Tatamailau	Regulamento UNTAET 19/2000	Definitive	Implemented
Cristo Rei PA	Regulamento UNTAET 19/2000	Definitive	Implemented
Talobu/Laumeta	Regulamento UNTAET 19/2000	Definitive	Implemented
Mount Cutete		Definitive	Implemented
Mount Manoleu		Definitive	Implemented
Area Mangal Citrana		Definitive	Implemented
Mount Tapo / Saburai		Definitive	Implemented
Mount Taroman		Definitive	Implemented
Mount Kuri		Definitive	Implemented
Mount Lagumau		Definitive	Implemented
Mount Laretame		Definitive	Implemented
Mount Builo		Definitive	Implemented
Mount Guguleur		Definitive	Implemented
Mount Loelako		Definitive	Implemented
Mount Burabo		Definitive	Implemented
Lake Maurei		Definitive	Implemented
Mount Aitana		Definitive	Implemented
Mount Bibileo		Definitive	Implemented
Lake Modomahut		Definitive	Implemented
Lake Welenas		Definitive	Implemented

Source : Grantham, *et., al. 2011*; DPANP, 2011.

6.4.6 Wildlife, Especially Any Rare, Endangered or Vulnerable Species or Habitats

(1) Methodology

Methodology for the study on fauna of this Project can be summarized in the following steps:

1) Compile and Study secondary data from relevant document and reports of previous studies including topographical map scale 1:50,000 of Timor-Leste.

2) Field survey

- To conduct field survey on wildlife and ecological condition along 50 meters strips on both sides of the condensate pipeline alignment and in the vicinity with focus on 4 classes of invertebrates i.e. Class Amphibia, Class Aves, Class Mammalia and Class Reptile
- Identify diversity of species, population size and to evaluate abundance habitat condition and conservation status of wildlife living or coming into the project study area.

3) To compile field data by direct searching method and indirect inquiring method.

- **Direct Searching Method:** using Line Transect Method (Bibby and Borgess, 1973) and Point Count. Recorded species and frequency of finding wildlife or physical traces such as footprints, dung, slough, moult, hair, egg, nest, hole, calls songs, etc.
- **Indirect Inquiring Method:** Indirect Inquring was done by asking villagers living in the project vicinity about wildlife in the project area, wildlife hunting and wildlife utilization.
- **Population Size:** Population size of wildlife is evaluated in term of Relative Abundance as shown in equation below:

$$\text{Reletive Abundance} = \frac{\text{Times of finding}}{\text{Times of Survey}} \times 100$$

There are 3 levels of abundance value i.e.:

67-100%	high abundance
34-66%	moderate abundance
1-33%	low abundance

Status of Conservation: The study of Conservation Status was done by checking found species with IUCN Red List (2015), CITES List and List of Endemic Species/Plant and Wildlife Habitat of Timor-Leste.

(2) Results of the study

(2.1) Literature Review

Fauna of Timor-Leste: Approximately 6,000 years BC, Papuan people from the north invaded Timor and brought several animal species that are now considered part of the natural fauna, such as deer, civet, cuscus and shrews. Hence, the natural ecosystems of Timor-Leste have been heavily influenced, to some extent, by humans for a million years, although significant impacts on vegetation cover probably only come with agricultural practices commencing. Endemic species include the Timor shrew and Timor rat.

In a survey of fauna by a project, along a transmission line across Timor-Leste, mammals and reptiles were observed. For reptiles, the survey recorded 3 gecko species, two of which were introduced species, and two skink species. The endemic Timor gliding lizard (*Draco timorensis*) (Maguire and Haeng 2001), is generally a common species in woodlands, villages, and tall closed forests. Snakes, on the other hand, are recorded to have 15 species. None of Timor-Leste's snakes is presently globally threatened with extinction, but two Python species are in the CITES list.

From the survey of birds in Timor-Leste (Fauna Di Timor-Leste, Stocktaking Document 1) that listed 32 species, 3 were identified to be endangered: Timor green pigeon (*Treron psittacea*), Local name (Ln) Punai Timor; Timor imperial pigeon (*Ducula cineracea*) Ln: Pergam Timor; and Wetar ground dove (*Gallicolumba hoetdii*) Ln: Delimukan Wetar; one (1) is critically endangered Yellow-crested cockatoo, (*Cacatua sulphurea)* Ln.: *Kakatua jambulkuning*; and one (1) is vulnerable – Timor sparrow (*Padda fuscata*) Ln: Gelatik Timor. The non-bird fauna of Timor-Leste and its associated islands may be poorly known, but recent surveys have discovered new species of bats, frogs, geckos and skinks, indicating that there may be high levels of endemism in all faunal groups. While roughly half of the bird fauna originates from Asia and half from Australasia, the mammal, amphibian and reptile faunas are dominated by Asian families and species (BirdLife International 2007).

Bats are the best represented group with at least 34 species, including 12 fruit-bat species. There are at least seven species of rats and mice and five species of shrews; two of these shrew species are native to Timor: thin shrew (*Crocidura tenuis)* and Timor rat (*Rattus timorensis*). These are the only native mammals on Timor other than bats. Timor once had a rich native rat fauna including giant rats, but these may have become extinct after the introduction of many mammals associated with human settlement during the last 1,000–7,000 years. Such species include the common spotted cuscus (*Phalanger orientalis*) (the only marsupial on Timor), long-tailed macaque (*Macaca fascicularis*) (the only primate), common palm civet (*Paradoxurus hermaphrodites*), Eurasian wild pig (*Sus scrofa*), Rusa deer (*Cervus timorensis*), house mouse (*Mus musculus)*, house rat (*Rattus tanezumi*), brown rat (*R. norvegicus*) and fi eld rat (*R. exulans*) (BirdLife International 2007).

There are about 15–20 amphibian species and 40 or more reptiles on Timor including six geckos, two monitor lizards, about 10 skinks, at least one blind snake, three pythons, one viper snake, about eight colubrid snakes, one file snake, at least four primitive sea snakes, one crocodile, one freshwater turtle and four sea turtles (BirdLife International, 2007).

(2.2) Results of Field Survey

Results of field survey in February 2016 and April 2016 along 50 meters strips on both sides of the condensate pipeline covering wildlife and habitats can be summarized in ***Table 6.4-3*** and ***Table 6.4-4.***

TABLE 6.4-3
AMOUNT OF WILDLIFE ALONG THE CONDENSATE PIPELINE

Type	Species	Family	Order	Abundancy Level (species) Area along the condensate pipeline			Abundancy Level (species) Within 50 strips on both sides of the Condensate Pipeline alignment		
				Low	Medium	High	Low	Medium	High
Mammal	13	7	5	8	4	1	6	6	1
Bird	47	28	12	26	10	14	25	15	8
Raptile	8	5	2	3	4	0	4	4	0
Amphibian	3	3	1	1	1	1	1	1	1
Total	71	43	20	38	19	16	36	26	10

Source : TEAM Consulting Engineering and Management Co., Ltd., February 2016

TABLE 6.4-4
CONSERVATION STATUS AND LEGAL STATUS OF WILD ANIMALS ALONG THE CONDENSATE PIPELINE

Type	Area along the condensate pipeline						Within 50 strips on both sides of the Condensate Pipeline alignment					
	Conservation Status (Type)						Conservation Status (Type)					
	IUCN 2015				CITES List	Timor-Leste	IUCN 2015				CITES List	Timor-Leste
	CR	EN	VU	NT	App II	Endemic Species	CR	EN	VU	NT	App II	Endemic Species
Mammal	-	1	1	2	1	1	-	1	1	1	1	1
Bird	-	-	-	1	2	3	-	-	-	2	2	3
Raptile	-	-	-	-	-	1	-	-	-	-	-	1
Amphibian	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	1	1	3	3	5	-	1	1	3	3	5

Source : TEAM Consulting Engineering and Management Co., Ltd., February 2016

Remark : IUCN Red List (2015)

CR : Critically endangered

EN : Endangered

VU : Vulnerable

NT : Near Threatened

The wildlife diversity, level of abundance, status of conservation, and wildlife habitat along the condensate pipeline and area within 50 strips on both sides of the Condensate Pipeline alignment are described as follows:

Areas along the condensate pipeline

Areas along the condensate pipeline consist of mixed deciduous forest, mixed deciduous forest intermingled with teak plantation and palm and riparian forest which are habitats and feeding ground of various wildlife. The results of field survey can be summarized as follows:

1) Wildlife Diversity

Within the areas along the condensate pipeline alignment there are 67 species, 60 genera in 42 families from 20 orders of wildlife which can be classified below:

- **Mammal**

There are 13 species of mammals most of which are of small size such as Dagger-toothed long-nosed fruit bat *(Macroglossus minmus),* Roof Rat *(Rattus rattus)* and Brown Rat *(Rattus morvegicus)*, etc. Wildlife of big and medium size comprise Javan Rusa *(Rusa timorensis),* Wild Pig *(Sus scrofa)* and Common Palm, Civet *(Paradoxurus hermaphroditus).* The mammals which are domestic animal of local villagers and Ball Cattle/Banteng *(Bos javanicus)*, Domestic Horse *(Equus caballus)* and Domestic Goat *(Capra hircus)* raised for labour and food.

- **Birds**

Birds found along the condensate pipeline alignment consists of 44 species of birds, most of which are endemic species such as Cattle Egret*(Bubulcus ibis)*, Spotted Dove *(Streptopelia chinensis)*, Barred Dove *(Geopelia maugei),* Collared Kingfisher *(Todiramphus Chloris),* Dollarbrid *(Eurystomus orientalis),* Long-tailed Shrike *(Lanius schach),* Pied Bushchat *(Saxcola coprata),* Streaky-breasted Honeyeater *(Meiphaga reticulata),* and Helmeted Friarbird *(Philemon buceroides)* etc. There are some pradator species as Oriental Honey-buzzard *(Pernis ptilorhyncus)* and Brahminy Kite *(Haliastur indus);* Immigrating birds consisting of Chesinut headed Bee-eater *(Merops leschenualti),*Himalayan Cuckoo *(Cuculus saturatus),* Common Kingfisher *(Alcedo atthis),* Richard's Pipit *(Anthus novaeseeladiae)* and White-breasted Wood-swallow *(Artamus leucorhynchus),* etc.; Water bird as White-breasted Waterhen *(Amaurornis phoenicurus),* and mangrove birds such as Common Sandpiper *(Actitis hypoleucos)* and Leasser Sand Plover *(Charadrius mongolus)* etc.

- **Reptiles**

There are 7 species of reptiles, most of which are in Gekkonidae, Aganidae, Sciencidae and Colubridae families as Flat-tailed House Gecko (*Hemidactylus platyurus),* Indo-Pacific Gecko *(Hemidactylus garnotii),* Timor Flying Lizard *(Draco timoriensis),* Common sun skink *(Mabuya multifasciata)* and India Wolf Snake *(Lycodon capucinus)* etc.

- **Amphibian**

There are 3 species of amphibian in 3 families comprising Bufonidae, Dicroglossidae and Rhacophoridae families as Back-spined Toad *(Duttaphynus melanostictus)*, Asian Grass Frog *(Fejervarya limnocharis)* and Common Tree Frog *(Polypedates leucomystax)*. Example of wildlife found along the condensate pipeline alignment are presented in ***Photo 6.4-2***.

2) Level of Abundance

Abundance of wildlife along the condensate pipeline alignment can be classified into 3 levels as follows:

- **High Level of Abundance:** There are 10 wildlife species with high level of abundance such as Spotted Dove *(Streptopelia chinensis)*, Barred Dove *(Geopelia maugei)*, Collared Kingfisher *(Todramphus Chloris)*, Streaky-breasted Honeyeater *(Meliphaga reticulata)*, Pied Bushchat *(Saxicola caprata)* and Bali Cattle/Banteng *(Bos jvvanicus)* etc.

- **Medium Level of Abundance:** There are 19 species of wildlife with medium level of abundance such as Roof Rat *(Rattus rattus)*, House Mouse *(Mus musculus)*, Brahminy Kite *(Haliastur indus)*, Emerald Dove *(Chalcophaps indica)*, Lesser Coucal *(Centropus bengalensis)*, Helmeted Friarbid *(Philemon buceroides)*, Golden-headed Cisticola *(Cisticola exilis)*, Indo-Pracific Gecko *(Hemidactylus garnotii)*, Timor Flying Lizard *(Draco timoriensis)* and Black-spined Tod *(Duttaphrynus melanostictus)* etc.

- **Low Level of Abundance:** There are 38 species of widlife with low level of abundance such as Greater flying fox *(Pteropus vampyrus)*, Common Palm Civet *(Paradoxurus hermaphroditus)*, Brown Rat *(Rattus morvegicus)*, Striated Heron *(Butorides striata)*, Brown Quail *(Synoicus ypsilophorus)*, Slaty Cuckoo Dove *(Turacoena modesta)*, Olive-shouldered Parrto *(Aprosmictus jonguillaceus)*, Australian Koel *(Eudynamys cyanocephalus)*, Flame-breasted Sunbrid *(Cinnyris solaris)*, Tokay *(Gekko gecko)*, Indian Wolf Snake *(Lycodon Capuctinus)* and Common Tree Frog *(Polypedates leucomystax)* etc.



Remark : Wildlife found in the condensate pipeline alignment (X^1)

Wildlife fond within 50 meters strips on both sides of the condensate pipeline alignment (X^2)

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.4-2 : EXAMPLE OF WILDLIFE IN 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE ALIGNMENT

3) Status of Conservation

Conservation status of wildlife along the condensate pipeline alignment can be discribed as follows:

- **Conservation Status according to IUCN 2015**

There are 5 threatened wildlife species comprising 1 endangered mammal species namely Bali Cattle/Banteng *(Bos javanicus)* which is domestic animal of local villages, 1 Vulnerable mammal species namely Javan Rusa *(Rusa timorensis)* and 3 near threatened mammal and bird species namely Greater flying fox *(Pteropus vampyrus),* Slaty Cuckoo Dove *(Turacoena modesta)* and Olive-shouldered Parrot *(Aprosmictus jonguillaceus).*

- **Conservation Status according to CITES List**

There are 3 species of wildlife in List 2 (AppII) of CITES list comprising 1 mammal species namely Greater flying fox *(Pteropus vampyrus)* and 2 bird species namely Oriental Honey-buzzard *(Pernis ptilorhyncus)* and Brahminy Kite *(Haliastus indus).*

- **Conservation Status according to Timor-Leste**

There are 5 endemic species namely Javan Rusa *(Rusa timorensis),* Olive-shouldered Parrot *(Aprosmictus jongullaceus),* Streaky-breasted Hoencyeater *(Meliphaga reticulata),* Timor Friabrid *(Philemon inornatus)* and Timor Flying Lizard *(KDraco timoriensis).*

4) Wildlife Habitat

The wildlife habitat along the condensate pipeline can be classified into 3 categories as mixed deciduous forest, mixed deciduous forest intermigled with teak plantation and plam and riparian forest. Wildlife move from place to place among forest area, water sources and open space according to changing seasons and fertility of food sources as shown in ***Photo 6.4-3***.

	
Narrow strips of riparian forest[1,2]	Mixed deciduous intermingled with teak plantation and palm[1,2]
	
Mixed Deciduous with dense trees along the condensate pipeline alignment[1]	Mixed Deciduous forest in 50 meters strips on both sides of the condensate pipeline alignment[2]

Remark : Forest type along the condensate pipeline alignment (X1)

Forest type in 50 meters strips on both side of the condensate pipeline alignment (X2)

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.4-3 : EXAMPLE OF FOREST TYPE AND WILDLIFE HABITAT ALONG THE CONDENSATE PIPELINE ALIGNMENT AND WITHIN 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE ALIGNMENT

Within 50 strips on both sides of the Condensate Pipeline alignment

1) Diversity of Wildlife

There are 72 species 62 genera in 44 families from 20 orders within 50 meters strips on both sides of the condensate pipeline alignment.

- **Mammals**

There are 13 species of mammals such as Dagger-toothed long-nosed fruit bat *(Macroglossus minimus),* Roof Rat *(Rattus rattus),* Javan Rusa *(Rusa timorensis)* and Comon Palm Civet *(Paradoxurus hermaphroditus).* There are also some mammal species which are domestic animal of local villages as Bali Cattle/Banteng *(Bos javanicus),* Domestic Buffalo *(Bubalus bubalis),* Domestic Horse *(Equus caballus),* Domestic Goat *(Capra hircus)* and Domestic Dog *(Canis familiaris)* etc.

- **Birds**

There are 48 birds species, most of which are endamic birds such as Lesser Coucal *(Centropus bengalensis),* Large-billed Crow *(Corvus macrorhynchos),* Tawny Grassbird *(Megalurus timoriensis),* Eurasian Tree Spallow *Passer montanus)* and Spotted Dove *(Streptopelia chinensis)* etc. There are also predator birds as Oriental Honey-buzzard (*Pernis ptilorhyncus*) Brahminy Kite (*Haliastur indus*); immigrating birds as Little Egret *(Egretta garzetta),* Pallid Cuckoo *(cacomantis pallidus)* Edible-nest Swiftlet *(Collocalia fuciphaga)* Green Bee-eater *(Merops ornatus)* and Richard's Pipit (*Anthus novaeseelandiae)* etc.; Water bird and mangrove birds such as White-breasted Waterhen *(Amaurornis phoenicurus),* Common Sandpiper *(Actitis hypoleucos)* and Lesser Sand Plover *(Charadrius mongolus)* etc.

- **Reptiles**

There are 8 species of reptiles most of which are in Gekkonicae, Agamidae, Scincidae, Colubridae and Pythonidae families such as Tokay *(Gekko gecko),* Indo-Patific Gecko *(Hemidactylus garnotii),* Timor Flying Lizard *(Draco timoriensis),* Common sun skink *(Mabuya multifasciata),* Indian Wolf Snake *(Lycodon capuctinus)* and Indonesian Water Pythos *(Liasis mackloti)* etc.

- **Amphibians**

There are 3 species of amphibian in Bufonidae, Dicroglossidae and Rhacophoridae families i.e. Black-spined Toad *(Duttaphrynus Melanostictus),* Asian Grass Frog *(Fejervarya limnocharis)* and common Tree Frog *(Polypedates leucomystax).* Example of wildlife found in 50 meters strips on both sides of the condensate pipeline alignment are shown in ***Photo 6.4-2***.

2) Level of Abundance

Level of wildlife abundance can be classified into 3 level as follows:

- **High Level of Abudance**

Threr are 10 species of wildlife with high level of abundance such as: Barred Dove *(Geopelia maugei)*, Collared Kingfisher *(Todiramphus Chloris)*, Eurasian Tree spallow *(Passer montanus)*, Scaly-breastede Munia *(Lonchura punctulata)*, Asian Grass Frog *(Fejervarya linnocharis)* and Bali Cattle/Banteng, etc.

- **Medium Level of Abudance**

There are 26 species of wildlife with medium level of abundance such as: Wild Pig *(Sus scrofa)*, Javan Rusa *(Rusa timorensis)*, House Mouse *(Mus musculus)*, Roof Rat *(Rattus rattus)*, Cattle Egret *(Bubulcus ibis)*, Brahminy Kite *(Haliastur indus)*, Emerald Dove *(Chalcophaps indica)*, Edible-net Swiftlet *(Collocalia fuciphaga)*, Plan Gerygone *(Gerygone inornata)*, Pechora Pipit *(Anthus gustavi)*, Northern Fantail *(Rhipidura rufiventris)*, Common House Gecko *(Hemidactylus frenatus)*, Flat-tailed House Gecko *(Hemidactylus plataurus)* and Black-spined Toad *(Duttaphrynus melanostictus*, etc.

- **Low Level of Abudance**

There are 36 species of wildlife with low level of abundance such as: Dagger-toothed long-nosed fruit bat *(Macroglossus minumus)*, Common Palm Civet *(Paradoxurus hermaphroditus)*, Oriental Honey-bazzard *(Pernis ptilorhyncus)*, Lesser Sand Plover *(Charadrius mongolus)*, Island Collared-dove *(Streptopelia bitorquata)*, Olive-shouldered Parrot *(Aprosmictus jonguillaceus)*, Large-tailed Nightjar *(Caprimulgus macrurus)*, Timor Friarbird *(Philemon inornatus)*, Thick-billed Flowerpecker *(Dicaeum agile)*, Flame-breasted Sunbird *(Cinnyris solaris)*, Tokay *(Gekko gecko)*, Common sun skink *(Mabuya multifasciata)*, and Indonesian Water Python *(Liasis mackloti)*, etc.

3) Status of Conservation

Conservation status of wildlife within 50 meters strip on both side of the condensate pipeline alignment can be described as follows:

- **Conservation Status according to IUCN 2015**

There are 5 species of wildlife in Threatened status comprising 1 endangered mammal species namely Bali Cattle/Banteng *(Bos javanicus)* which is domestic animal of local villagers; one vulnerable species namely Javan Rusa *(Rusa timorensis)*, and 3 near threatmened mammal and bird species as: Greater flying fox *(Pteropus vampyrus)*, Slaty Cuekoo Dove *(Turacoena modesta)* and Olive-shouldered Parrot *(Aprosmictus jonguillaceus)*.

- **Conservation Status according to CITES List**

There are 3 wildlife species in List 2 (AppII) comprising 1 mammal species namely Greater flying fox *(Pteropus vampyrus)* and 2 bird species as Oriental Honey-buzzard *(Pernis ptilorhyncus)* and Brahminy Kite *(Haliastur indux)*.

- **Conservation Status according to Timor-Leste**

There are 5 Endemic species comprising Javan Rusa *(Rusa timorensis)* Olive-shouldered Parrot *(Aprosmictus jonguillaceus)* Streaky-breasted Honeyeater *(Meliphaga reticulata)* Timor Friarbird *(Philemon inornatus)* and Timor Flying Lizard *(Draco timoriensis)*.

4) Wildlife Habitat

There are 5 types of wildlife habitat i.e. mixed Deciduous forest, mixed deciduous forest intermingled with teak plantation and palm, riparian forest water source and connecting zone with agricultural area as shown in ***Photo 6.4-3***.

List of species, diversity, level of abundance an conservation status of wildlife within 50 meter strips on both sides of the condensate pipeline alignment are shown in ***Appendix 6B***.

6.4.7 Forest and Flora

(1) Methodology

Methodology for the study on forest and flora of this Project can be summarized in the following steps:

1) Compile and Study secondary data from relevant document and reports of previous studies including topographical map scale 1:50,000 of Timor-Leste.

2) Field survey

- To conduct field **investigation** along 50 meters strips on both sides of the condensate pipeline alignment;
- To record species, ecological contion;
- To identify rare, endangered and endemic species recording to IUCN Red List, CITES List and Endimic plant and wildlife/habitats of Timor-Leste.

(2) Results of the study

(2.1) Literature Review

Forests are defined as land spanning more than 0.5 hectares, with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use (FAO).

As background in assessing the relative abundance of communities, Monk, et al. reported that 41 percent or 5,735 square kilometers of East Timor is covered with forest (based on 1972–86 satellite imagery) (***Figure 6.4-3***), apportioned as follows: tidal (mangrove forest) – 0; coastal forest – 11; swamp forest – 57; heath-like cover – 161; moist primary lowland forest below 1000 meters above sea level (m asl) – 3,301; moist submontane forest at 1000–2000 m asl – 98; forest on limestone rock – 400; and mixed savanna – 1,707. These forest cover values are likely to have declined substantially in the past 20–30 years due to increasing population pressure. Also, these figures take no account of quality or degree of fragmentation and disturbance of remnant vegetation (Cowie, 2006).

The composition of the flora of Timor is influenced by its location in Central Malesia (Wallacea), a transition zone between the main rainforest blocks of the Sunda (Peninsula Malaysia, Sumatra, Borneo, West Java) and Sahul (New Guinea) shelves (van Welzen,et al. 2005 in Cowie, 2006).

On the other hand, based on the data of the Recapitulação Dos Dados De Flora E Fauna, wherein flora surveys were done in 11 localities, the top 5 dominant plant species in their order of importance are "Paaraku", a plant of the Euphorbiaceae family, genus Fluggea; *Pterocarpus indicus* (Fabaceae), local name: "Mataria"; *Pterosporum acerifolium* (Sterculiaceae), local name: "Pookuro"; *Schleichera oleosa* (Sapindaceae), local name: "Kaitxava"; and *Mimusops elengi* (Sapotaceae), locally known as "Piaparuno".

At present, several forest types have been identified for Timor-Leste by various sources. The main forest types identified by the Ministry of Agriculture and Fisheries are dry lowland forest, moist forest, montane forest and swamp. Whitmore (1975) classified Timor's vegetation as "monsoon forests and savannah" due to the marked wet and dry season with low annual precipitation. The main monsoon forest species classified include *Aegle marmelos*, *Cassia fistula*, *Eucalyptus alba*, *Tamarindus indica* and *Melia azedarach*. On the other hand, Timor-Leste's NBSAP 2011 further defined the different types of forests as primary forest, modified natural forest, semi-natural forest, productive plantations and protective plantations.

The natural vegetation is tropical in character and consists of dry broadleaf forests with an undergrowth of shrubs and grasses supporting a rich wildlife. Many trees drop their leaves during the dry season but there are also evergreen and thorn trees in the woodland mix. Typical trees of the lowland slopes include a tropical chestnut, *Sterculia foetida*, *Callophyllum teysmannii* and candlenut (*Aleurites moluccana*).

There are three dominant native species and these are *Eucalyptus alba*, *Eucalyptus urophylla* and *Pterocarpus indicus*. The most valuable among the native species include sandalwood (*Santalum album*) and *Pterocarpus indicus*. Nationally, *Santalum album* is considered a endangered species. Based on a preliminary survey of the flora and fauna in Timor-Leste conducted in collaboration with Birdlife International, more than 251 tree species have been identified as native.

(2.2) Results of Field Survey

Results of field survey in February 2016 and April 2016 along 50 meters strips on both sides of the condensate pipeline covering plant speceis and forest types can be summarized in ***Table 6.4-5***.

TABLE 6.4-5

AMOUNT OF FLORA SPECIES ALONG THE CONDENSATE PIPELINE

Area along the condensate pipeline			Within 50 strips on both sides of the Condensate Pipeline alignment		
Flora Species	Status of Conservation		Flora Species	Status of Conservation	
	IUCN 2015	Timor-Leste		IUCN 2015	Timor-Leste
110	1	1	126	1	1

Source : TEAM Consulting Engineering and Management Co., Ltd., February 2016

The forest type and status of construction along the condensate pipeline and area within 50 strips on both sides of the Condensate Pipeline alignment are described as follows:

Along the condensate pipeline alignment

There is about 282.8 ha of forest area. The types of forest found along the condensate pipeline are shown in ***Photo 6.4-4*** and Summarized below:

1. Forest Type

- **Mixed Deciduous Forest:** Along the condensate pipeline alignment there are 125.25 ha of deciduous forest. Trees within type of forest lose this leaves during 4-7 month of dry season which there are always forest fires. The soil is sandy loam with medium humidity. Mixed deciduous forest can be found on low hills and plain areas. There are only a few big trees but a lot of medium and small size trees mixed with bamboo. The heights of conopy range between 5-22 meters. Dominat trees species consist of *Schleichera oleosa* (Lour.) Oken, *Pterocarpus indicus* Willd., *Acacia tomentosa* Willd., *Albizia lebbeckoides* (DC.) Benth., *Senna siamea* (Lam.) Irwin & Barneby, *Tamarindus indica* L., *Sumbaviopsis albicans* (Blume) J.J. Sm., *Alstonia angustiloba* Miq., *Albizia lebbeck* (L.) Benth., *Peltophorum pterocarpum* (DC.) Backer ex K.Heyne., and*Bambusa blumeana* J.H.Schultes etc. Trees with medium size found consist of *Leucaena leucocephala* (Lam.) de Wit, *Cassia timoriensis* DC., *Streblus ilicifolius* (Vidal) Corner, *Capparis micracantha* DC., *Kopsia larutensis* King ex Gamble, *Ficus hispida* L. f., *Ziziphus jujuba* Mill. etc. Annual plants found comprise *Cleome viscosa* L., *Achyranthes aspera* Linn., *Mimosa diplotricha* C.Wright ex Sauvalle, *Euphorbia heterophylla* L., and *Chromolaena odoratum* (L.) R.M. King & H.Rob., etc.Vines consist of *Ziziphus oenoplia* (L.) Mill., *Lantana camara* L., *Coccinia grandis* (L.) Voigt and *Cayratia trifolia* (L.) Domin etc. Grasses consist of *Imperata cylindrica* (L.) P. Beauv., *Cynodon dactylon* (L.) Pers. and *Eragrostis ciliata* (Rolb.) Nees etc. Tree plant species with high level of economic values is Rosewood (*Pterocarpus indicus* Willd.) which are in form of tree, sapling and seedling.

		
Sumbaviopsis albicans	*Ziziphus jujuba*	*Corypha utan*
		
Ficus carica	*Mallotus philippensis*	*Casuarina equisetifolia*
		
Azadirachta indica	*Lannea coromandelica*	*Acacia nilotica*

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.4-4 : EXAMPLE OF PLANT SPECIES THE CONDENSATE PIPELINE ALIGNMENT AND IN 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

- **Mixed Deciduous Forest Intermingled with Teak Plantation and Palm:** This type of forest can be found scattered along the condensate pipeline alignment with total area of 137.4 ha. The forest condition is sparse forst with naturally grown trees of medium and small sizes. There is only a few trees of big size. The heights of canopy range between 5-20 meters. Dominant species consist of *Tectona grandis* L. f., *Corypha utan* Lam., *Schleichera oleosa* (Lour.) Oken, *Samanea saman* (Jacq.) Merr., *Acacia tomentosa* Willd., *Sumbaviopsis albicans* (Blume) J.J. Sm., *Gmelina arborea* Roxb., *Melia azedarach* L., *Azadirachta indica* A. Juss. var. *siamensis* Valeton, *Lannea coromandelica* (Houtt.) Merr. and *Bambusa blumeana* J.H.Schultes etc. Trees of medium size found consist of *Leucaena leucocephala* (Lam.) de Wit, *Flacourtia indica* (Burm. f.) Merr., *Bridelia tomentosa* Blume, *Micromelum minutum* (G.Forst.) Wight & Arn., etc. Annual plants found comprise *Croton hirtus* L.Her., *Eclipta prostrata* (L., *Corchorus capsularis* L. etc. Vines comprise *Passiflora foetida* L., *Cardiospermum halicacabum* L., *Canavalia rosea* (Sw.) DC. etc. Grasses found include *Dactyloctenium aegyptium* (L.) P. Beauv., *Cynodon dactylon* (L.) Pers. And *Cyperus rotundus* L. etc.

- **Riparian Forest:** Riparian forest can be found around the crossing points with rivers with total area of about 20.16 ha. This type of forest has both dry and wet conditions, therefore, plant species can tolerate water in flooding period and also can tolerate drought period. Due to high erosion of the river banks the vegetation in this area has deep and supporting roots to hold soil. The height of canopy range between 3-28 meters. There is low diveristy of species. Dominant species comprise *Casuarina equisetifolia* J.R. & G. Forst., *Ficus hispida* L. f., *Ficus carica* L., *Acacia nilotica, Cathormion umbellatum* (Vahl) Kosterm., *Pandanus odoratissimus* L.f. and *Bambusa blumeana* J.H.Schultes etc. Slow bushes found comprise *Jatropha curcas* L., *Calotropis gigantea* (L.) Dryander el W. T. Aiton, *Bridelia tomentosa* Blume, *Senna alata* (L.) Rozb. And *Muntingia calabura* L. etc. Annual plants comprise *Ruellia tuberosa* L., *Murdannia nudiflora* (L.) Brenan, *Chromolaena odoratum* (L.) R.M. King & H.Rob. and *Blumea aurita* (L.f.) DC. etc. Vines consists of *Dalbergia suthepensis* Niyomdham, *Canavalia rosea* (Sw.) DC., and *Cardiospermum halicacabum* L. etc,. Grasses found comprise *Eleusne* indica (L.) Gayerth, *Imperata cylindrical* (L.) P. Beauv., and *Fragrostis* crliata (Rolb.). Examples of plant species found along the condensate pipeline are shown in ***Photo 6.4-4***.

2. Status of Conservation

- **Conservation Status according to IUCN 2015**

There is 1 vulnerable plant species namely Rosewood (*Pterocarpus indicus* Willd.)

- **Conservation Status according to CITES List**

There are no rare, endangered or endemic species according to CITES List found.

- **Conservation Status of Timor-Leste**

These is 1 undangered species namely Rosewood (*Pterocarpus indicus* Willd.)

Within 50 meters strips on both sides of the Condensate Pipeline Alignment

Within 50 meters strips on both sides of the condensate pipeline alignment there are forest with at least 120 plant species. Types of forest are shown in ***Photo 6.4-4***.

1. Forest Type

- **Mixed Deciduous Forest:** Mixed deciduous forest can be found on low hills and undulating areas. The soil is sandyloam with lime fragments in some areas. This type of forest comprise deciduous plant species resulting in accumultation of biomass on ground surface and frequent forest fires in dry season. In rainy season the forest becomes green. The heights of canopy rang between 5-25 meters. Dominant species consist of *Pterocarpus indicus* Willd., *Mallotus philippensis* Mull. Arg., *Acacia tomentosa* Willd., *Schleichera oleosa* (Lour.) Oken, *Nephelium hypoleucum* Kurz., *Tamarindus indica* L., *Peltophorum pterocarpum* (DC.) Backer ex K.Heyne., *Cassia fistula* L, and *Bambusa blumeana* J.H.Schultes etc. Trees of medium size found comprise *Morinda coreia* Buch.-Ham., *Micromelum minutum* (G.Forst.) Wight & Arn., *Ficus hispida* L. f., *Grewia eriocarpa* Juss., *Broussonetia papyrifera* (L.) Vent. and *Ziziphus jujuba* Mill. etc. Annual plants consist of *Tribulus terrestris* L., *Euphorbia hirta* L., *Chromolaena odoratum* (L.) R.M. King & H.Rob. etc.Vines consists of *Lantana camara* L., *Dalbergia suthepensis* Niyomdham, *Cayratia trifolia* (L.) Domin etc. Grasses are such as *Imperata cylindrica* (L.) P. Beauv., *Cynodon dactylon* (L.) Pers. and *Eragrostis ciliata* (Rolb.) Nees etc. Plant species with high economic value is Rosewood (*Pterocarpus indicus* Willd.).

- **Mixed Deciduous Forest Intermingled with Teak Plantation and Palm:** This type of forest is sparse forest with naturally grow trees of mostly medium and small size. There are only a few trees of big size. The heights of conopy rang between 5-22 meters. Dominant species are *Tectona grandis* L. f., *Corypha utan* Lam., *Schleichera oleosa* (Lour.) Oken, *Samanea saman* (Jacq.) Merr., *Acacia tomentosa* Willd., *Gmelina arborea* Roxb., *Cathormion umbellatum* (Vahl) Kosterm., *Spondias pinnata* (L.f.) Kurz, *Azadirachta indica* A. Juss. var. *siamensis* Valeton, *Lannea coromandelica* (Houtt.) Merr. and *Bambusa blumeana* J.H.Schultes etc. Tree of medium size comprise *Leucaena leucocephala* (Lam.) de Wit, *Streblus ilicifolius* (Vidal) Corner, *Cassia timoriensis* DC., *Flacourtia indica* (Burm. f.) Merr. and *Ziziphus jujuba* Mill. etc. Annual plants found consist of *Croton hirtus* L.Her., *Portulaca oleracea* L. and *Corchorus capsularis* L. etc. Vines found consist of *Passiflora foetida* L., *Ziziphus oenoplia* (L.) Mill. and *Cayratia trifolia* (L.) Domin etc. Grasses comprise *Dactyloctenium aegyptium* (L.) P. Beauv., *Imperata cylindrica* (L.) P. Beauv. and *Cynodon dactylon* (L.) Pers., etc.

- **Riparian Forest:** Some Thorny plants are found. Due to low fertility of pebble and sand, plants have slow growth. The heights of canopy range between 1-8 meters and 9-28 meters. There is low diverrsity of species. Dominant species consists of *Casuarina equisetifolia* J.R. & G. Forst., *Ficus hispida* L. f., *Ficus carica* L., *Acacia nilotica*, *Cathormion umbellatum* (Vahl) Kosterm. and *Pandanus odoratissimus* L.f. etc. There are also small bushes as *Jatropha curcas* L., *Calotropis gigantea* (L.) Dryander el W. T. Aiton, *Bridelia tomentosa* Blume, *Senna alata* (L.) Rozb. and *Muntingia calabura* L. etc. Annual plants found consist of *Ruellia tuberosa* L., *Murdannia nudiflora* (L.) Brenan. *Chromolaena odoratum* (L.) R.M. King & H.Rob. and *Blumea aurita* (L.f.) DC. etc. Vines such as *Dalbergia suthepensis* Niyomdham, *Canavalia rosea* (Sw.) DC. and *Cardiospermum halicacabum* L. etc. Grasses as *Eleusine indica* (L.) Gayertn., *Imperata cylindrica* (L.) P. Beauv. And *Eragrostis ciliata* (Rolb.) Nees etc. Example of plant species within 50 meters strips along both sides of the condensate pipeline are presented in ***Photo 6.4-4***.

2. Status of Conservation

- **Conservation Status according to IUCN 2015**

There is 1 vulnerable plant species namely Rosewood (*Pterocarpus indicus* Willd.)

- **Conservation Status according to CITES List**

There are no rare, endangered or endemic species according to CITES List.

- **Conservation Status of Timor-Leste**

These is 1 undangered species namely Rosewood (*Pterocarpus indicus* Willd.)

Examples of rare, endangered, endemic species within 50 meters strips on both sides of the condensate pipeline alignment are shown in ***6.4-5***.

List of plant species and conservation status of plants along condensate pipeline alignment and within 50 meter strips on both sides of the condensate pipeline are presented in ***Appendix 6C***.







Rosewood
(*Pterocarpus indicus* Willd.)

Source : Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.4-5 : EXAMPLES OF RARE, ENDANGERED, ENDEMIC PLANT SPECIES FOUND ALONG THE CONDENSATE PIPELINE ALIGNMENT AND WITHIN 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE ALIGNMENT

6.4.8 Coastal Resources

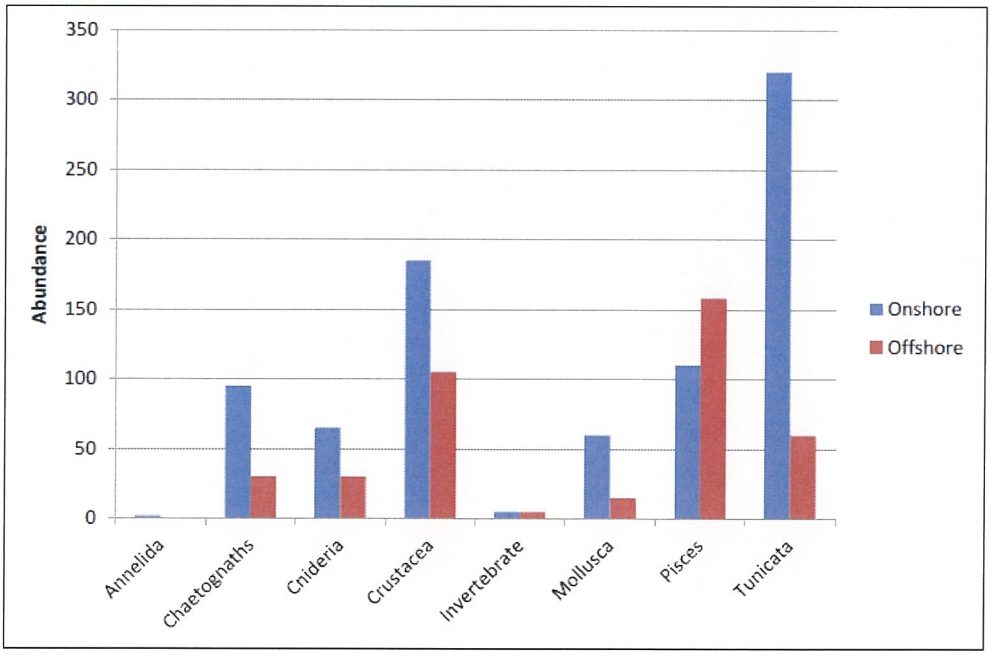
Information about this subject derived from the coastal resource survey, reported in Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project-Betano Petroleum Refinery and Beaço LNG Plant, TIMOR GAP, E.P., 2012.[20] Plankton and infauna survey were collected at 3 onshore station and 3 offshore station.

The coastline consists of a combination of sandy beaches and limestone rock ledges that extend from the shoreline as intertidal reef flat areas that then slope down steeply towards the seabed. Water depths of 200 m can be found less than 1 km offshore. The sandy beaches consist of medium to fine sand with silt. Results of the coastal resource survey can be summarized as follows:

Plankton

A total of 1,249 planktonic fauna from 17 taxonomic groups were found. The most abundant fauna were the siphonophores, crustacean and fish eggs, respectively. One fish larvae family, Terapontidae family, and 269 fish eggs were collected.

Abundance of plankton classes found onshore and offshore was presented in *Figure 6.4-4*.



Source: Tasi Mane Project-Betano Petroleum Refinery and Beaço LNG Plant Strategic Environmental Impact Statement, TIMOR GAP, E.P. (2012)

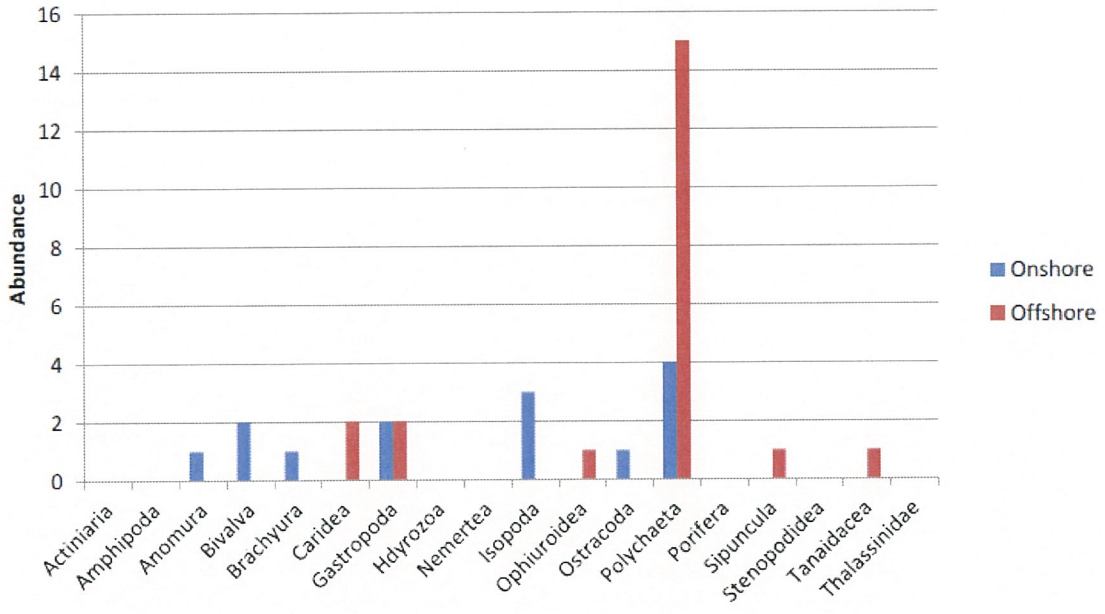
FIGURE 6.4-4 : ABUNDANCE OF PLANKTON FOUND ONSHORE AND OFFSHORE SITES

[20] Prepared by WorleyParsons

Infauna

A total of 36 macroinvertebrates from 24 taxonomic groups were collected. The most abundant families were Polychaeta (eunicid worm and spionid worms) and Isopoda (isopod sea lice).

Abundance of benthic infauna classes found onshore and offshore was presented in ***Figure 6.4-5***.



Source: Tasi Mane Project-Betano Petroleum Refinery and Beaço LNG Plant Strategic Environmental Impact Statement, TIMOR GAP, E.P. (2012)

FIGURE 6.4-5 : ABUNDANCE OF BENTHIC INFAUNA FOUND ONSHORE AND OFFSHORE SITES

Benthic Community

Three biota classes, including algae and invertebrates were identified. Algae were found in the study area including turfing, brown, red, green and coralline species. Gorgonians, sea whips, sponges and crinoids were the dominant invertebrates.

Coralline and turf algae were the main types of algae present with the invertebrates mainly consisting of sea whips, sponges, crinoids and gorgonians.

In addition, brittle stars (ophiuroids) and other mobile organisms as well as a total of 27 taxa were identified as inhabiting the reef platform. The main taxa present were algae, sponges (poriferans), corals (scleractinians), ascidians, anemones and forams.

6.5 ECONOMIC COMPONENTS

6.5.1 Employment Sectors

(1) Methodology

The collection of information on employment sector covered eight existing sub-villages of four sub-districts and three districts along the proposed condensate pipeline alignment; namely Betano village (1) of Same sub-district, Manufahi district, Foho-Ailico and Leolima villages (2) of Hatu-Udo sub-district, Ainaro district, Raimea, Tashilin and Zulo villages (3) of Zumalai sub-district, Covalima district, and Beco and Labarai villages (2) of Suai sub-district, Covalima district in February 2016.

(2) Results of the Study

Most of villagers in Betano Village are agriculturist and fisherman (80%). The remaining work as employee (15%) followed by government officers (2%) and unemployed persons (5%) who are adult after school or 18-60 years old.

For Foho-Ailico and Leolima villages of Hatu-Udo sub-district, Ainaro district, about 85% of households are agriculturist and the remaining is employee.

For Raimea, Tashilin and Zulo villages of Zumalai sub-district, Covalima district, they have secondary data about occupation of villagers as shown in ***Table 6.5-1***. Most of villagers in these three villages are agriculturist followed by government employee and the business man, labour and others.

For Beco and Labarai villages of Suai sub-district, Covalima district, about 95% of households are agriculturist and the remaining is government officer and employee.

TABLE 6.5-1

MAIN OCCUPATION FROM RECORDED DATA OF ZUMALAI SUB-DISTRICT

Name of village	Main Occupation				
	FP/MLT/PNTL (Gov. employer/ Military/Police)	AGR (Agriculturist)	Negocinte (business)	TRBA (Labour)	Others
Raimea	18	142	28	-	5
Zulo	40	365	6	5	15
Tashilin	32	260	3	-	-

Remarks : Number of households classified by occupation was recorded from secondary data of Zumalai sub-districts, this recorded data not covered all households in each village when compared with number of household.

Source : Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd / TIMOR GAP, E.P., February 2016

6.5.2 Infrastructure Facilities

(1) Methodology

The collection of information on infrastructure facilities covered eight existing sub-villages of four sub-districts and three districts along the proposed condensate pipeline alignment; namely Betano village of Same sub-district, Manufahi district (1), Foho-Ailico and Leolima villages of Hatu-Udo sub-district, Ainaro district (2), Raimea, Tashilin and Zulo villages of Zumalai sub-district, Covalima district (3), and Beco and Labarai villages of Suai sub-district, Covalima district (2) in February, 2016.

(2) Results of the Study

For water supply system, Betano village had piped water supply system to support two sub-villages (Selihasan and Rai-fussa) and groundwater well supply for five sub-villages (Bemetan, Lalica, Leo-ai, Loro and Sessurai). In addition, there is irrigation system which supplies water for agriculral activities. Two villages of Hatu-Udo sub-district (Foho-Ailico and Leolima) have piped water supply system from spring water as same as with three villages (Raimea, Tashilin and Zulo) of Zumalai sub-district. In addition, villagers in Zumalai sub-district also use water from river within nearby area during dry season. For the two villages of Suai sub-district, Covalima district (Beco and Labarai). Major source of water supply in these two villages are groundwater. In conclusion, ground water and spring water are two supply sources which adequately provide water of good quality for domestic consumption. Ground water is accessed through bore wells or dug wells (more than 30 groundwater wells exist in each village).

For electricity supply, seven villages are supplied with electricity from Betano Power Plant except for Labarai village which uses electricity supply from Suai. Currently, most of households in these eight villages use electricity supply with free of charge due to unavailability of meter; metering system will be finished in each village in next two years. In addition, some households in these areas have small generators and some have solar panel and battery for lighting only during nighttime.

In case of waste and wastewater treatment system, all villages along the proposed condensate pipeline alignment have no central systems for waste management and wastewater treatment system. Excreta is disposed in cesspits while sullage is disposed of on ground. Garbage from individual households is dumped on open land around the villages or burnt.

6.5.3 Land Use

(1) Methodology

Information about land use was collected from secondary sources in combination with field surveys. The survey helps to verify and fill gaps of the secondary information.

Secondary Data Collection

Secondary data on land use was compiled from the following sources:

- Satellite image of GOOGLE EARTH (http://earth.google.com)
- Geographical Information System (GIS) of Timor-Leste

Based on the secondary data, initial land use maps were prepared and used as a basis for subsequent ground truth surveys.

Field Surveys

Field surveys were conducted in February 2016 the project site and area within 5 km radius around the project site in order to verify the land use information in the initial land use maps. The results were used to recheck, revise and modify the accuracy of each type of land use on initial map. The final land use maps were then generated accordingly.

(2) Result of the Study

The study area consists of the condensate pipeline from Betano Refinery to Suai Supply Base (60.00 km) and 50 m strips on both sides of pipeline route (1,482.63 acres). The study area is characterized by fourteen types of land use: (i) mixed deciduous forest, (ii) mixed deciduous forest, palm and teak, (iii) riparian forest, (iv) paddy field, (v) field crop, (vi) mixed orchards perennial, (vii) teak and perennial plant, (viii) residential area, (ix) education institute, (x) government institute, (xi) industrial land, (xii) idle land, (xiii) idle land and shrubs, and (xiv) water bodies. ***Photo 6.5-1*** shows typical scenes of the various types of land use within project study area.

Result of land use investigation can be divided into 4 parts of 1) forest area, 2) agriculture area, 3) built-up area, and 4) miscellaneous area within 50 m strips on both sides of pipeline route. The land use types are summarized and illustrated in ***Table 6.5-2*** and ***Figure 6.5-1,*** respectively.

1) Forest Area

Forest areas cover 700.52 acres or 47.25 % of the study area. The forest areas mostly consist of mixed deciduous forest (20.93%), mixed deciduous forest, palm and teak (22.95%), and riparian forest (3.37%).

2) Agriculture Area

Agricultural land covers 563.27 acres or 37.99% of the study area. Mostly, the areas are composed of paddy field (10.20%), field crop (12.86%), and mixed orchards perennial (14.33%), there is some areas of teak and perennial plant (0.60%).

3) Built-Up Area

The built-up area cover 47.97 acres or 3.23% of the study area. This type of land use consist residential area (2.31%), education institute (0.21%), government institute (0.03%), and industrial land (0.67%).

 Mixed deciduous forest	 Mixed deciduous forest and palm
 Riparian Forest	 Teak and perennial plant
 Paddy field	 Field crop
 Residential area	 Education institute
 Power electric plant	 Idle land

Source : Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA

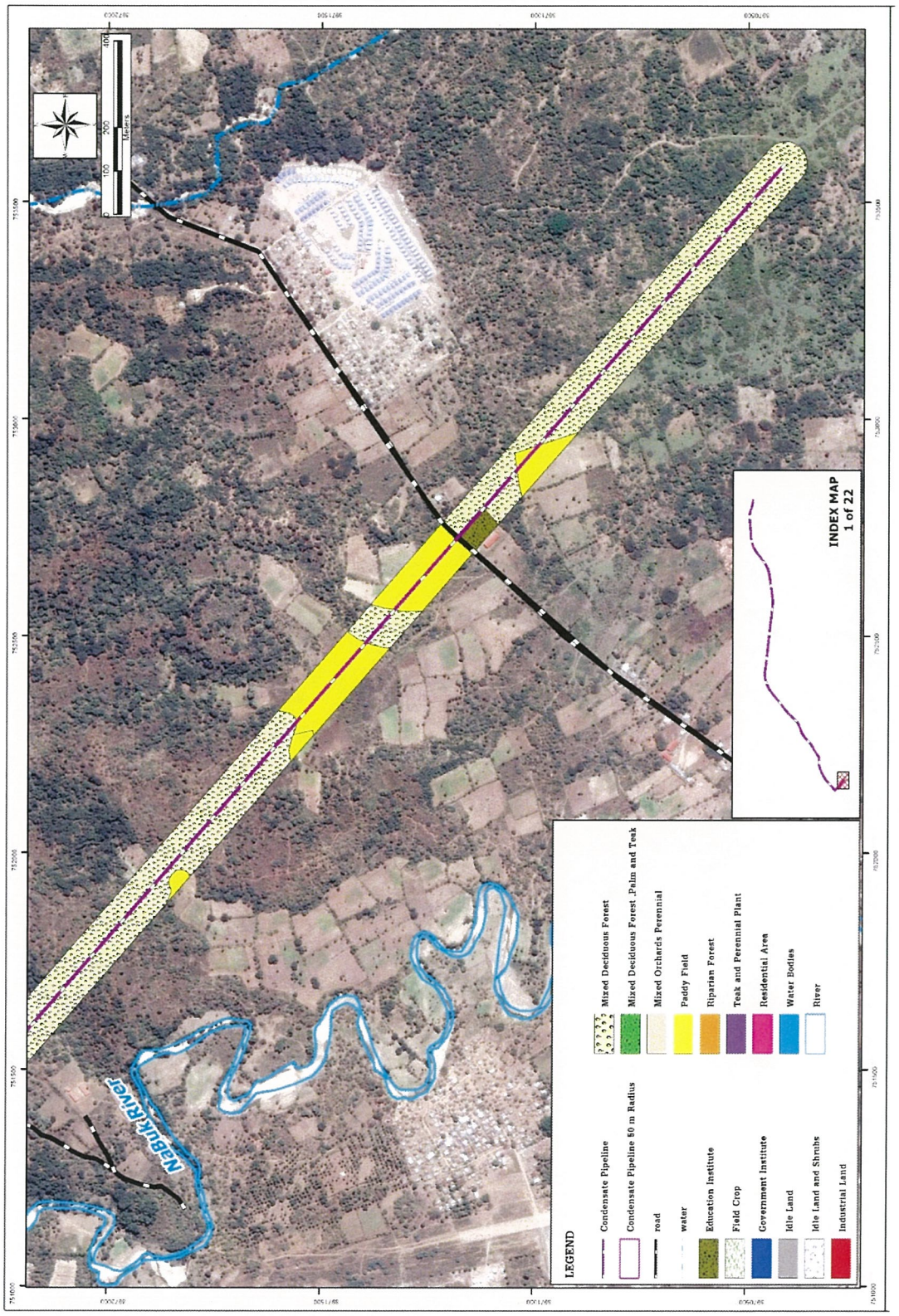
TABLE 6.5-2
LAND USE TYPE IN THE STUDY AREA

Land Use Type	Area (Acres)	Area (ha)	Percentage (%)
(1) Agricultural land			
- Paddy field	151.18	61.03	10.20
- Field crop	190.66	76.97	12.86
- Mixed orchards perennial	212.49	85.78	14.33
- Teak and perennial plant	8.94	3.61	0.60
Sub-Total (1)	**563.27**	**227.39**	**37.99**
(2) Forest land			
- Mixed deciduous forest	310.26	125.25	20.93
- Mixed deciduous forest, palm and teak	340.32	137.39	22.95
- Riparian forest	49.94	20.16	3.37
Sub-Total (2)	**700.52**	**282.80**	**47.25**
(3) Build –Up Area			
- Residential area	34.32	13.85	2.31
- Education institute	3.18	1.28	0.21
- Government institute	0.48	0.19	0.03
- Industrial land	10.00	4.04	0.67
Sub-Total (3)	**47.98**	**19.37**	**3.24**
4) Miscellaneous Area			
- Idle land	122.2	49.33	8.24
- Idle land and shrubs	4.26	1.73	0.29
- Water bodies	44.4	17.92	2.99
Sub-Total (4)	**170.86**	**68.98**	**11.52**
Total	**1,482.63**	**598.54**	**100.00**

Source : Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

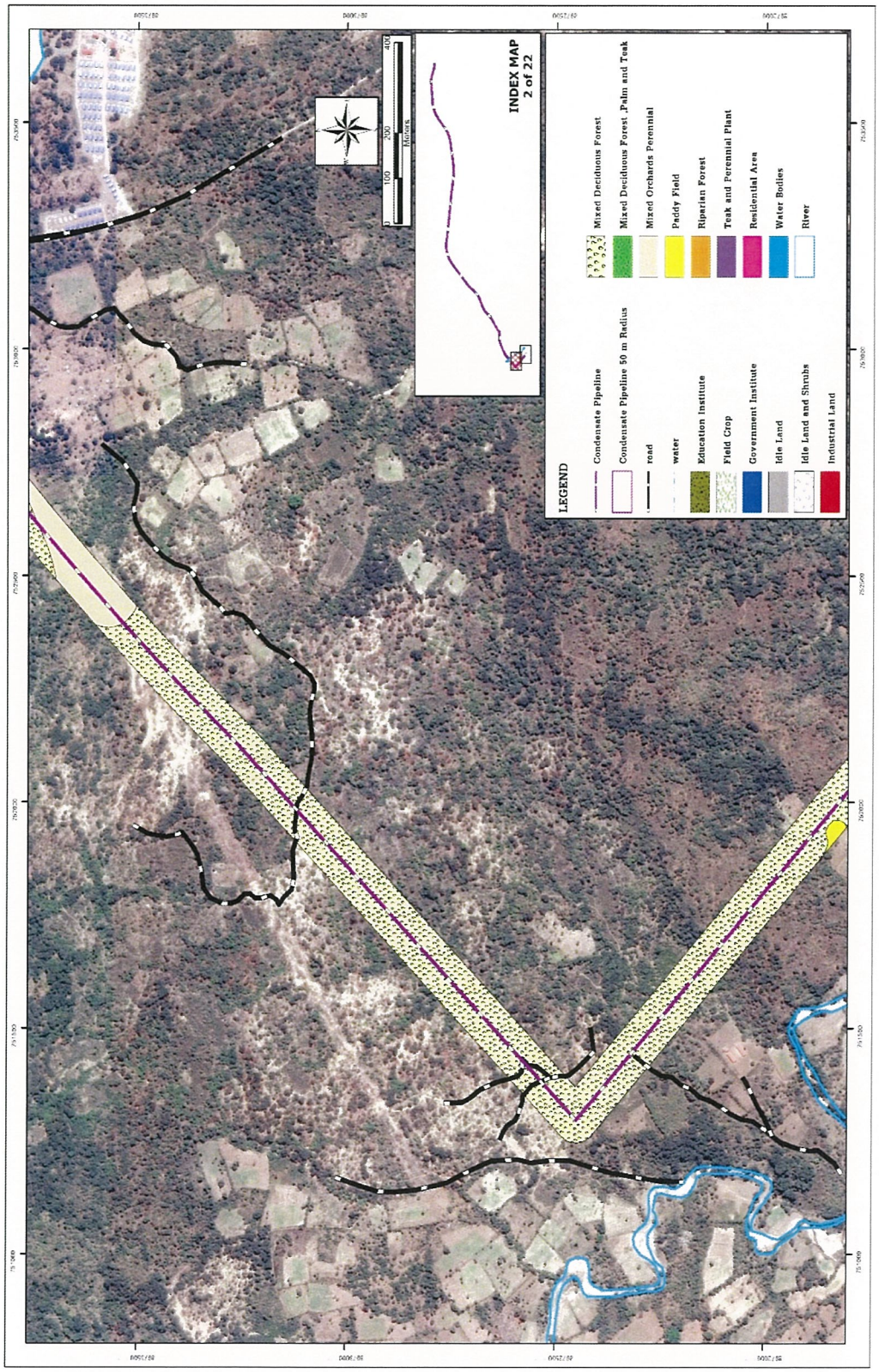
4) Miscellaneous Area

Miscellaneous areas cover 170.86 acres or 11.52% of the study area. Most of this land use type is idle land (122.20 acres or 8.24%), idle land and shrubs (4.26 acres or 0.29%) and water body (44.40 acres or 2.99%).



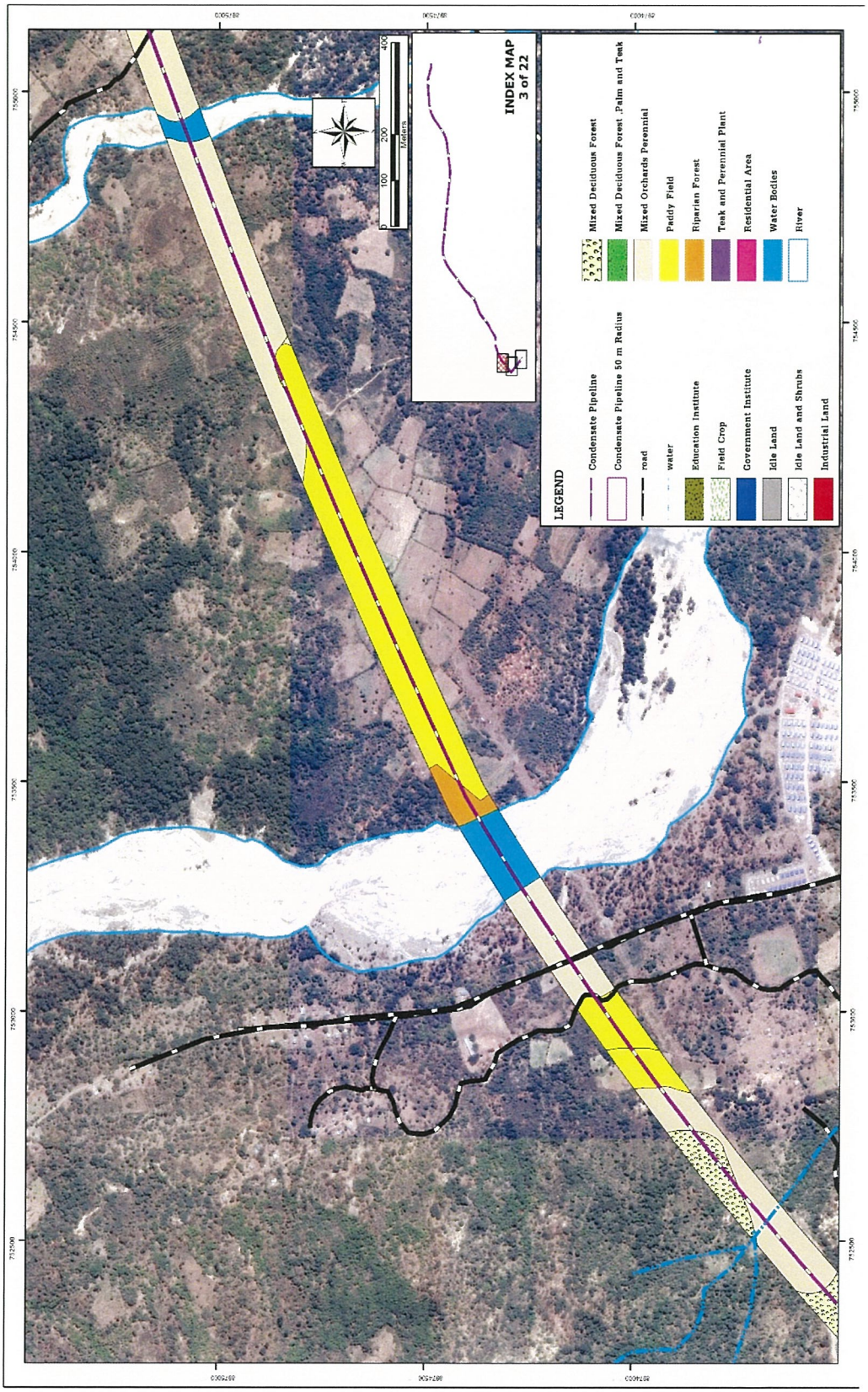
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA



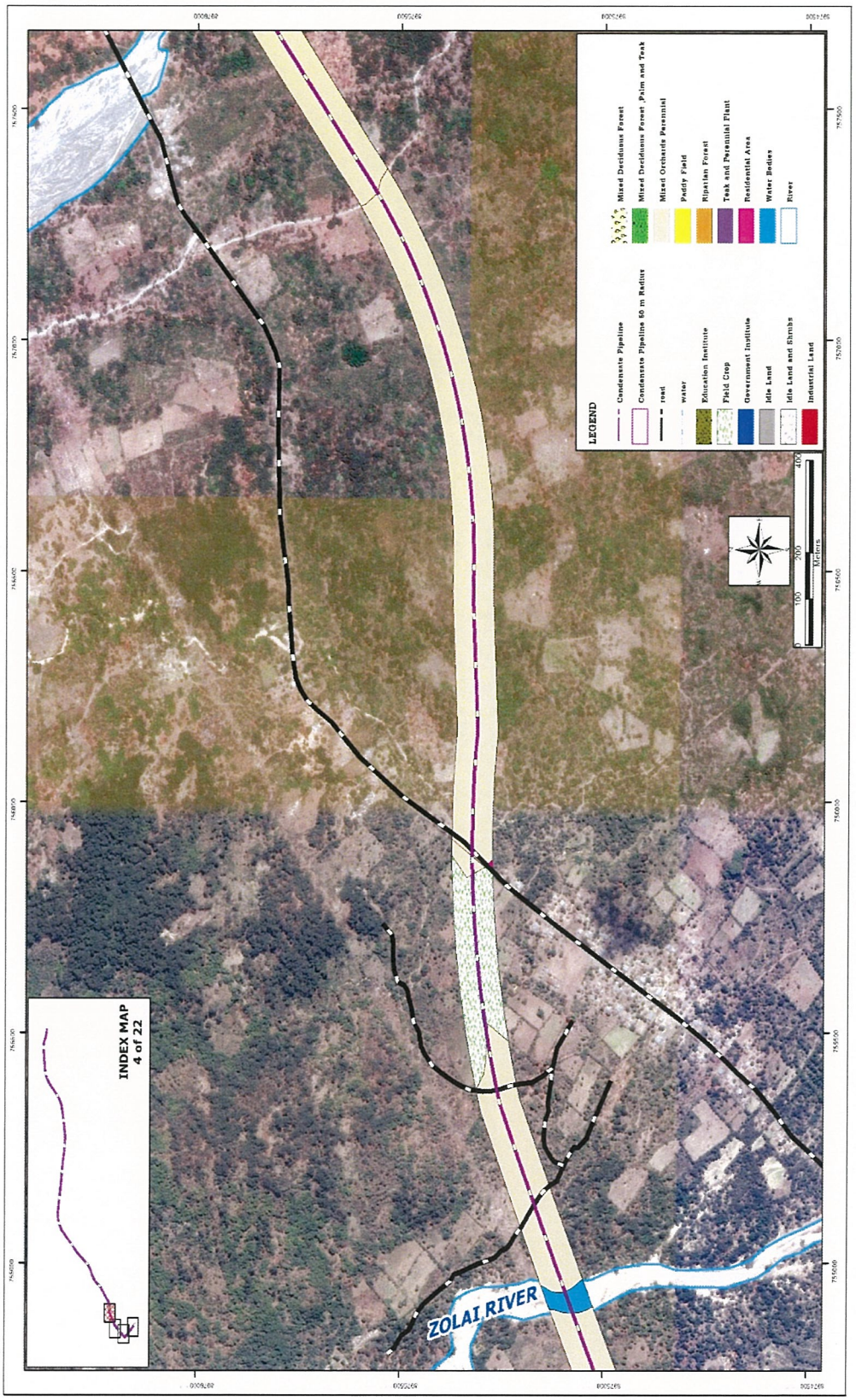
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



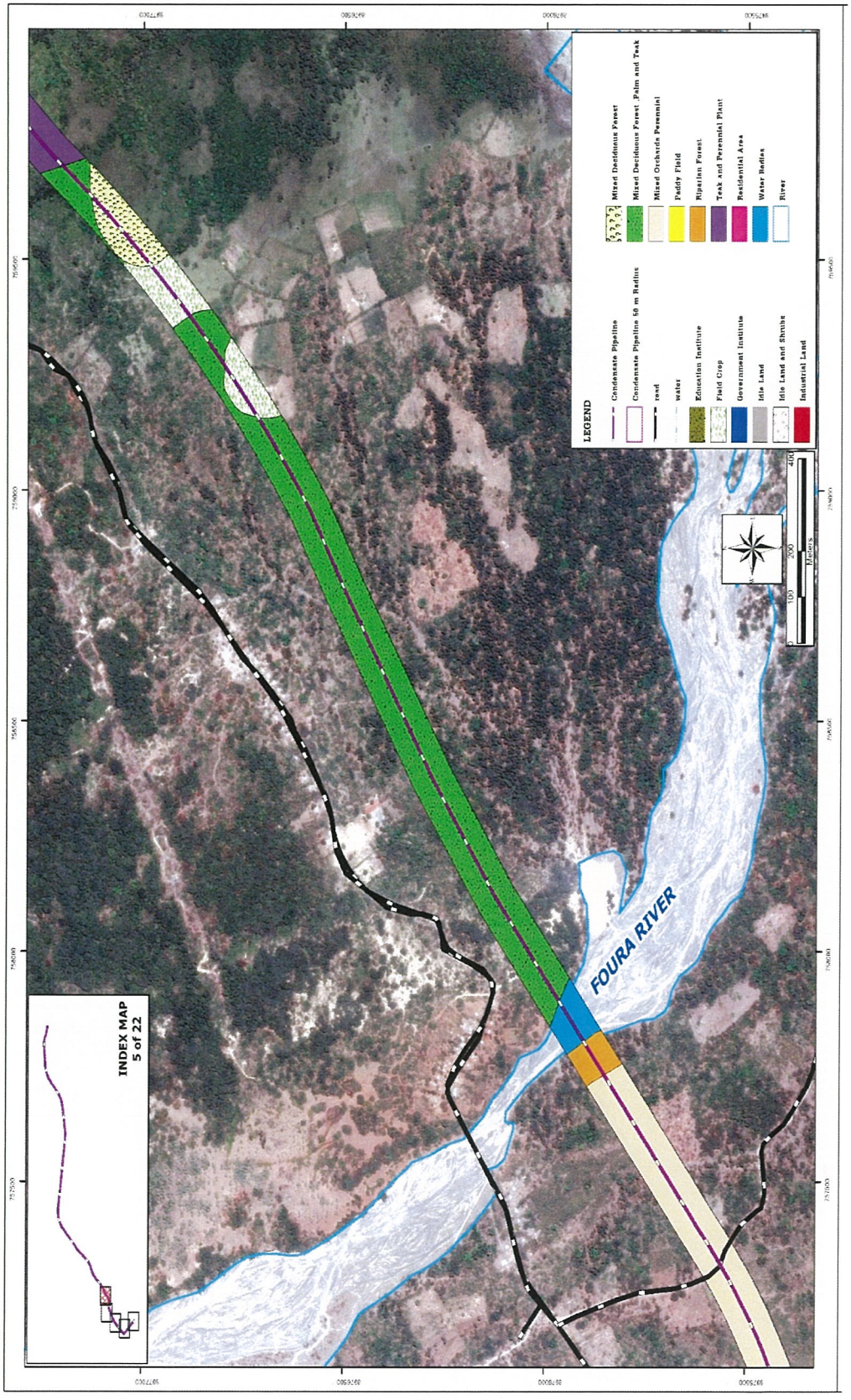
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



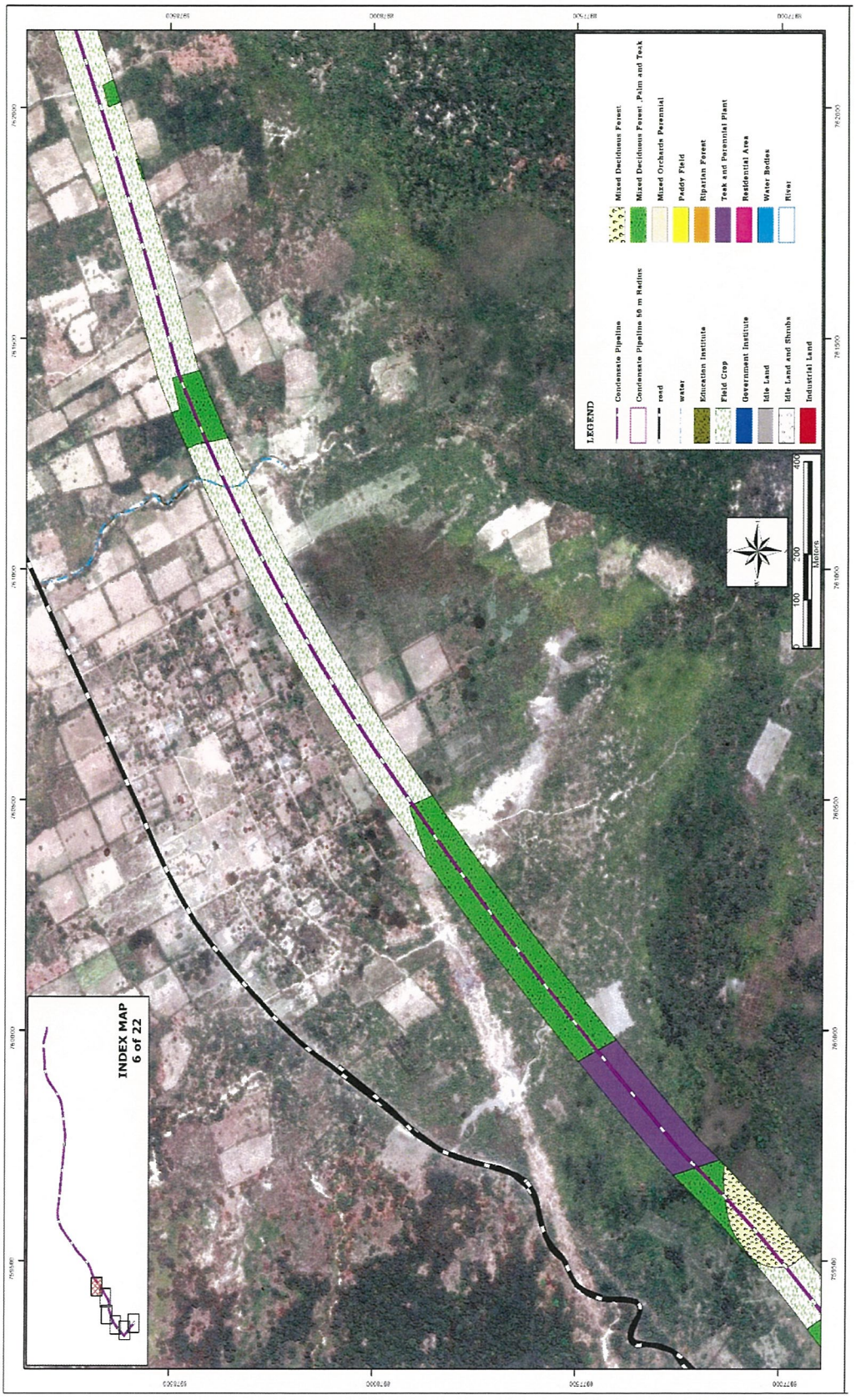
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



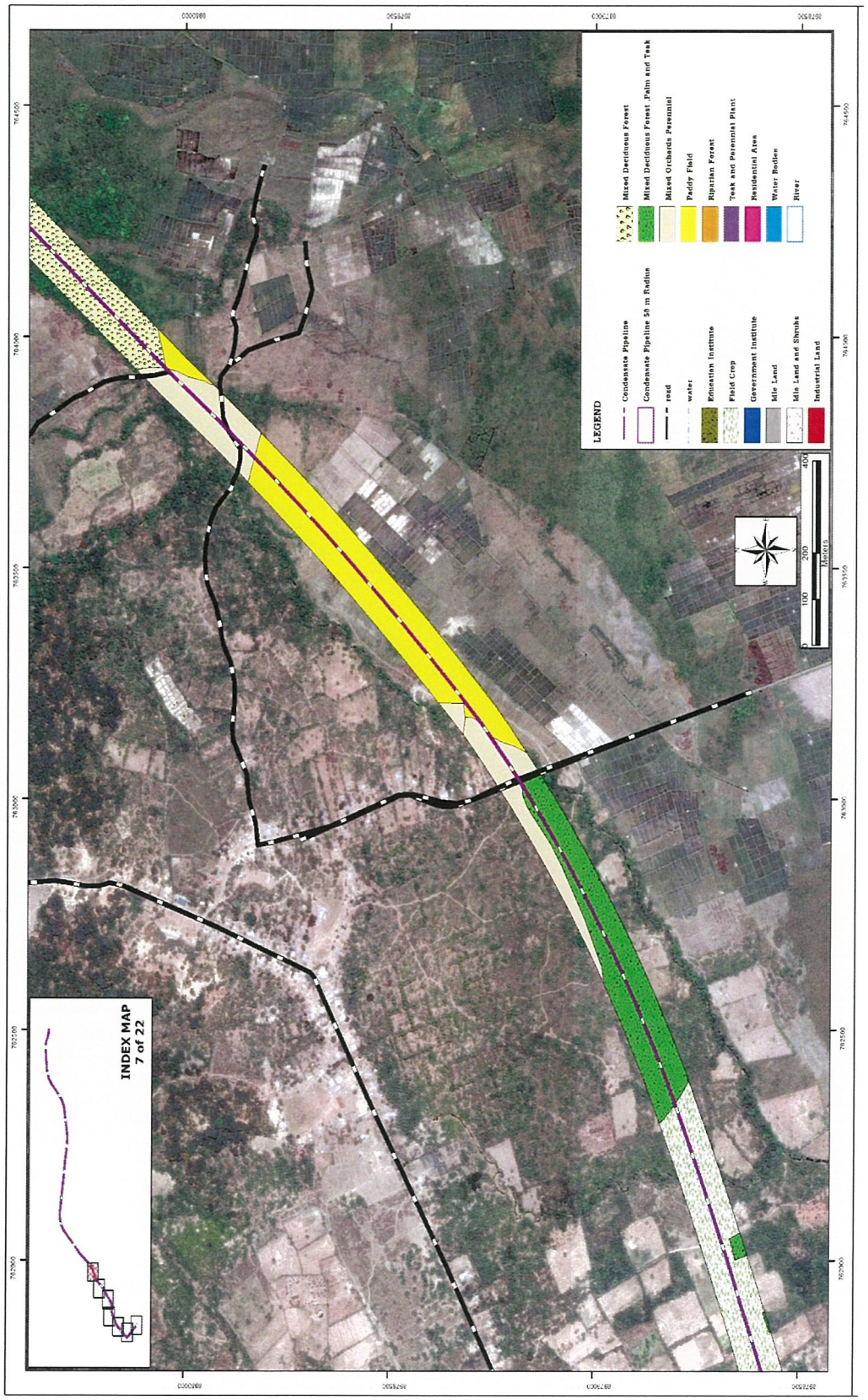
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



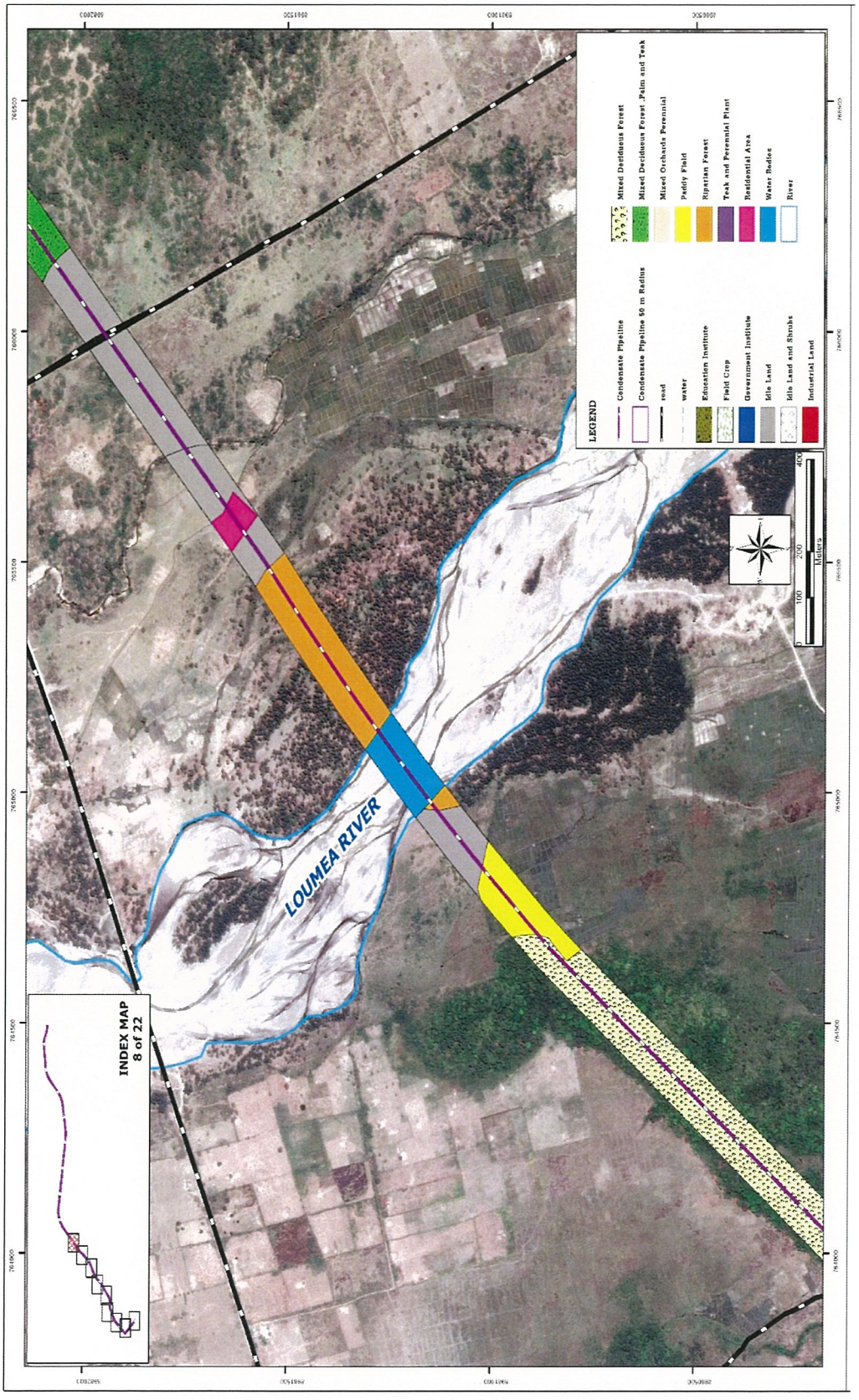
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



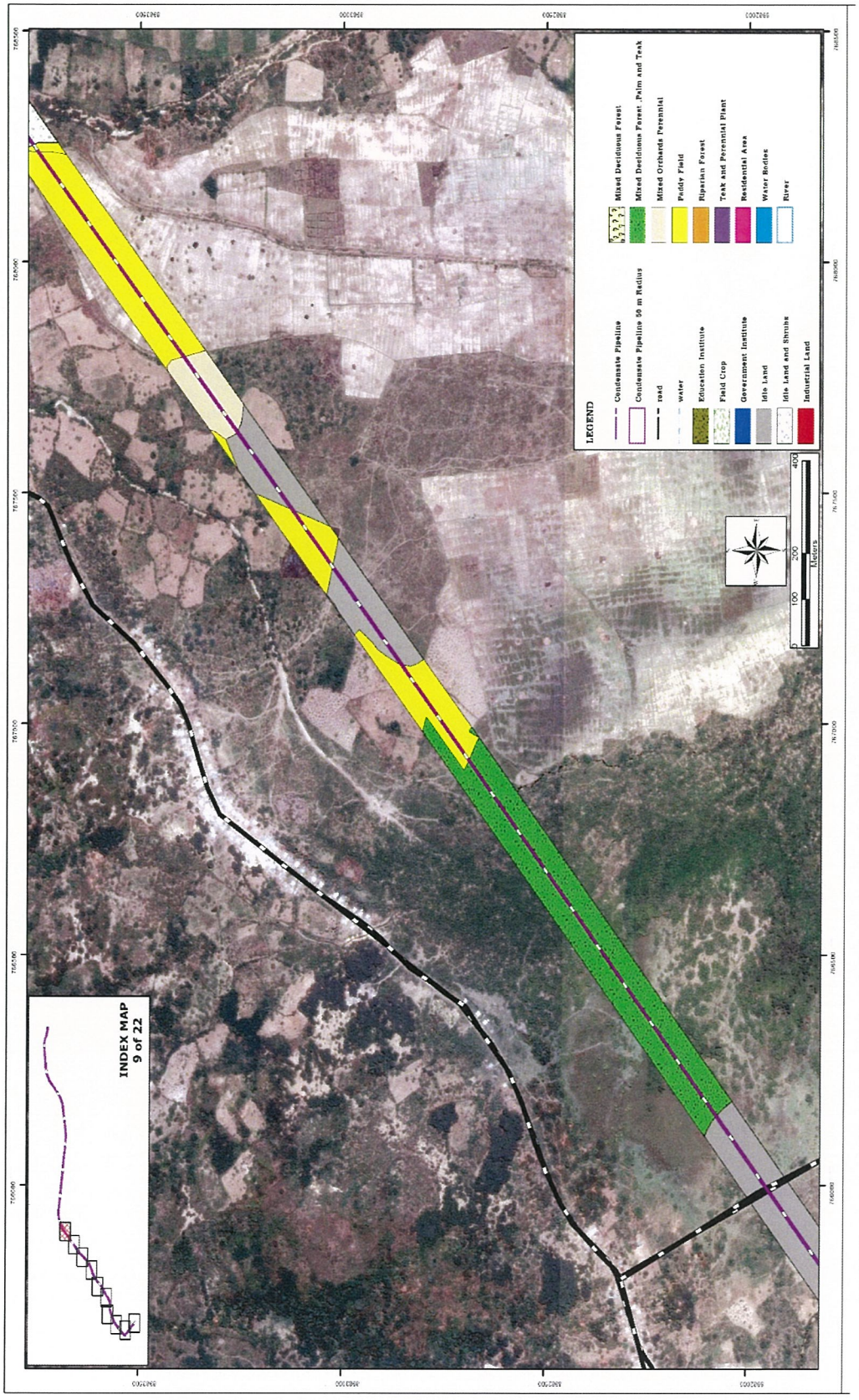
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



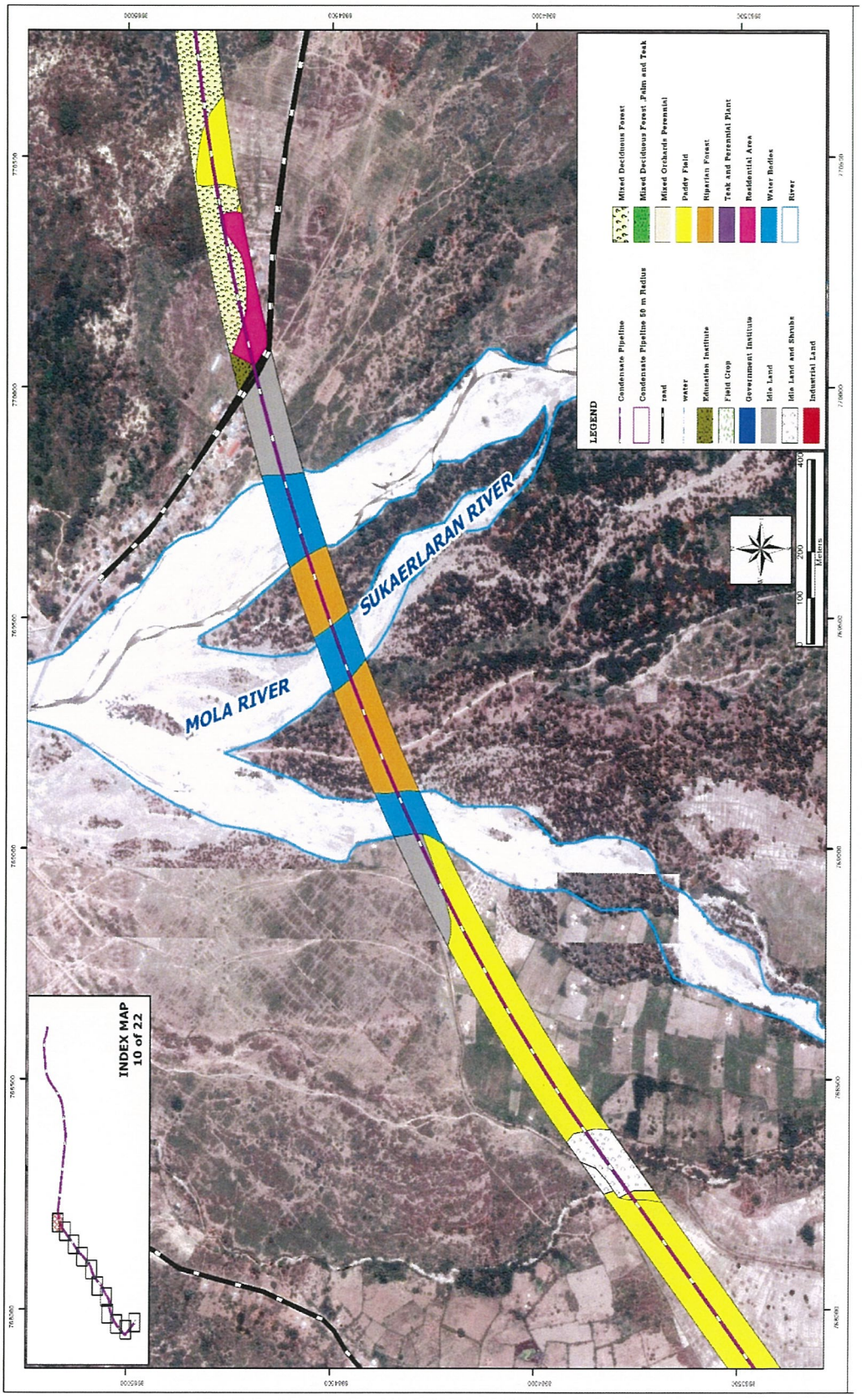
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



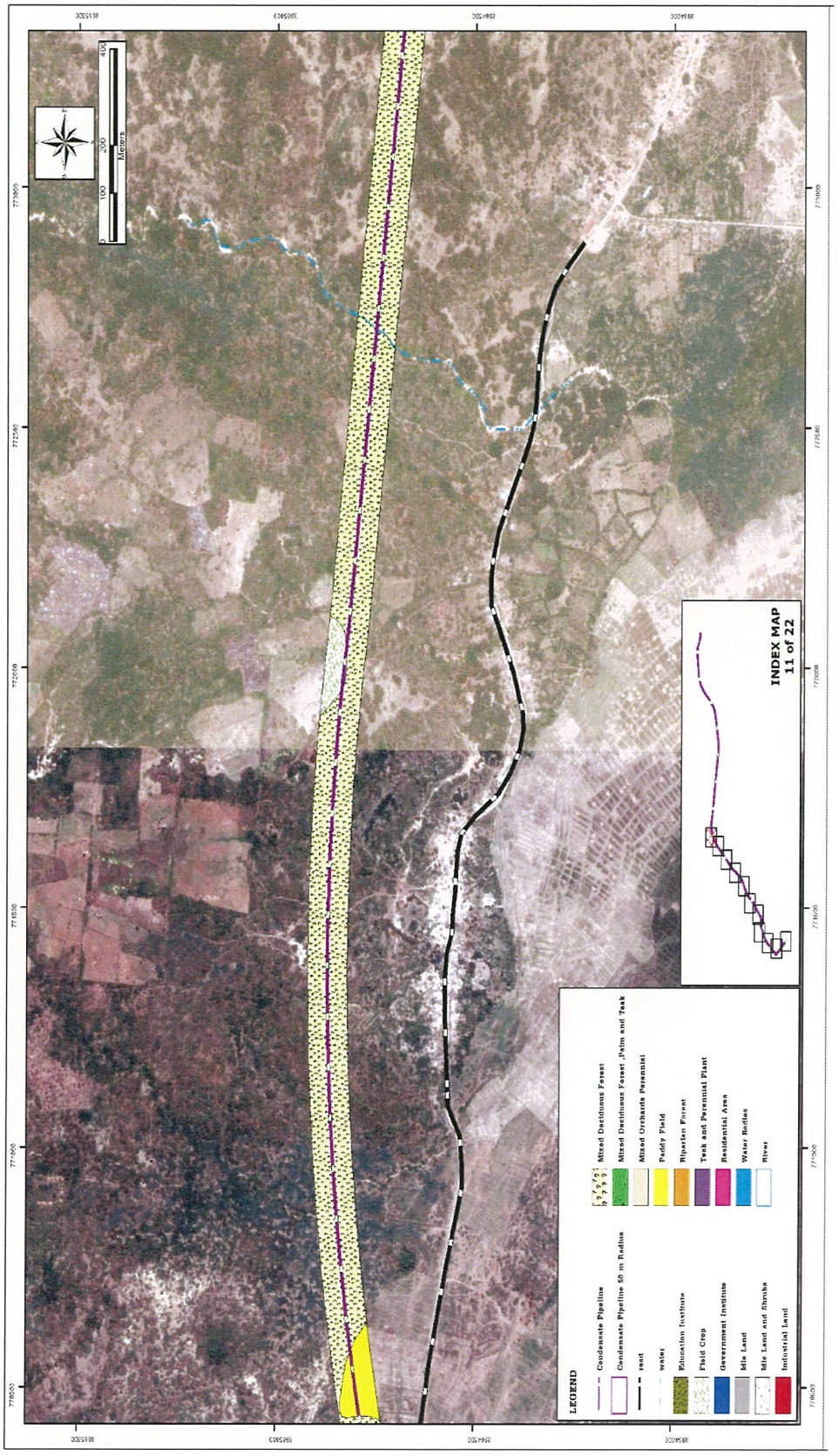
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



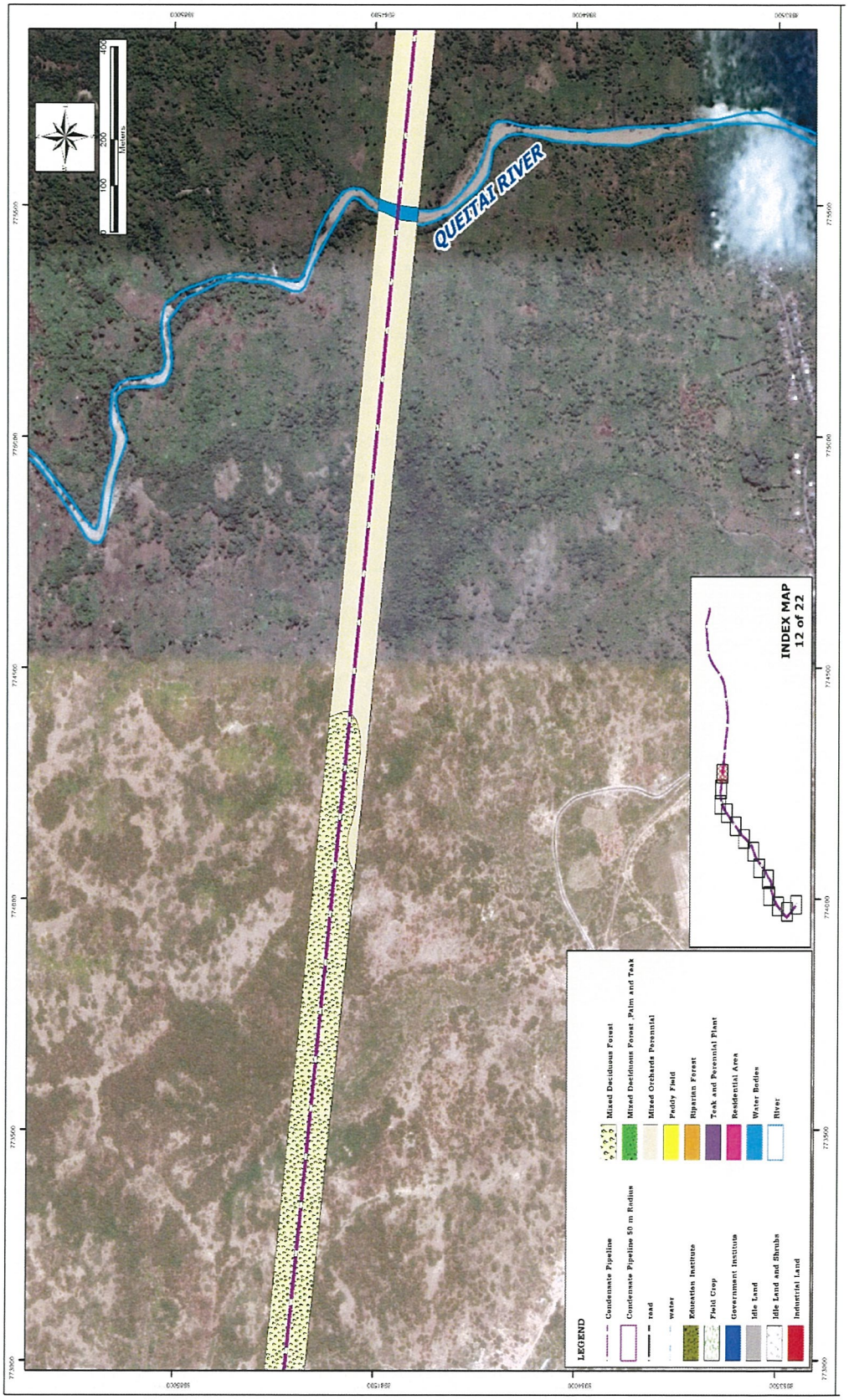
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



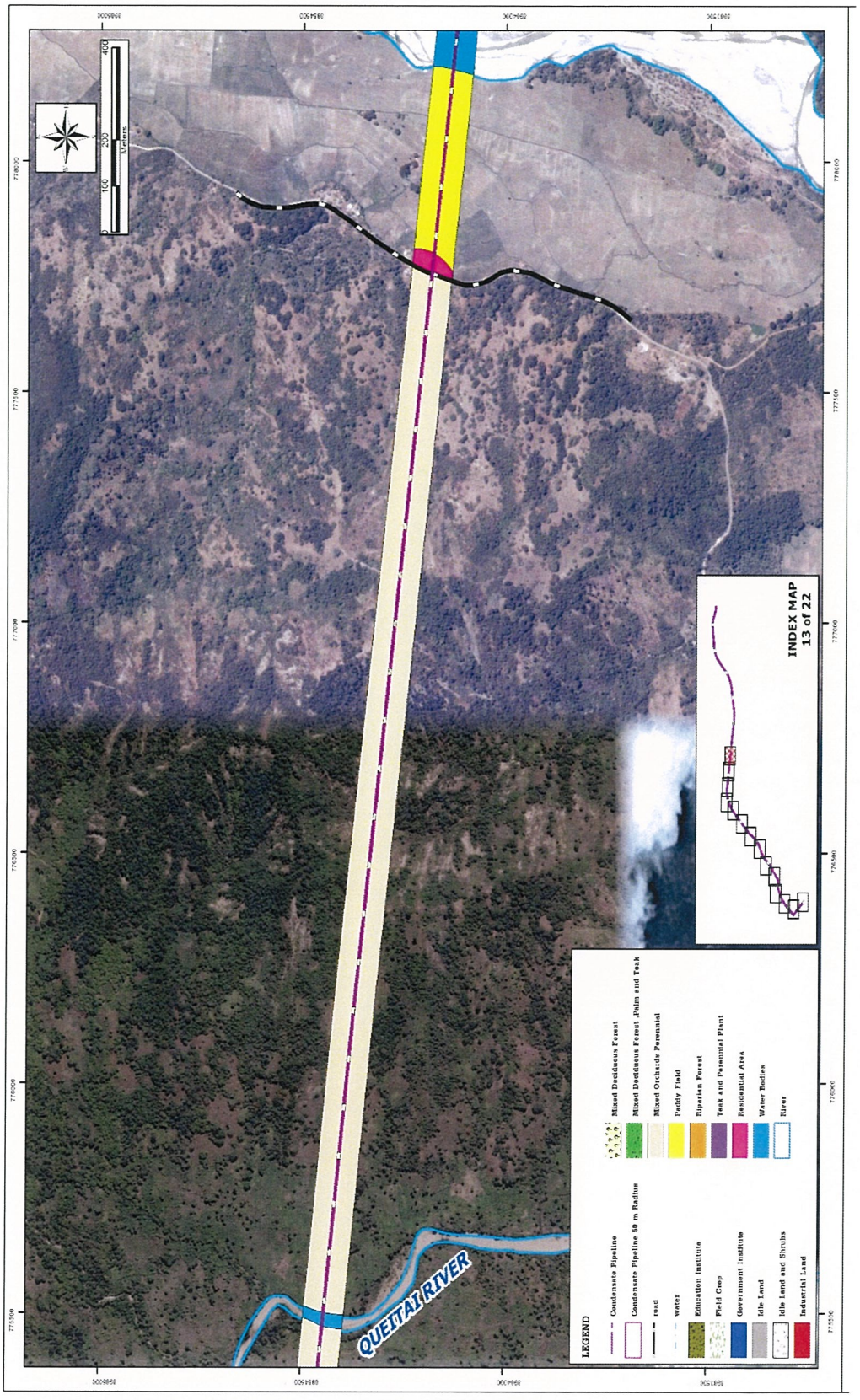
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



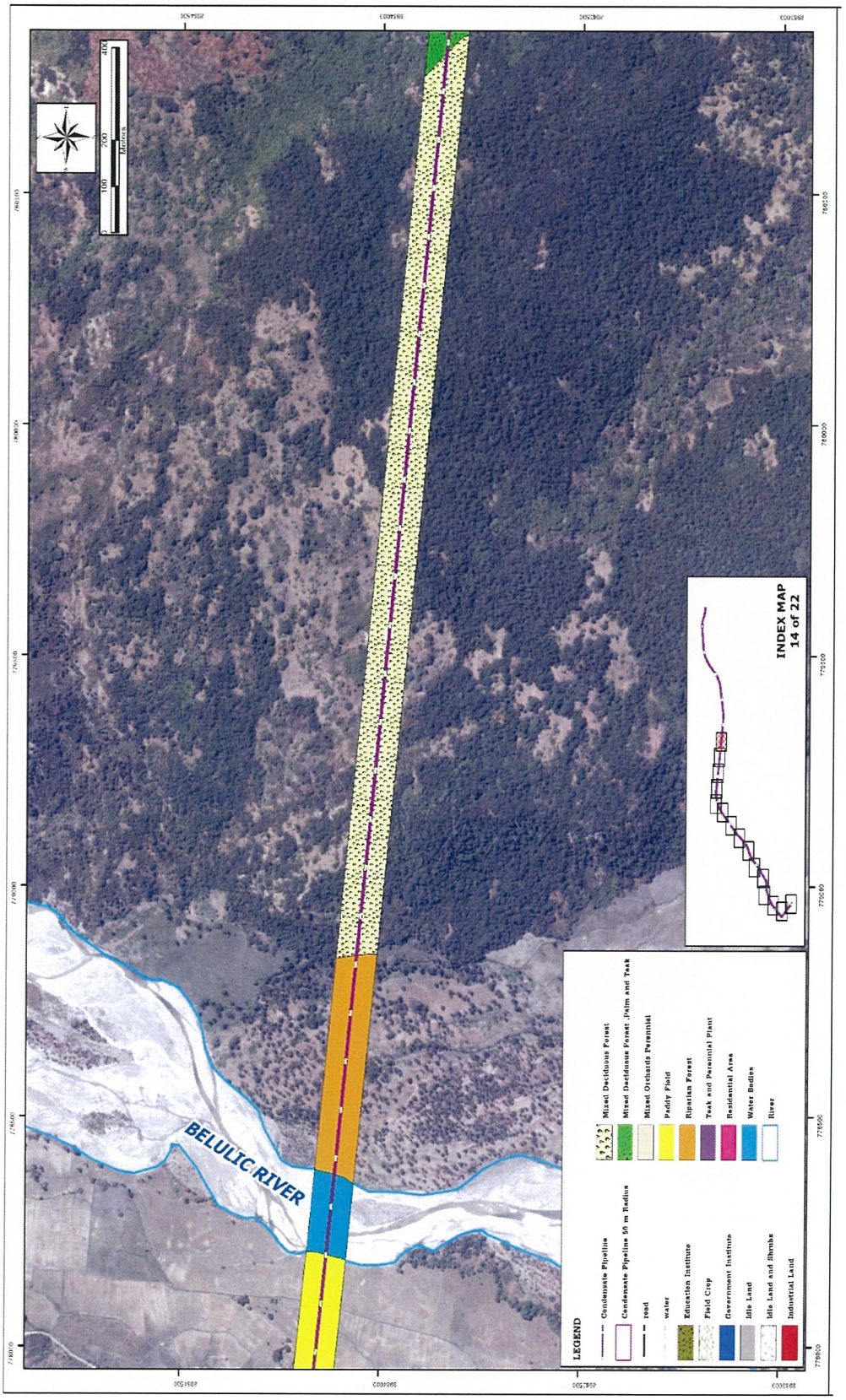
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



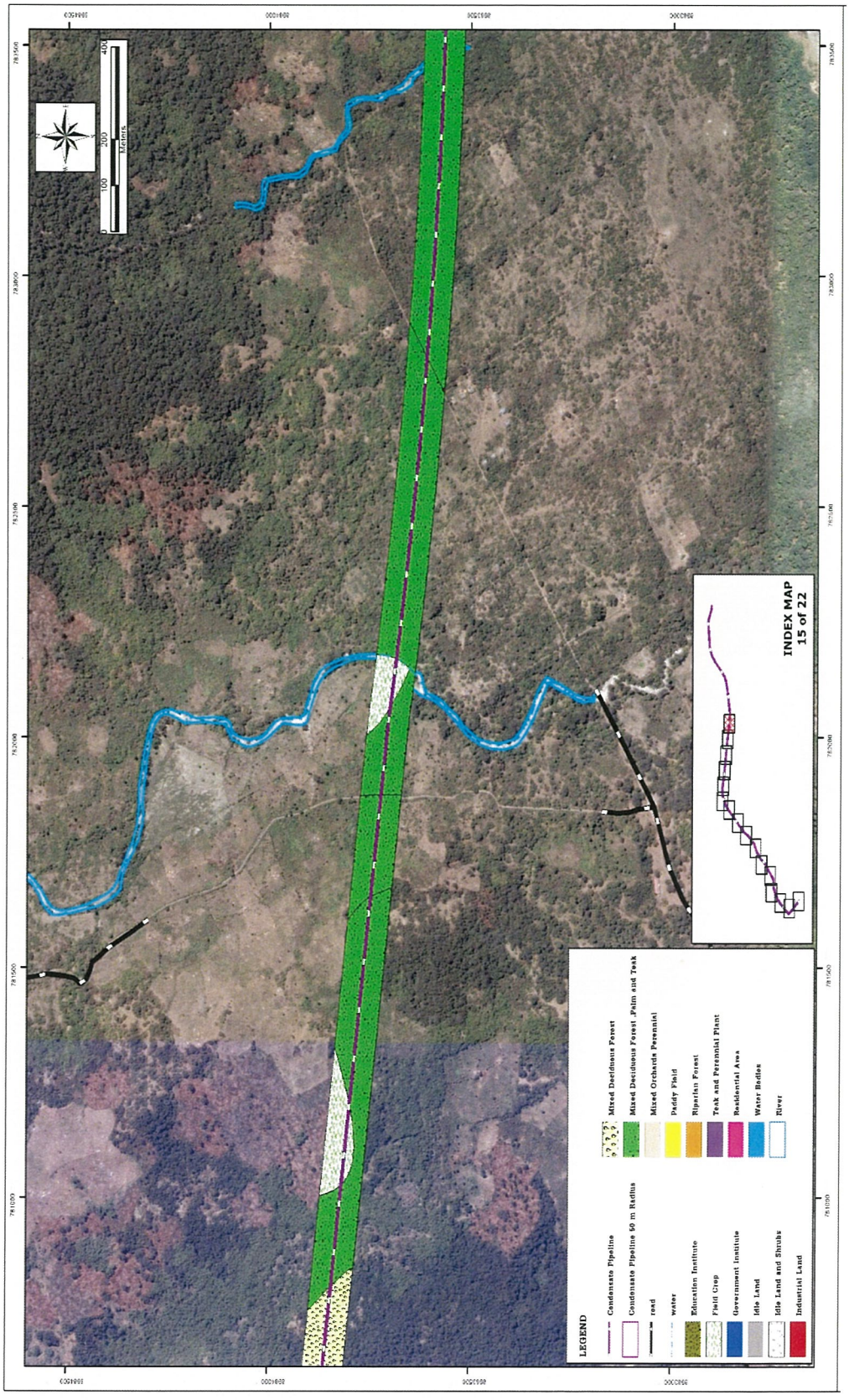
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



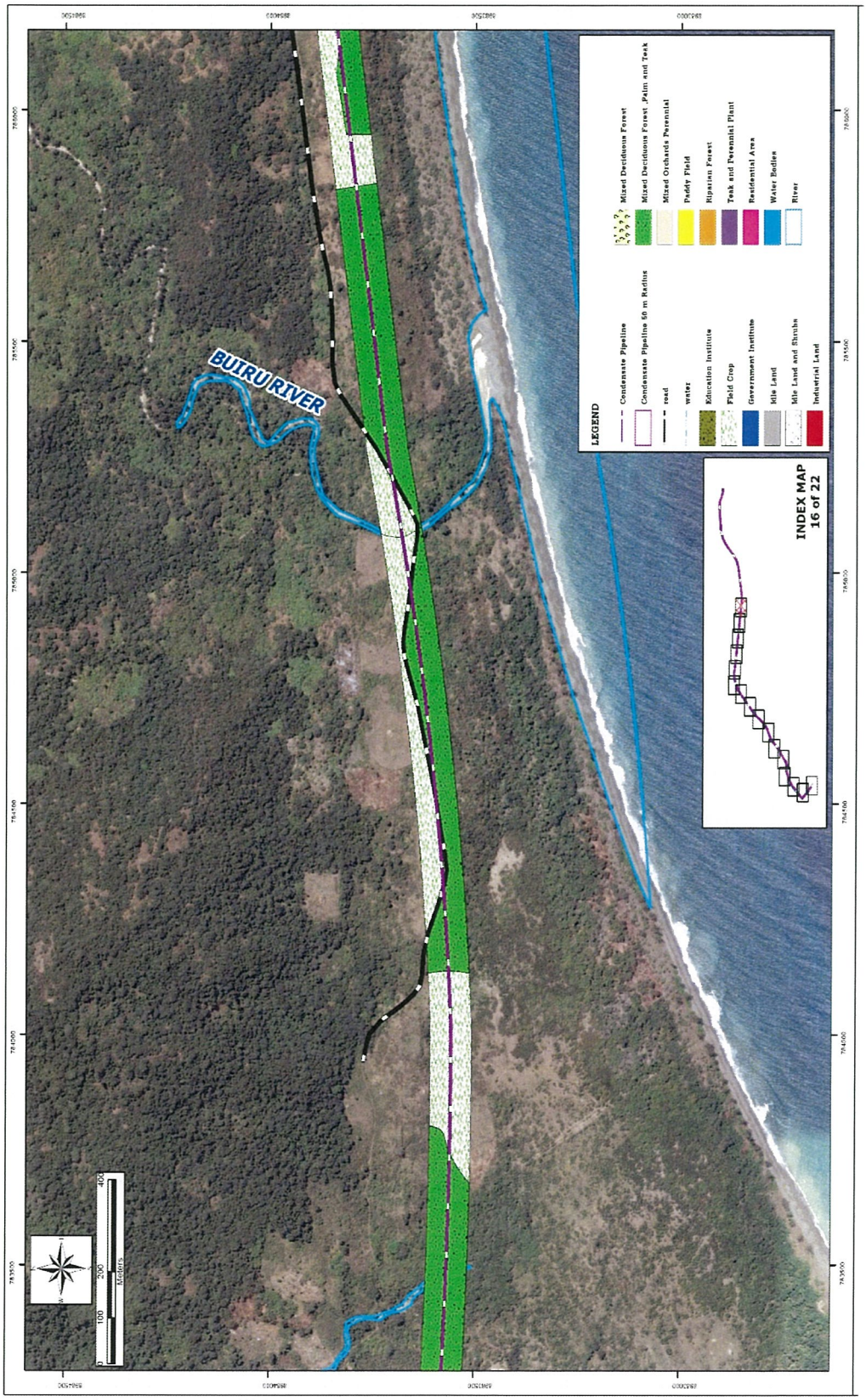
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



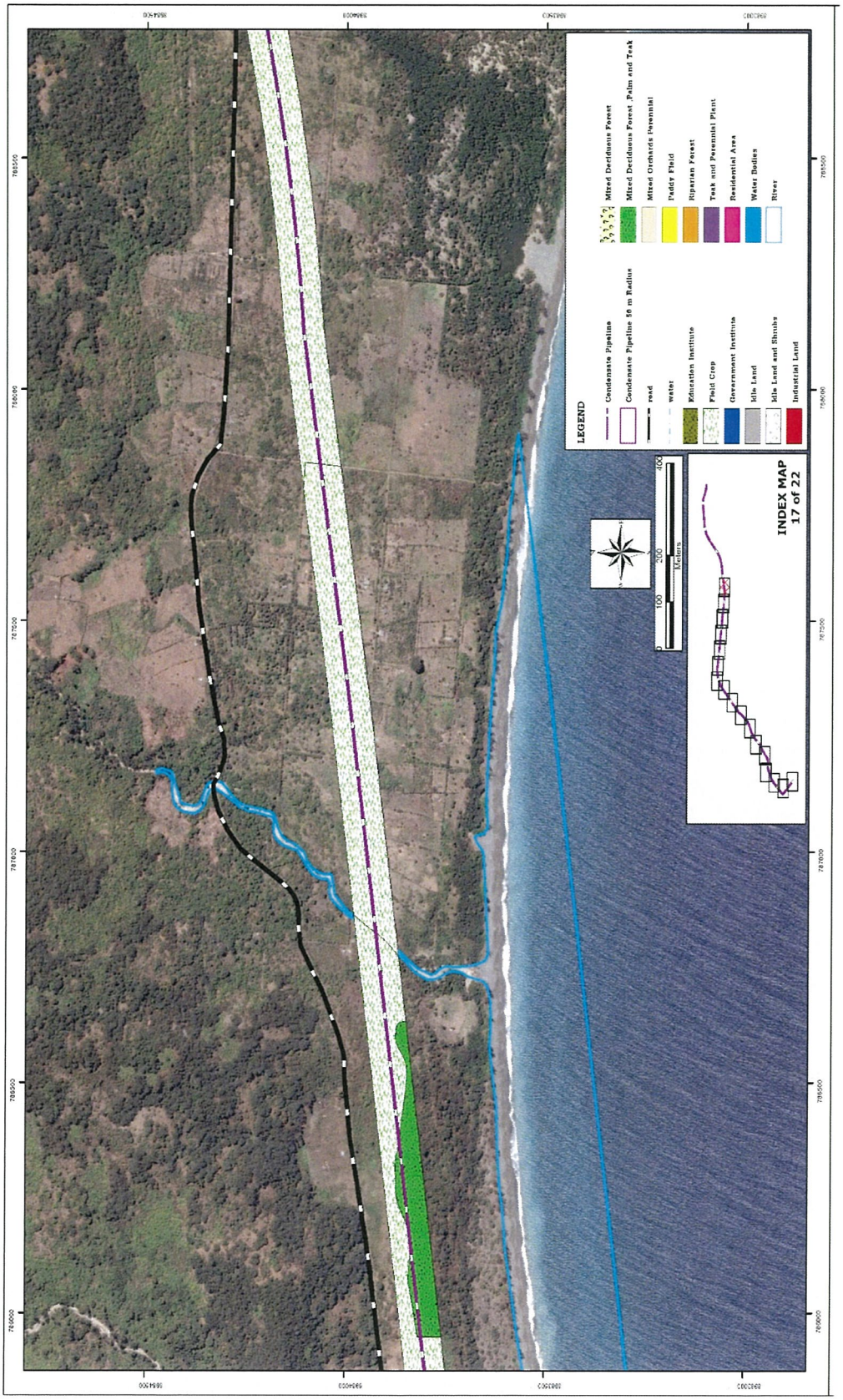
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



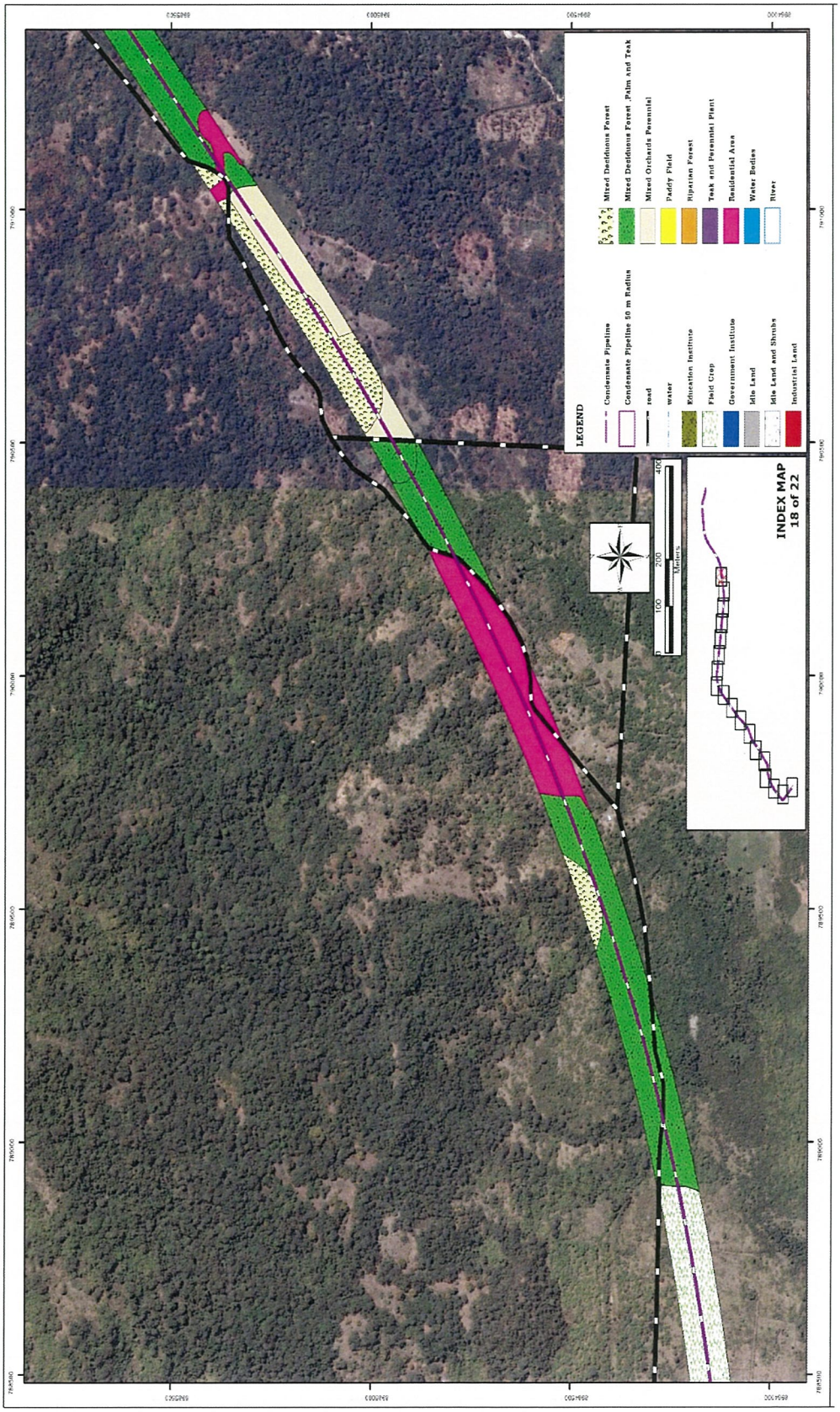
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



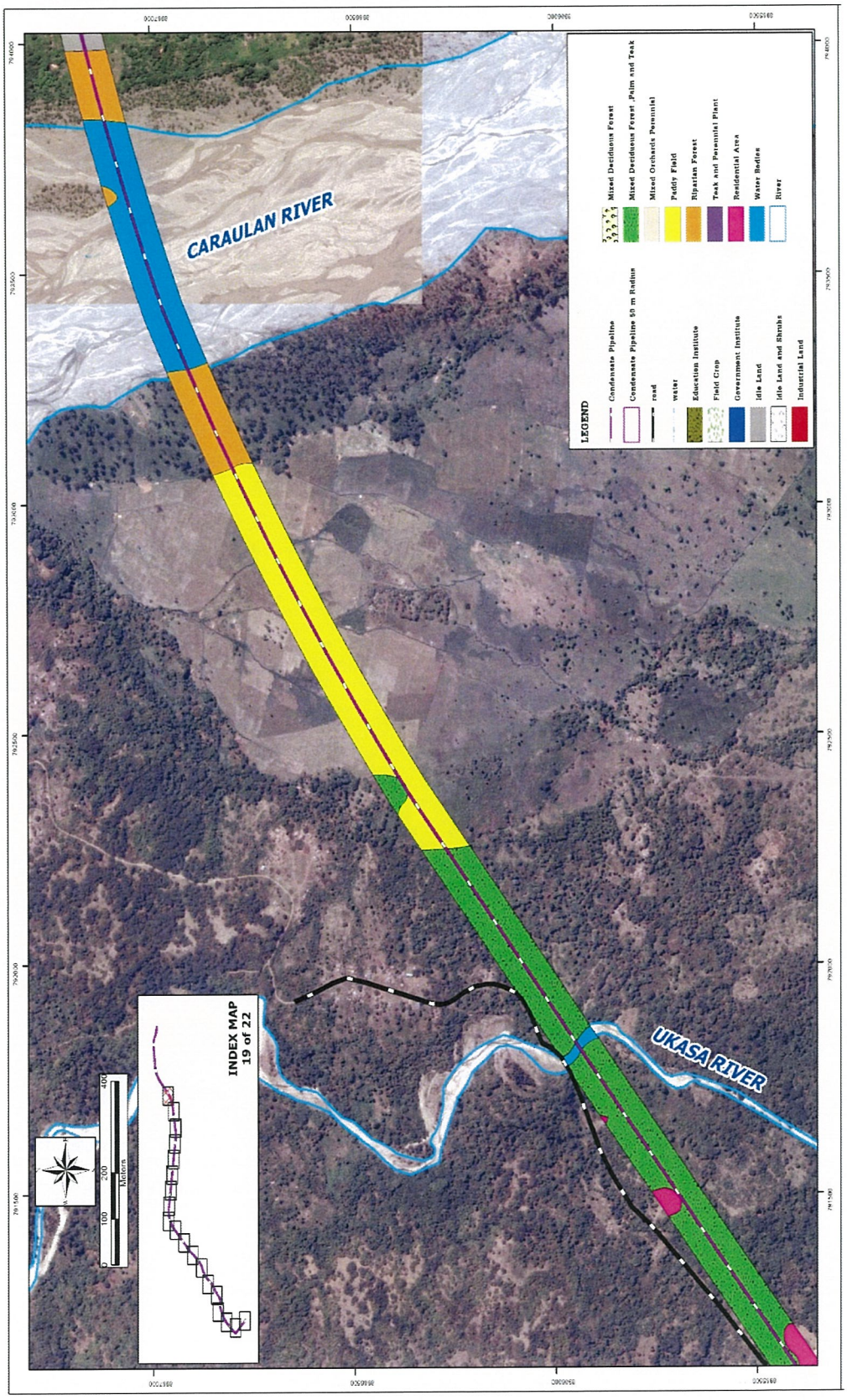
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



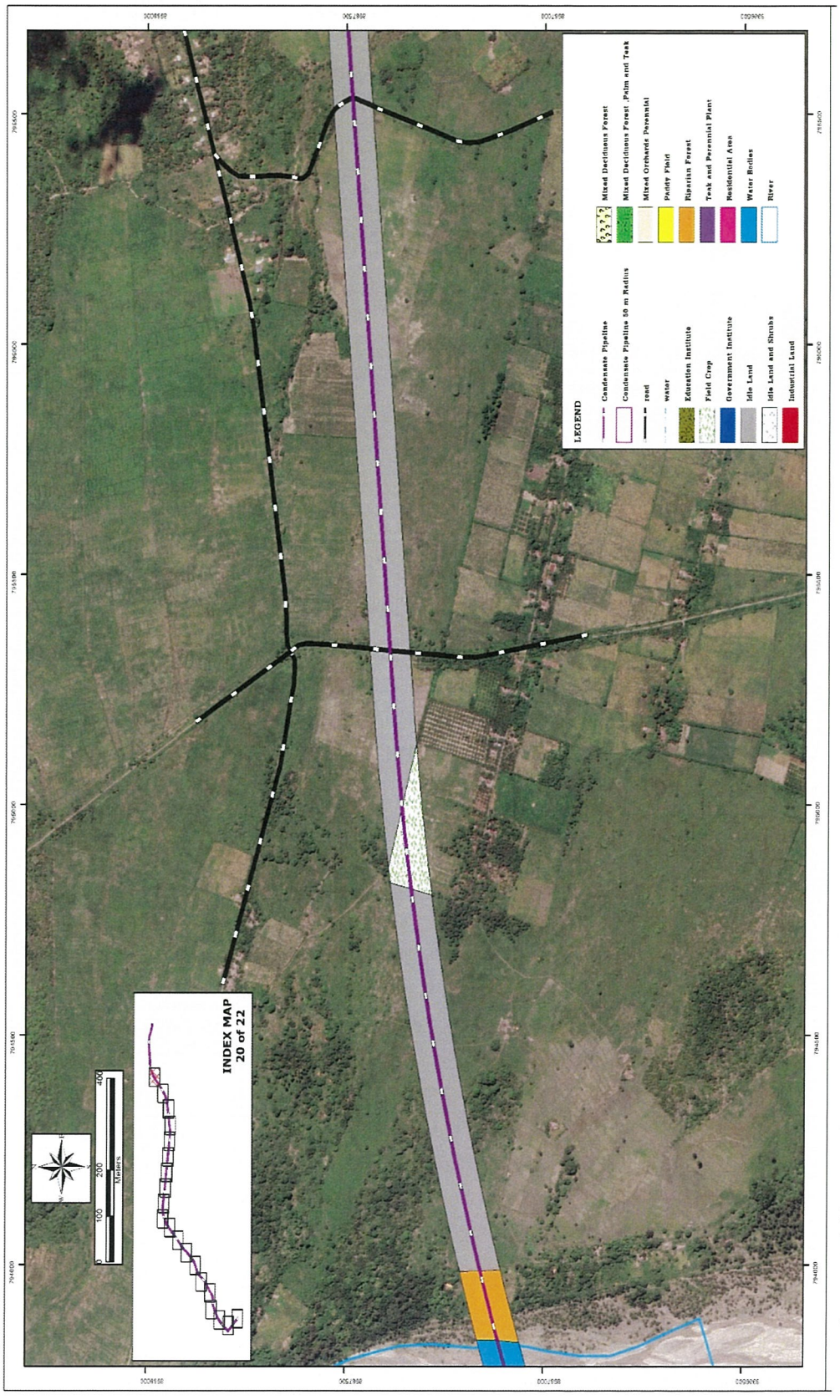
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



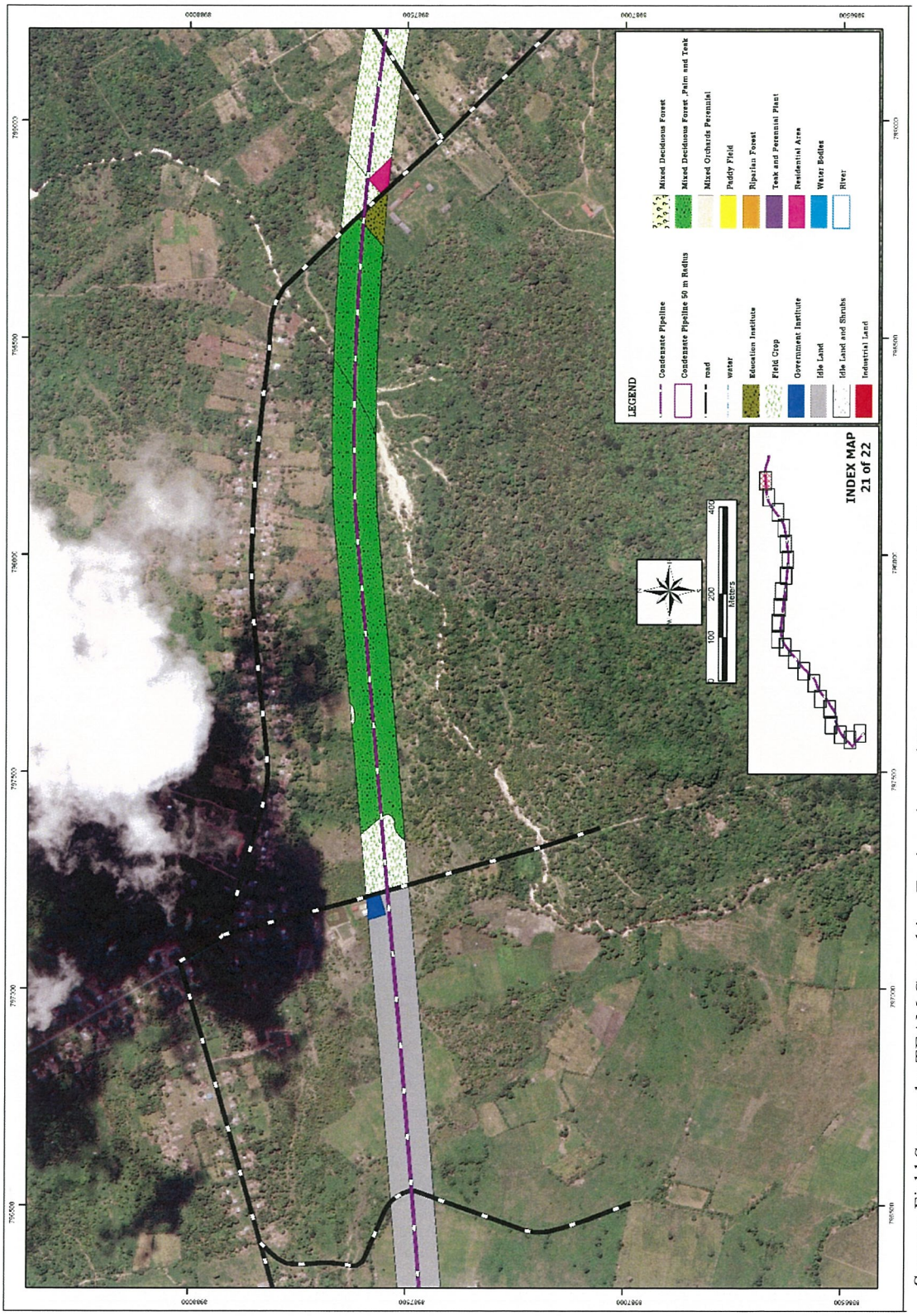
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



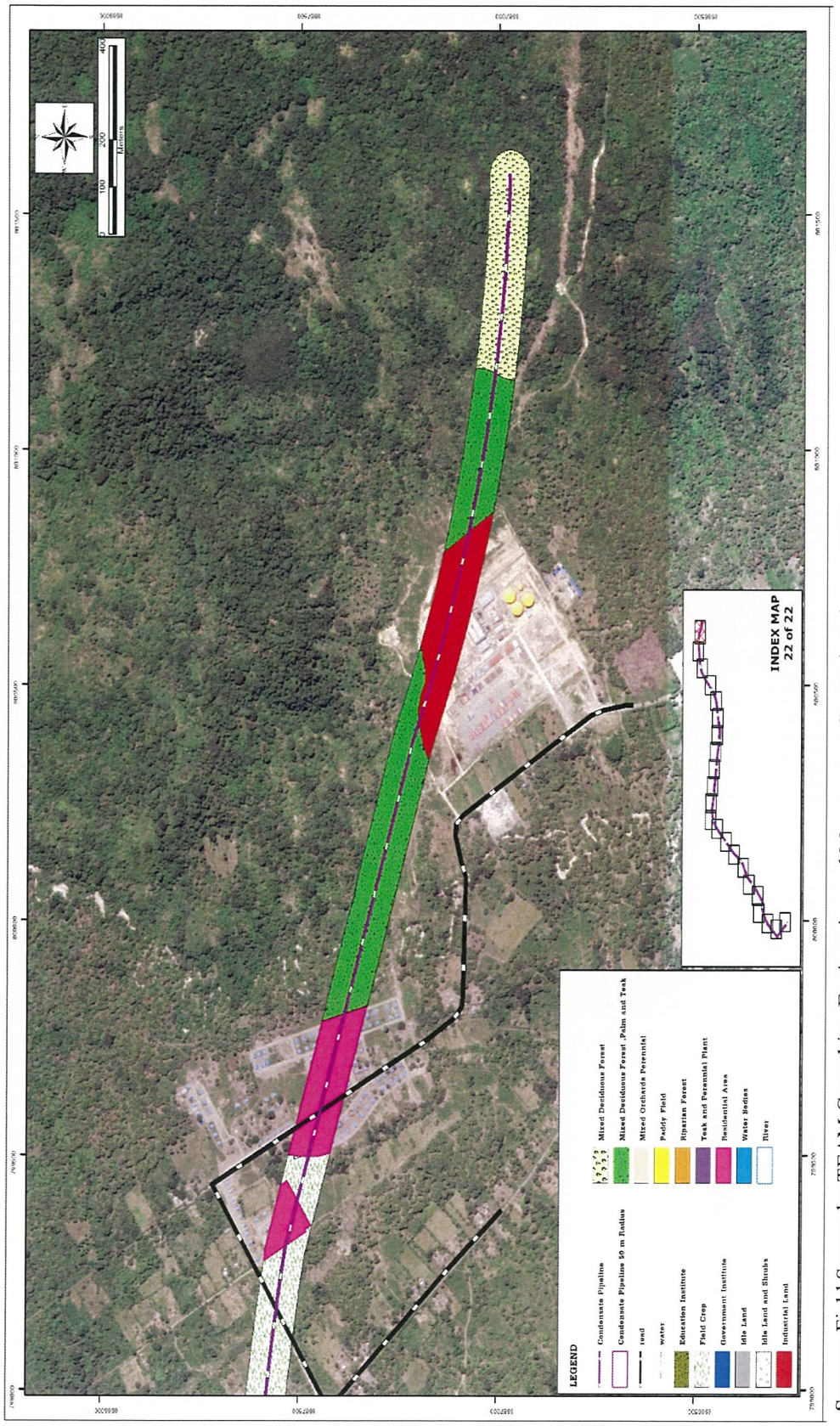
Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)



Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

FIGURE 6.5-1 : EXISTING LAND USE WITHIN PROJECT STUDY AREA (CONT'D)

6.5.4 Use of Forests and Other Natural Resources

(1) Methodology

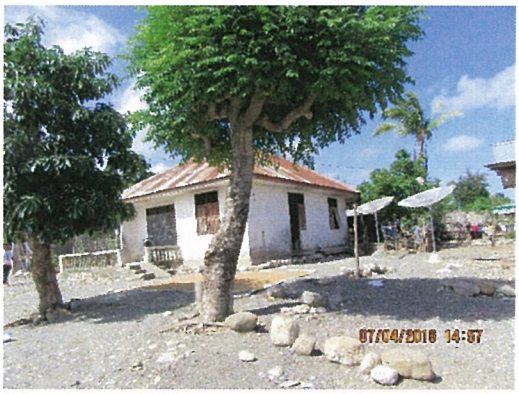
The study of use of forests and other natural resources covered eight existing villages within 50 m strips on both sides of pipeline route in Covalima district, Anairo district and Manufahi district; namely (i) Raimea village, Tashilin village and Zulo village of Zumalai sub- district in Covalima district, (ii) Beco village and Labari village of Suai sub-district in Covalima district, (iii) Leo Lima village and Foho-Ailico village of Hatu-Udo sub-district in Anairo district, and (iv) Betano village of Same sub- district in Manufahi district. Information on use of forests and other natural resources was collected from primary sources by interviewing headmen of the eight villages and field investigation in February and April, 2016.

(2) Results of the Study

The inland forest within eight villages is resources for food, energy and medicine. Villagers collect wood for building and fuel of cooking and selling. Some medical plants in the forest are collected when necessary. The sandalwood grown in the natural forest is valuable tree for essential oil extraction.

In the study area, palm leaves are used for thatching the roofs and making walls of houses. The stems of palm are used for making the walls and fences of houses and selling in front of their houses. The grassland is used for grazing animals such as cattle and goat.

Villagers in eight villages apply water of the big river for irrigation system. Wells and spring water are used for household consumption such as clothes washing, bathing, cooking and drinking. Some villagers collect rock from the river for building house base. Some pictures of use of forests and other natural resources are shown in ***Photo 6.5-2***.

	
Stems of Palm	Roof from Palm Leaves and Wall from Stems of Palm
	
Rock from the River for Building House Base	Woods for Fuel
	
Irrigation System of the Molar River	Grassland for Grazing Animals

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February and April 2016.

PHOTO 6.5-2 : USE OF FORESTS AND OTHER NATURAL RESOURCES

6.5.5 Fishing

(1) Methodology

The study of fishing covered eight existing villages within 50 m strips on both sides of pipeline route in Covalima district, Ainaro district and Manufahi district; namely (i) Raimea village, Tashilin village and Zulo village of Zumalai sub-district in Covalima district, (ii) Beco village and Labari village of Suai sub-district in Covalima district, (iii) Leolima village and Foho-Ailico village of Hatu-Udo sub-district in Ainaro district, and (iv) Betano village of Same sub-district in Manufahi district. Information on fishing was collected from primary sources by interviewing village headmen and field investigation in February and April, 2016.

(2) Results of the Study

The pipeline route runs mostly underground within the south of Right-Of-Way (ROW) of the Tasi Mane South coast highway. Most of land use within the ROW of the proposed highway are forest and agricultural land (***Photo 6.5-3)***. The location of the coastline is quite distant to the south of the pipeline route. There are 8 big rivers to be crossed by condensate pipeline from Suai Supply Base to refinery in Betano village (***Photo 6.5-4)***. There are no subsistence fishing in the rivers by villagers. Therefore, there is no fishing zone adjacent to the proposed project.

	
Forest	Agricultural Land

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February and April 2016.

PHOTO 6.5-3 : LAND USE WITHIN THE PIPELINE ROUTE AREA

	
The Loumea River	The Mola River

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February and April 2016.

PHOTO 6.5-4 : RIVER IN THE STUDY AREA

6.5.6 Agriculture

(1) Methodology

The collection of information on agriculture covered eight existing villages within 50 m strips on both sides of pipeline route in Covalima district, Anairo district and Manufahi district; namely (i) Raimea village, Tashilin village and Zulo village of Zumalai sub- district in Covalima district, (ii) Beco village and Labari village of Suai sub-district in Covalima district, (iii) Leolima village and Foho-Ailico village of Hatu Udo sub-district in Ainaro district, and (iv) Betano village of Same sub- district in Manufahi district. Information on agriculture was collected from primary sources by interviewing village headmen of the eight villages in February, 2016.

(2) Results of the Study

- **Zumalai sub-district, Covalima district**

Main crops within the three villages are maize or corn, rice, banana, sweet potato and vegetables. Average land size per household in the three villages is about 1 to 5 acres. (see ***Table 6.5-3***). Maize or corn, sweet potato and rice yield are seasonal while the rests yield fruits and vegetables all year round. These agricultural activities are for commercial purpose for household income generation and household consumption.

Apart from growing crops, fruit trees and vegetables, some households in the three villages also engage in livestock raising such as pig, chicken, cow and goat. Every household in three villages raises chicken, pig, cow and goat for sale, household consumption and ceremony (see ***Table 6.5-4***). Some pictures of agricultural land and livestock activities are shown in ***Photo 6.5-5***.

TABLE 6.5-3
AGRICULTURE ACTIVITY

Sub-district/District	Village	Type of Plants	Seeding-Harvest Period	Land Size (acre/hh)
Zumalai sub-district, Covalima district	Raimea Tashilin Zulo	Maize/Corn	2 times per year (Jan-Mar and May-Jul)	1-5
		Rice	2 times per year (Jan-Mar and May-Jul)	1-5
		Fruit (Banana)	Throughout the year	1-5
		Sweet Potato	Jan-Sep	
		Vegetables	Throughout the year	1-5
Suai sub-district, Covalima district	Beco Labari	Maize/Corn	2 times per year (Jan-Jun and Jul-Oct)	1-5
		Rice	2 times per year (Jan-Jun and Jul-Oct)	1-5
Hatu-Udo sub- district, Ainaro district	Leolima Foho-Ailico	Maize/Corn	2 times per year (Jan-Mar and May-Aug)	2-6
		Rice	2 times per year (Jan-Apr and Jun-Sep)	2-6
		Cassava	2 times per year (Dec-Mar and May-Aug)	2-3
		Banana	Throughout the year	2-3
		Mango	Throughout the year	2-3
		Vegetables	Throughout the year	2-3
Same sub-district, Manufahi district.	Betano	Maize/Corn	2 times per year (Jan-Jun and May-Dec)	1-2
		Rice	2 times per year (Jan-Jun and May-Dec)	1-2
		Cassava	Throughout the year	1-2
		Banana	Throughout the year	1-2
		Mango	Throughout the year	1-2
		Vegetable	Throughout the year	1-2

Source : Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2016.

TABLE 6.5-4
LIVESTOCK IN COVALIMA DISTRICT

Livestock	Zumalai sub-district			Suai sub-district		Purpose
	Raimea V % of hh	Tashilin V % of hh	Zulo V % of hh	Beco V % of hh	Labari V* % of hh	
Pig	100	100	100	100	34	Sale/Consumption/Ceremony
Chicken	100	100	100	100	36	Sale /Consumption/Ceremony
Cattle	100	100	80	100	25	Sale/Consumption/Ceremony
Goat	100	60	100	50	4	Sale/Consumption/Ceremony
Horse	-	-	-	-	1	Farm activity

Remrk : hh = Household

V = Village

* Sensus, labarai, Covalima District, 2010

Source : Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2016

- **Suai sub-district, Covalima district**

Main crops within the two villages are maize or corn and rice. Average land size per household in the two villages is about 1 to 5 acres. (see ***Table 6.5-3***). Maize or corn and rice yield are seasonal. These agricultural activities are for commercial purpose for household income generation and household consumption.

Apart from growing crops, some households in the two villages also engage in livestock raising such as pig, chicken, cattle and goat. Every household in two villages raises chicken, pig, cow and goat for sale, household consumption and ceremony (see ***Table 6.5-4***). Some pictures of agricultural land and livestock activities are shown in ***Photo 6.5-5***.

	
Rice	Corn
	
Coconut	Banana
	
Cow	Horse
	
Pig	Goat

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.5-5 : MAIN AGRICULTURAL AND LIVESTOCK ACTIVITIES

- **Hatu-Udo sub-district, Ainaro district**

Main crops within the two villages are maize or corn, rice, cassava, banana, mango and vegetables. Average land size per household in the two villages is about 2 to 6 acres. (see ***Table 6.5-3***). Maize or corn, rice and cassava yield are seasonal while the rests yield fruits and vegetables all year round. These agricultural activities are for commercial purpose for household income generation and household consumption.

Apart from growing crops, fruit trees and vegetables, some households in the two villages also engage in livestock raising such as pig, chicken, cattle, goat and fish. Every household raises chicken, pig, cow, goat and fish for sale and household consumption (see ***Table 6.5-5)***. Some pictures of agricultural land and livestock activities are shown in ***Photo 6.5-5***.

TABLE 6.5-5

LIVESTOCK IN AINARO DISTRICT AND MANUFAHI DISTRICT

Livestock	Hatu-Udo sub-district		Same sub-district	Purpose
	Leolima V % of hh	Foho-Ailico V % of hh	Betano V % of hh	
Pig	20	100	100	Sale/Consumption
Chicken	100	100	100	Sale/Consumption
Cattle	5	50	100	Sale/Consumption
Goat	1	-	2	Sale/Consumption
Fish	2	-	2	Sale/Consumption

Remrk : hh = Household

V = Village

Source : Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2016

- **Same sub-district, Manufahi district**

Main crops within the Betano village (Bemetan sub-village) are maize or corn, rice, cassava, banana, mango and vegetables. Average land size per household in the one sub-village is about 1 to 2 acres. (see ***Table 6.5-3***). Maize or corn and rice yield are seasonal while the rests yield fruits, cassava and vegetables all year round. These agricultural activities are for commercial purpose for household income generation and household consumption.

Apart from growing crops, fruit trees and vegetables, some households in the one sub-village also engage in livestock raising such as pig, chicken, cattle, goat and fish. Every household raises chicken, pig, cow, goat and fish for sale and household consumption (see ***Table 6.5-5)***. Some pictures of agricultural land and livestock activities are shown in ***Photo 6.4-5***.

6.5.7 Tourism

The beach in the study area which is tourist place and recreation area is Betano beach. Betano beach is about 13 km south of the Same sub-district and 1.72 km south of pipeline route. There are several simple restaurants serving fresh seafood. This location offers great views along the beach and out to the sea as shown in ***Photo 6.5-6***.



Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.5-6 : BETANO BEACH

6.5.8 Other Industries

No industries in the project area. There is only one rock quarrying factory located in Betano village, about 7 km from the starting point of the condensate pipeline alignment (***Photo 6.5-7***).



Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February and April 2016.

PHOTO 6.5-7 : ROCK QUARRYING FACTORY IN BETANO VILLAGE

6.5.9 Land Transportation

(1) Methodology

To establish baseline data on traffic conditions, traffic counting was carried out at 2 stations within the project study area for continuous 12 hours during 12-13 February, 2016, covering one working day and one holiday. The two traffic counting (TC) stations were:

- **TC1**- The traffic counting (TC1) station is at the junction of Betano Town (access road to Betano refinery), Bemetan sub-village, Betano village, Manufahi district, Timor-Leste. There were two directions of traffic counted were conducted i.e. Same to Betano (**TC1A**) and the direction of Betano to Selihasan (**TC1B**).
- **TC2**-The traffic counting (TC2) station is at the Cassa junction (proposed access roads to condensate pipeline route), Cassa village, Ainaro district, Timor-Leste. There were two directions of traffic counted were conducted i.e. Zumalai to Ainaro (**TC2A**) and the direction of Ainaro to Suai (**TC2B**).

The location of two traffic counting stations is indicated on a map in ***Figure 6.5-2***, traffic counting activities and existing condition of road at each station are shown in ***Photo 6.5-8***.

Traffic counting was done manually by four observers (two observers at each station). The number and types of vehicles passing the station were recorded. The traffic counting data were used to calculate the V/C ratios.

Traffic condition is normally assessed in terms of road capacity relative to traffic volume, V/C ratio is commonly used for this purpose. This ratio is considered as a baseline traffic flow condition and will be further utilized to evaluate the consequences of the Project's impact on local traffic.

The calculation of V/C ratios follows the steps below:-

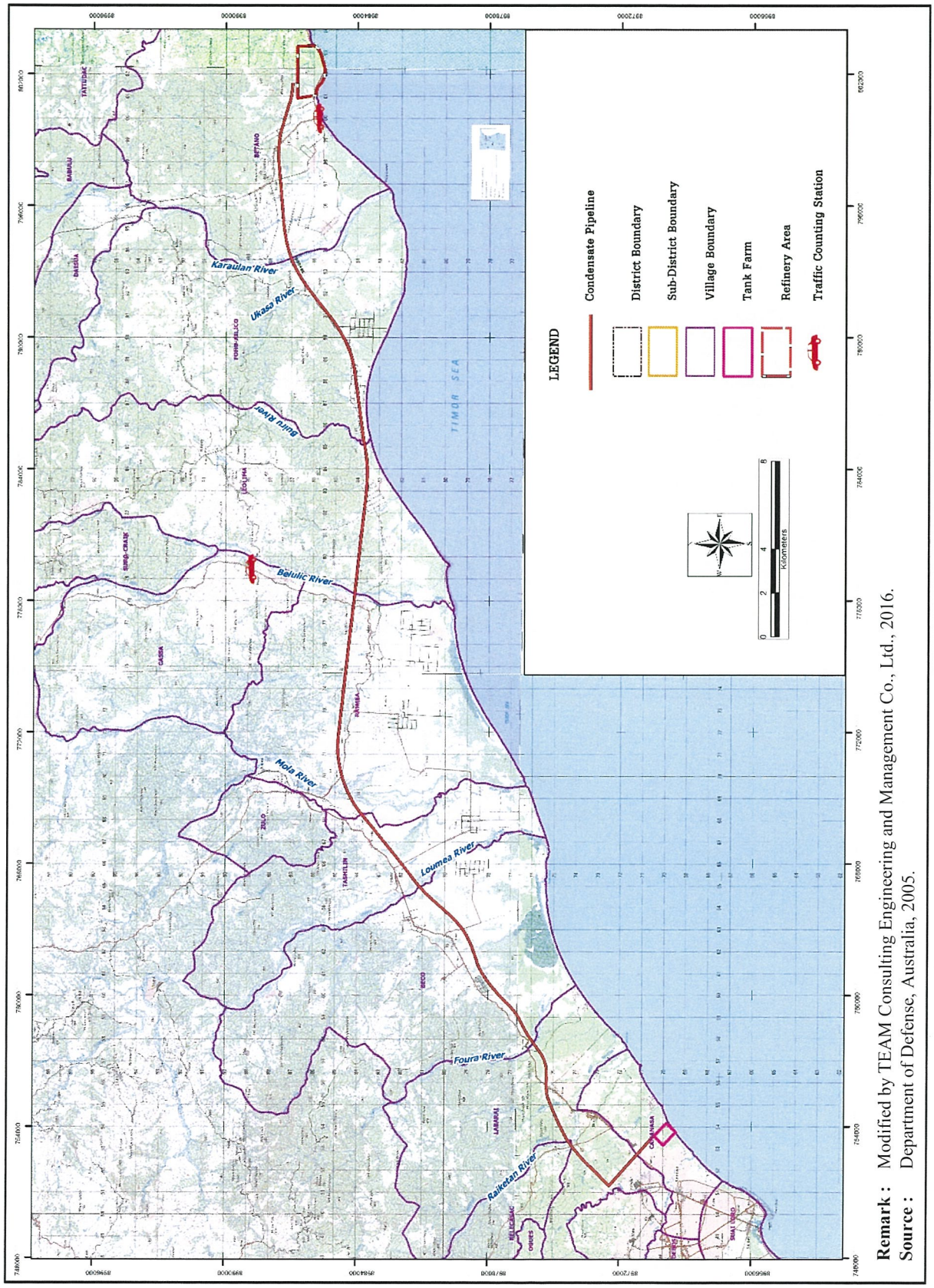
1) Convert the number of vehicles from observation to Passenger Car Unit (PCU) by using Passenger Car Equivalents (PCE) factors specified for each type of vehicles as indicated in ***Table 6.5-6***. This is used as "Traffic Volume" or "V".

2) Select an applicable carrying capacity or "C" for the road (***Table 6.5-7***). The capacity can be estimated following the highway capacity manual (HCM, 2000).

3) Ratio of V/C can be calculated using the following formula

$$\text{V/C ratio} = \frac{\text{TrafficVolume}}{\text{Carrying Capacity of Respective Road}}$$

V/C ratio can be used to compare with the values defined by the Division of Traffic Engineering (Thailand) as shown in ***Table 6.5-8*** for indication of present traffic condition.



Remark : Modified by TEAM Consulting Engineering and Management Co., Ltd., 2016.
Source : Department of Defense, Australia, 2005.

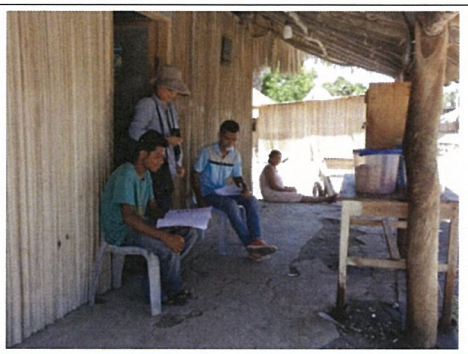
FIGURE 6.5-2 : TRAFFIC COUNTING STATIONS WITHIN PROJECT STUDY AREA





Existing condition at the junction of Betano town (TC1)





Existing condition in front of Selihasan sub-village

Traffic counting at the junction of Betano town (TC1)





Existing condition of the road at the Cassa junction (proposed access roads to condensate pipeline route) (TC2)



Traffic counting at the Cassa junction (proposed access roads to condensate pipeline route) (TC2)

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.5-8 : TRAFFIC COUNTING AND EXISTING CONDITION OF ROADS WITHIN PROJECT STUDY AREA

TABLE 6.5-6
PASSENGER CAR EQUIVALENT FACTOR OF EACH VEHICLE

Types of Vehicles	Passenger Car Equivalents Factor (PCE)
Passenger Car and Taxi	1.00
Light bus	1.50
Medium bus	1.50
Light truck	1.00
Crane and grader	2.10
Medium truck (6 wheels truck)	2.10
Heavy truck (10 wheels truck)	2.50
Heavy truck including trailer	2.50
Bicycle, Tricycle	0.33
Motorcycle	0.33

Source: Paopong, 1997 and DOH of Thailand, 2011.

TABLE 6.5-7
TRAFFIC CARRYING CAPACITY AND HIGHWAY TYPES

Highway Types	Carrying Capacity of Traffic Volume (PCU/hr.)
2 way road with more than 2 traffic lanes/multi-traffic lanes	2,000 (per 1 traffic lane)
2 way road with 2 traffic lanes	2,000 (for both directions)
2 way road with 3 traffic lanes	4,000 (for both directions)

Source: Paopong, 1997

TABLE 6.5-8
RANGE OF V/C RATIO FOR TRAFFIC CONDITION CLASSIFICATION

Range of V/C Ratio	Classification of Traffic Condition
0.88 – 1.00	Severe traffic congestion
0.67 – 0.88	Heavy traffic congestion
0.52 – 0.67	Satisfactory traffic flow
0.36 – 0.52	Good traffic flow
0.20 – 0.36	Very good traffic flow

Source: Paopong, 1997

(2) Results of the Study

- **Road Condition**

Major road nearby the Condensate pipeline alignment is paved road, about 7 m wide without median, divided traffic lane, and shoulder. Most of the local roads can be used all year round. Existing road conditions nearby the proposed condensate pipeline alignment at the junction of Betano town and Cassa junction and several locations close to the proposed condensate pipeline alignment are shown in ***Photo 6.5-8***.

- **Traffic Counting**

The results of traffic counting are presented in four tables in ***Appendix 6D***. The data show traffic volume of 10 categories of vehicles as follows: (i) passenger car; (ii) light bus; (iii) medium bus; (iv) heavy bus; (v) light truck: (vi) six- wheels truck; (vii) ten-wheels truck; (viii) heavy truck including trailer; (ix) bicycle and tricycle; and (x) motorcycle. Tractors, pushcarts and motored tricycles (tuk tuks) were included in the passenger car category.

The traffic volume observed can be summarized as follows.

Station TC1A

The number of vehicles passing main road at the junction of Betano town (the direction of Same to Betano) on Friday 12th and Saturday 13th February 2016 were 470 and 192 units/day, respectively. The majority of vehicles were motorcycles. For working day (Friday), the traffic volume was highest during early morning (during 7.00 am – 9.00 am) about 70-80 units/hour while the highest traffic volume for holiday was about 34 units/hour (during 12.00 am-1.00 pm). Results of traffic counting at the station TC1A are shown in ***Appendix 6D-1 and 6D-2***.

Station TC1B

The number of vehicles passing main road at the junction of Betano town (the direction of Betano to Selihasan) on Friday 12th and Saturday 13th February 2016 were 541 and 575 units/day, respectively. The majority of vehicles were motorcycles, followed by bicycle and light truck. For working day (Friday), the traffic volume was highest during morning (during 7.00 am-10.00 am) about 60-70 units/hour while the highest traffic volume for holiday was about 76 units/hour (during 7.00 am-8.00 am). Results of traffic counting at the station TC1B are shown in ***Appendix 6D-3 and 6D-4***.

Station TC2A

The number of vehicles passing main road at the Cassa junction (the direction of Zumalai to Ainaro) on Friday 12th and Saturday 13th February 2016 were 459 and 631 units/day, respectively. The majority of vehicles were motorcycles. For working day (Friday), the traffic volume was highest during early morning (during 8.00 am – 9.00 am) about 63 units/hour while the highest traffic volume for holiday was about 78 units/hour at the same period with working day. Results of traffic counting at the station TC2A are shown in ***Appendix 6D-5 and 6D-6***.

Station TC2B

The number of vehicles passing main road at the Cassa junction (the direction of Ainaro to Suai) on Friday 12th and Saturday 13th February 2016 were 463 and 506 units/day, respectively. The majority of vehicles were motorcycles, followed by bicycle and light truck. For working day (Friday), the traffic volume was highest during morning (during 8.00 am-9.00 am) about 55 units/hour while the highest traffic volume for holiday was about 54 units/hour at the same period with working day. Results of traffic counting at the station TC2B are shown in ***Appendix 6D-7 and 6D-8***.

Traffic Conditions

Table 6.5-9 shows the highest V/C ratios calculated for the traffic condition during the field survey. An average V/C ratio of the working day and holiday at Station TC1A, TC1B, TC2A and TC2B were 0.0085, 0.0117, 0.0120 and 0.0103, respectively. These figures indicated very good traffic flow condition at all station both during working day and holiday.

TABLE 6.5-9

EXISTING TRAFFIC CONDITION WITHIN PROJECT STUDY AREA IN FEBRUARY 2016

Description	TC1A			TC1B			TC2A			TC2B		
	Friday, 12th	Saturday, 13th	Average*	Friday, 12th	Saturday, 13th	Average*	Friday, 12th	Saturday, 13th	Average*	Friday, 12th	Saturday, 13th	Average*
Total Traffic volume (PCU/day)**	272.17	135.08	203.625	261.03	298.52	279.775	214.24	360.9	287.57	236.93	258.2	247.565
Traffic volume per hours	22.68	11.26	16.97	21.75	24.88	23.31	17.85	30.08	23.96	19.74	21.52	20.63
Carrying capacity (C) (PCU/hours)	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
V/C ratio	0.0113	0.0056	0.0085	0.0109	0.0124	0.0117	0.0089	0.0150	0.0120	0.0099	0.0108	0.0103
Traffic Condition	**Very good traffic flow**			**Very good traffic flow**			**Very good traffic flow**			**Very good traffic flow**		

Remark : * Average of working day and holiday values

** Traffic volume during 06.00 am-06.00 pm

TC1A: Betano junction (Same--→Betano)

TC1B : Betano junction (Betano----→ Selihasan)

TC2A : Cassa junction (Zumalai--→Ainaro)

TC2B : Cassa junction (Ainaro--→Suai)

Source : Traffic survey by TEAM Consulting Engineering and Management Co., Ltd., February, 2016.

6.6 SOCIAL COMPONENTS

Development of the condensate pipeline project may contribute both of negative and positive impacts on the peoples who are living along the Project alignment. Hence it is essential to understand the socio-economic situations of the locals. Findings / results will be used as the base information against the Project impacts. Then the measures can be formulated to prevent and mitigate the negative impacts while promoting the positive impacts. The measures however have to be in accordance with the locals' circumstances and acceptable by the people.

Information on social, and health profiles of the local communities was collected from both of secondary and primary sources. The secondary information was compiled from statistical records, maps, publications at the district and village levels, including online database. The primary information was collected through ground check, site observations and interviewing key informants who are knowledgeable about the community circumstances. These comprised government officers at district and sub-district administration offices, chief of village, chief of sub-village, mediator, elderly, and youth group. Key questions used for interviewing the key informants and photos are shown in ***Appendix 6 F***.

Baseline information on social profile was collected at the local level, covering eight villages situated in four sub-districts and three districts ***(Table 6.6-1)***.

TABLE 6.6-1

INFORMATION COLLECTION AT VILLAGE LEVEL

Village	Sub-District	District
Betano (1)	Same	Manufahi
Foho-Ailico and Leolima (2)	Hatu-Udo	Ainaro
Raimea, Tashilin and Zulo (3)	Zumalai	Covalima
Beco and Labarai (2)	Suai	
Total of 8 villages	**Total of 4 Sub-districts**	**Total of 3 districts**

Source: Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd / TIMOR GAP, E.P., February 2016

Findings are presented as follows:

6.6.1 Population Composition

(1) Population at the District Level

The three districts of Manufahi, Ainaro and Covalima are among thirteen districts in Timor Leste. Information about their population composition was gathered from Strategic Plan 2011-2030 and Popolation and Housing Cencus 2015[21], as elaborated below:

1) Manufahi District

The Project alignment starts from Manufahi District. The district lies on the south coast of Timor Sea, bordering on Manatuto District to the east, Ainaro District to the west, and Aileu District to the north. Its area is 1,323 km^2. Manufahi district comprises four sub-districts, namely Same, Alas, Fatuberliu and Turiscai. The district capital is Same. Based on 2015 census[22], its population in Manufahi was 52,246. Male population was slightly higher than the female. The number was 26,783 and 25,463, respectively.

2) Ainaro District

The Project alignment passes Ainaro District (next from Manufahi district). The district lies on the south coast of Timor Sea, bordering on Manufahi District to the east, Bobonaro and Covalima Districts to the west, and Ermera and Aileu Districts to the north. Its area is 804 km^2. Ainaro district comprises four sub-districts, namely Ainaro, Hatu-Udo, Maubisse and Hatobuilico. The district capital is Ainaro. Based on 2015 census, its population was 66,397. Male population was slightly higher than the female. The number was 33,488 and 32,909, respectively.

3) Covalima District

The Project alignment passes Covalima District (next from Manufahi and Ainaro districts). The district lies on the south coast of Timor Sea, bordering on Ainaro District to the east and Bobonaro District to the north. Its area is 1,203 km^2. Covalima district comprises seven sub-districts, namely Fatululic, Fatumean, Fohorem, Maucatar, Suai, Tilomar and Zumalai. The district capital is Suai. Based on 2015 census, its population was 64,550. Male population was slightly lower than the female. The number was 32,021 and 32,529, respectively.

[21] Some information is not available in 2015 census. Therefore the information from Strategic Plan 2011-2030 has to be used as supplementary data.
[22] Population and Housing Cencus 2015, Preliminary results, Government of Timor-Leste 2015.

Table 6.6-2 summarizes population figure of these three districts.

TABLE 6.6-2
AREA AND POPULATION IN THE THREE DISTRICTS IN THE STUDY AREA

District	Area (km^2)	Population		
		Male	Female	Total
Manufahi	1,323	26,783	25,463	52,246
Ainaro	804	33,488	32,909	66,397
Covalima	1,203	32,021	32,529	64,550

Source: Strategic Plan 2011-2030 and Popolation and Housing Cencus 2015

(2) Population at the Village Level

Information about population and its composition of eight villages[23] where the condensate pipeline passes through was gathered from two sources of (i) Statistic data of Administration office at the village and sub-district level[24] (as of 5 January 2015); and (ii) The interview of key Informants by TEAM Consulting Engineering and Management Co., Ltd / Timor Gap, February 2016. Details are shown below:

1) Betano Village

The condensate pipeline project starts from Betano Village (the first village), one of seven villages in Same Sub-district, Manufahi District. Based on 2015 census, its population was 6,071, living in 292 households, giving an average household size of about 5-6 persons. Male population was slightly higher than the female. The number was 3,149 and 2,922, respectively.

2) Foho-Ailico Village

The second village which condensate pipeline alignment passed is Foho-Ailico Village, one of two villages in Hatu-Udo Sub-district, Ainaro District. Based on 2015 census, its population was 4,473, living in 1,094 households, giving an average household size of about 4-5 persons. Male population was slightly higher than the female. The number was 2,321 and 2,152, respectively.

3) Leolima Village

The third village which condensate pipeline alignment passed is Leolima Village, one of two villages in Hatu-Udo Sub-district, Ainaro District. Based on secondary data of Hatu-Udo Sub-district, its population was 5,872, living in 1,470 households, giving an average household size of about 3-4 persons. Male population was slightly higher than the female. The number was 2,963 and 2,909, respectively.

[23] They are Betano, Foho-Ailico, Leolima, Raimea, Tashilin, Zulo, Beco and Labarai villages.
[24] These comprise Betano village, Hatu-Udo sub-distict, Zumalai sub-district and Suai sub-district.

4) Raimea Village

The fourth village which condensate pipeline alignment passed is Raimea Village, one of eight villages in Zumalai Sub-district, Covalima District. Based on secondary data of Zumalai Sub-district, its population was 1,757, living in 422 households, giving an average household size of about 4-5 persons. Male population was slightly higher than the female. The number was 905 and 852, respectively.

5) Zulo Village

The fifth village which condensate pipeline alignment passed is Zulo Village, one of two villages in Zumalai Sub-district, Ainaro District. Based on 2015 census, its population was 5,872, living in 607 households, giving an average household size of about 9-10 persons. Male population was slightly higher than the female. The number was 2,963 and 2,909, respectively.

6) Tashilin Village

The sixth village which condensate pipeline alignment passed is Tashilin Village, one of eight villages in Zumalai Sub-district, Covalima District. Based on secondary data of Zumalai Sub-district, its population was 2,370, living in 503 households, giving an average household size of about 4-5 persons. Male population was slightly higher than the female. The number was 1,259 and 1,111, respectively.

7) Beco Village

The seventh village which condensate pipeline alignment passed is Beco Village, one of five villages in Suai Sub-district, Covalima District. Based on secondary data of Suai Sub-district, its population was 5,111, living in 986 households, giving an average household size of about 5-6 persons. Male population was slightly lower than the female. The number was 2,479 and 2,632, respectively.

8) Labarai Village

The eighth village which condensate pipeline alignment passed is Labarai Village, one of five villages in Suai Sub-district, Covalima District. Based on secondary data of Suai Sub-district, its population was 2,956, living in 664 households, giving an average household size of about 4-5 persons. Male population was slightly higher than the female. The number was 1,540 and 1,416, respectively.

Table 6.6-3 shows information about number of population at the village level in the project study area.

TABLE 6.6-3

POPULATION BY VILLAGE WITHIN PROJECT STUDY AREA

Name of Village	Population (Jan 2015)			No. of Household (Jan 2015)	Family Size (Person/household)
	Total	Male	Female		
Betano	6,071	3,149	2,922	1,222	4.97
Foho-Ailico	4,473	2,321	2,152	1,094	4.09
Leolima	5,872	2,963	2,909	1,470	3.99
Raimea	1,757	905	852	422	4.16
Zulo	5,872	2,963	2,909	607	9.67
Tashilin	2,370	1,259	1,111	503	4.71
Beco	5,111	2,479	2,632	986	5.18
Labarai	2,956	1,540	1,416	664	4.45

Source: 1. Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd / TIMOR GAP, E.P., February 2016
2. Statistic data of Administration office at the village and sub-district level

(3) Age Group

Information about age group at the village level is available only at two villages of Betano and Labarai Villages, but not at the other six villages of Foho-Ailico, Leolima, Raimea, Zulo, Tashilin and Beco Villages.

Overall, the majority of people in the study area are the young generaiton, at age between 0-20 years old, followed by edu21-40 and 41-65 age group respectively. Details are:

1) Age Group at Betano Village

The young generation is the largest proportion of the people in this village. As shown in ***Table 6.6-4***, the people in age group of 0-20 years old is about 45%, followed by about 30% and 20% of the people in the age group of 21-40 and 41-65 years old respectively. The elderly group of over 65 years old is the smallest proportion (only 6%). As agriculture is the prime occupation, most villagers are self-employed in their farms. Exception is the elderly (age over 65), who are not involving in the farm anymore [25].

2) Age Group at Labarai Village

Similar to Betano, the largest proportion of the people in this village is the young generation. As shown in ***Figure 6.6-1***, the people in age group of 0-19 years account about half of total population of the village (about 54%), followed by about 28% and 13% of the people in the age group of 20-39 and 40-64 years old respectively. The elderly group of 65 years old and over is the smallest proportion (only about 5%) [26].

[25] Source: Statistic figure of Administration office of Betano Village (as of 5 January 2015).
[26] Calculation based on Sensus Fo Fila Fali, Ministeriu Finansas, 2010

TABLE 6.6-4
POPULATION IN BETANO VILLAGE CLASSIFIED BY AGE

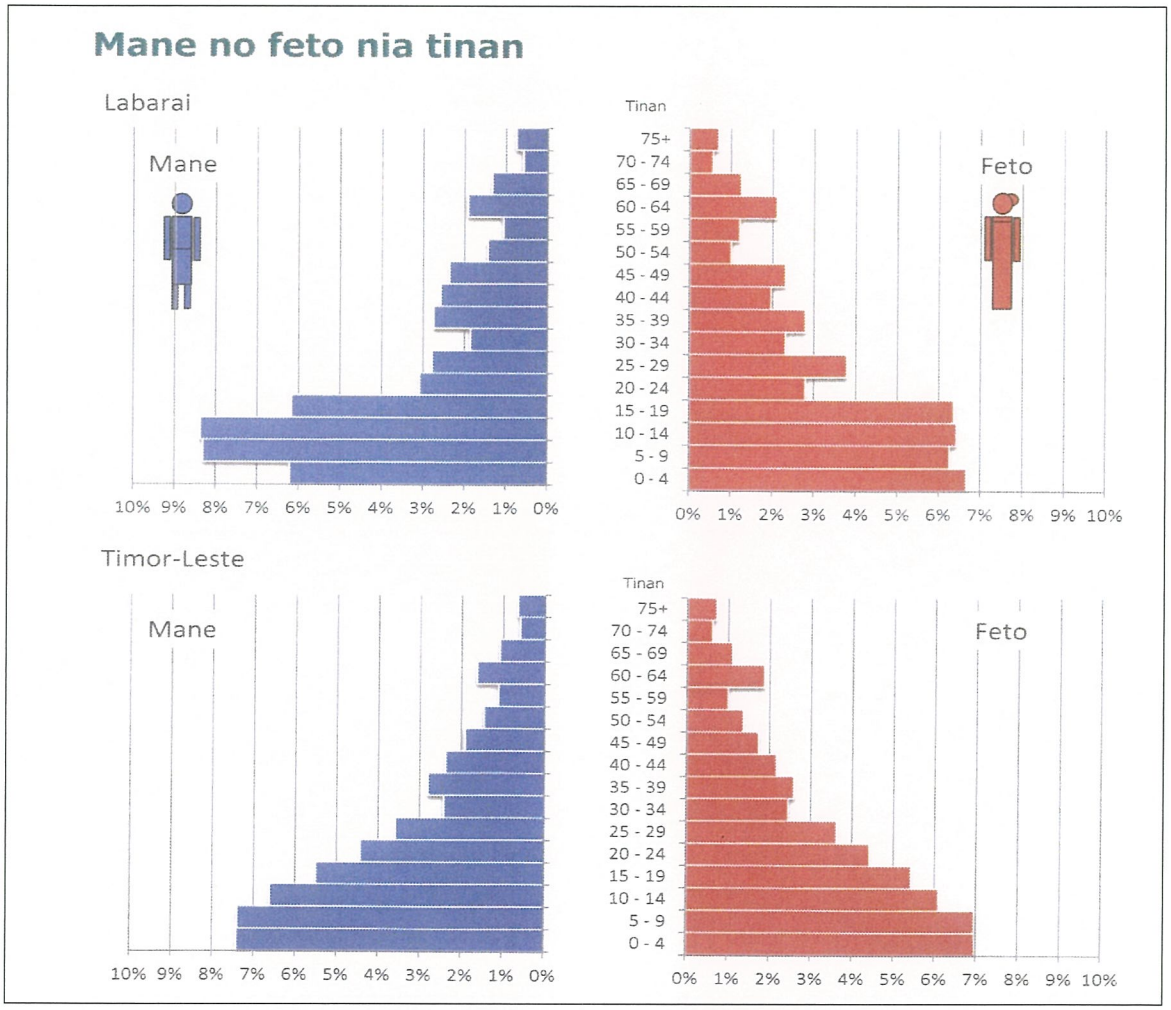
Name of Village	No. of Household (Jan 2015)	Number of population classified by age														Population		Total Population
		0-5		6-10		11-15		16-20		21-40		41-65		Over 65				
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Betano Village	1,222	221	225	426	370	417	399	370	302	931	866	612	560	172	200	3,149	2,922	6,071
		446		796		816		672		1,797		1,172		372				
Percentage		7.35		13.11		13.44		11.07		29.60		19.30		6.13				
		44.97								29.60		19.30		6.13				

Remarks: # = sub-village situated nearby Condensate pipeline alignment

Source: Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd / TIMOR GAP, E.P., February 2016

3) Comparison to Age Group at National Level

Age group of the people at Betano and Labarai Villages are similar to age group at the national level. As shown in ***Figure 6.6-1***, the largest proportion of the people in Timor Leste is the young generation. the people in age group of 0-19 years account about half of total population of the village (about 53%), followed by about 27% and 14% of the people in the age group of 20-39 and 40-64 years old respectively. The elderly group of 65 years old and over is the smallest proportion (only about 6%).



Source: Statistic figure of Administration office of Betano Village (as of 5 January 2015).

FIGURE 6.6-1 : PERCENTAGE OF POPULATION IN LABARAI VILLAGE CLASSIFIED BY AGE

(4) Education

Information about education at the village level is available at six villages of Betano, Raimea, Zulo, Tashilin, Beco and Labarai, but not at the two villages of Foho-Ailico and Leolima [27].

Overall, the majority of people in the study area do not have high education. A large number of people are uneducated, not completed primary school and completed only primary school. A small number of people have higher education than that. Details are:

1) Education Level at Betano Village

The majority of villagers in Betano Village do not have high education. About 35% of them completed only primary education and similar number are uneducated. Nearly 30% of them have higher education. The proportion of people who attended pre-secondary and secondary education was about 15% and 12%, respectively (see ***Figure 6.6-2***)[28].

2) Education Level at Raimea Village

The majority of villagers in Raimea Village do not have high education. About 40% of them completed only primary education while about 23% of them are uneducated and 15% not completed primary level. Nearly 20% completed secondary education while about 5% have higher education of high school and diploma (see ***Table 6.6-5***).

3) Education Level at Zulo Village

For Zulo village, about one-third of villagers here completed primary education while the proportion of uneducated and not completed primary school was 15% and 16%, respectively. Proportion of those who attended secondary and high school is 13% and 21%, respectively. About 1% of them have higher education than that (see ***Table 6.6-5***).

4) Education Level at Tashilin Village

About two-third of villagers in Tashilin Village do not have high education. Proportion of uneducated, not complete primary school and completed primary school is in the range of 20-23% while those who attended secondary and high school were 12% and 20%, respectively. Similar to Zulo village, about 1% of them have higher education than that (see ***Table 6.6-5***).

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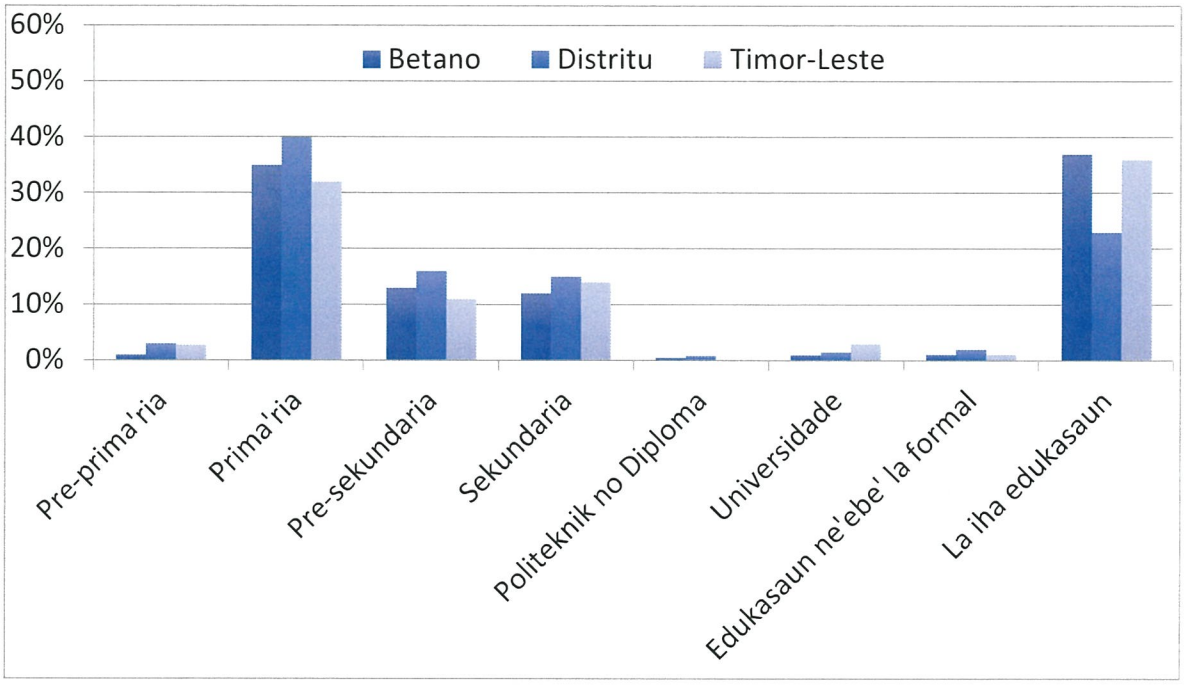
[27] Source: 1. Statistic Figure from Zumalai and Suai Administration offices
2. Key Informant Interviewed by TEAM Consulting Engineering and Management Co., Ltd and TIMOR GAP, E.P., February 2016

[28] Calculation based on Sensus Fo Fila Fali, Ministeriu Finansas, 2010.

Nivel edukasaun ne'ebe' hetan

Hosi ema ne'ebe' tinan 5 ba leten

Target: Iha 2015 proporsaum ema hetan edukasaun sekundaria tenki to'o 20%.



Source: Sensus Fo Fila Fali, Ministeriu Finansas, 2010.

FIGURE 6.6-2 : EDUCATION LEVEL AT BETANO VILLAGE

TABLE 6.6-5

POPULATION INZUMALAI AND SUAI SUB-DISTRICT CLASSIFIED BY LEVEL OF EDUATION

Name of Village	Level of Education by Percentage									
	LE (No education)	ELR (Not complete)	EP (Primary School)	EPS (Secondary School)	ES (High School)	BCL (Diploma)	LIC (Bachelor Degree)	MASEST. (Master)	DTR (Doctor)	Total
Raimea	22.77	15.33	39.66	17.67	3.53	1.05	0.00	0.00	0.00	100.00
Zulo	14.56	16.04	32.20	14.68	17.52	0.57	4.21	0.11	0.11	100.00
Tashilin	22.51	19.81	23.07	12.47	20.74	1.21	0.09	0.09	0.00	100.00
Beco	60.93	2.43	35.61	0.00	0.00	0.12	0.84	0.08	0.00	100.00
Labarai	54.19	0.00	20.74	9.47	12.99	0.34	2.10	0.17	0.00	100.00

Source: Key Informant Interviewed by TEAM Consulting Engineering and Management Co., Ltd / TIMOR GAP, E.P., February 2016 and statistic from Zumalai and Suai Administration offices.

5) Education Level at Beco Village

The majority of villagers in Beco Village have low education. Uneducated people are the largest group (about 60%). About one-third of the total population here completed only primary education. Only 1% of them have higher education, at diploma level and beyond (***Table 6.6-5***).

6) Education Level at Labarai Village

Similar to Beco, the majority of villagers here have low education. More than half of the people here are uneducated while about 20% of them completed only primary education. About 10% and 13% of them attended secondary and higher school respectively. A few of them have higher education (less than 3%, ***Table 6.6-5***).

(5) Language

Despite not large area involved, four major languages are spoken in Betano Foho-Ailic, Leolima, Raimea, Tashilin, Zolu and Beco villages. Tetum Prasa and Mambai are spoken by the largest proportion of the locals (about 40% in each language), followed by Tetum Terik and Bunak. For Labarai village, more than 90% of local people speak Bunak language, the remaining are Mambai and Makasai.

The major religious in this area is Catholic, followed by Protestant.

(6) Minority Groups

There is no minority group in these eight villages, along the proposed condensate pipeline alignment.

(7) Vulnerable Groups

Vulnerable groups are identified into 2 categories of disabled people and persons living alone. The number of vulnerable persons is small, in comparison to the total population. A total number of 204 disabled persons were found in these eight villages. The number is varied from village to village, in a range of 3-68 persons per village. The highest number is in Tashilin Village, of 68 persons while the smallest one is 3 persons in Beco Village.

A total number of living alone persons in six villages of the study area is 68 persons. The number is varied from village to village, in a range of 2-32 persons. The highest number is in Zulo Village, of 32 persons while the smallest one is 2 persons in Beco Village.

According to key-informants, all of disabled person were supported by the Government of Timor-Leste. They got subsidy from government about 2 times per year, at the rate of 30 USD/person/time. However, by social structure, they are taken care of by relatives and neighbors and are living in the communities without difficulties.

Table 6.6-6 shows the number of vulnerable group by village.

TABLE 6.6-6

IDENTIFIED VULNERABLE GROUP IN THE PROJECT STUDY AREA

Vulnerable groups	Number (persons)								Total
	Betano	Foho-Ailico	Leolima	Raimea	Zulo	Tashilin	Beco	Labarai	
Disabled people	7	35	10	20	51	68	3	10	204
Orphan	-	-	-	-	-	-	-	-	-
Persons living alone household	-	-	5	10	32	7	2	12	68
Homeless	-	-	-	-	-	-	-	-	-

Source : Key Informant Interviewed by TEAM Consulting Engineering and Management Co., Ltd and TIMOR GAP, E.P., February 2016

(8) Gender Situation

In general, men and women have similar role in Timor-Leste. However, the study team found that the women decision is dominated in some roles such as cooking and children education.

Therefore, there are no gender issues within the study area. Roles, work division and decision making between men and women are determined by physical conditions, social structure and norms. Decision making on some aspects are on a joint or sharing basis by both male and female. Once a decision is made in a family by one party, it will always be respected by another party. For example, men and women are making decisions together on participation in activities in their community, property purchasing and religious activities. While men play a major role on fishing, farming and political interest, women dominate in cooking and children's education29.

(9) Communities

The people in the study area are rural type people. They have close relationship and help each other in the same village.

(10) Social Problems and Crime

According to the interview of key informants by TEAM Consulting Engineering and Management Co., Ltd., and TIMOR GAP, E.P. in February 2016, serious problems in each village were identified as follows:

[29] **Source:** Key Informants Interviewed by TEAM Consulting Engineering and Management Co., Ltd., and TIMOR GAP, E.P., February 2016.

1) Betano Village

The serious problems here are poverty and land holding.

2) Leoima Village

The serious problems in Leoima village are land dispute and sexuality violence.

3) Foho-Ailico Village

The serious problem in Foho-Ailico village is land ownership.

4) Raimea, Zulo, Tashilin and Labarai Villages

The serious problem in these four villages is land dispute.

5) Beco Village

According to the key informants, there is no serious problem in this village.

(11) Opinions Towards the Project Development

According to the interview of key informants, the communities in these eight villages have totally agreed (100%) with the project development. Their reasons were as the Project would offer job opportunities including capacity building and development at the local and national level of Timor-Leste.

In addition, their recommendations towards the project development were:

- Priority of employment should be given to local workers,
- Fair compensation for land and properties being affected by the project,
- Similar compensation rate in each of the project affected area,
- Close coordination with chief of villages and sub-villages during project construction and implementation,
- Clearly inform the local people about impact level and affected area,
- The project staff should respect to local culture,
- Concerns on impacts on sacred places nearby condensate pipeline alignment,
- The project should prepare for water spraying along project construction area,
- The project should minimize negative impacts caused by the project implementation, and
- Provision of proper resettlement site for project affected people.

6.6.2 Health Profiles of Communities

Information about health profiles of communities was derived from in the interview of key informants at the village and sub-village level in the study area undertaken by TEAM Consulting Engineering and Management Co., Ltd. and TIMOR GAP, E.P in February 2016.

(1) Access to Health Services

Most of the people in these eight villages are relying on the service of village hospital. Their preference is the village hospital due to better equipped than health care center available in all sub-villages where each center has only temporary doctor, one nurse, and no bed. These are alternatives for people who live nearby.

(2) Mortality and Morbidity

There are no serious health problems in all sub-villages in the study area. The mortality and morbidity rates are low.

(3) Nutrition Levels

There are no specific data about nutrition, at the sub-village and village levels.

(4) Communicable Diseases

Communicable diseases in the study area appear to be common cold and malaria.

6.6.3 Institutions, Schools and Health Facilities

Information about institutions, schools and health facilities was derived from the interview of key informants undertaken by TEAM Consulting Engineering and Management Co., Ltd. and TIMOR GAP, E.P in February 2016. Details are:

(1) School and Other Infrastructure Facilities

Primary and secondary schools are available in nearly every village, except Beco where only one elementary school exists. Well, church, shop and village hall are also available in all villages. The number of existing infrastructure and social facilities in the eight villages is shown in ***Table 6.6-7***.

TABLE 6.6-7

NUMBER OF SCHOOLS AND OTHER INFRASTRUCTURE FACILITIES IN PROJECT STUDY AREA

School and Other Infrastructure Facilities	Betano	Foho-Ailico	Leolima	Raimea	Zulo	Tashilin	Beco	Labarai
Elementary School/Nursery	2	-	2	-	-	-	1	-
Primary School	5	7	9	4	3	4	-	11
Secondary School	1	1	3	1	2	1	-	2
Junior High School	-	-	-	-	-	-	-	-
High School	-	1	-	-	-	-	-	-
Technical School	1	-	-	-	-	-	-	-
Well (specified shallow, deep well?)	> 40	>30	>50	34	4	>30	5	>30
Chapels	-	-	-	-	-	-	-	-
Church	>8	7	3	4	2	2	2	6
Mosque	2	-	-	-	-	-	-	-
Grave	-	-	-	3	3	2	-	11
Shops (approx.)	> 25	>30	>30	>20	>20	>25	>20	>30
Market	1	1	2	-	2	-	-	1
Recreation	-	-	-	-	1	-	-	-
Village Hall	2	1	1	1	1	1	1	1
Waste dump	-	-	-	-	-	-	-	-
Others (specified)	-	-	-	-	-	-	-	-

Source : Key Informant Interviewed by TEAM Consulting Engineering and Management Co., Ltd and TIMOR GAP, E.P., February 2016.

(2) Health Facilities

Villagers nearby the proposed condensate pipeline alignment rely on village hospital, except some communities and sub-villages which are far from the village hospital, they rely on health center of the sub-village.

(3) Amenities

The major amenities of villagers comprise mobile telephone, followed by radio and TV.

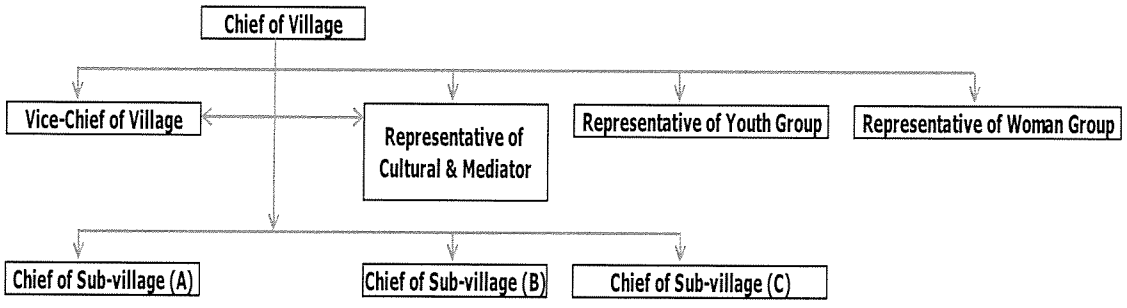
(4) Communication Network

The major communication network is mainly by mobile phone. The major vehicle using within village are bicycle, followed by motorcycle and small number of car/van. In term of travelling within and between villages, motorcycle is the major transportation mode, followed by bus and hired pick-up to transport goods.

6.6.4 Communities Structures and Family Structures

Information about communities structures and family structures was derived from the interview of key informants performed by TEAM Consulting Engineering and Management Co., Ltd and TIMOR GAP, E.P in February 2016.

Based on the old cluster type of settlement and social structure, the local communities pay respect to their leaders, chiefs of villages, and the mediator in particular. Normally, there are formal social groups in the study area, responsible for community activities. For example, they gather together to serve the local needs related to religious and funeral activities. Each member attends the activities and shares responsibility with the others in their communities. General village structure in the project study area is illustrated in ***Figure 6.6-3***.



Source : Information derived from the interview of key informants performed by TEAM Consulting Engineering and Management Co., Ltd and TIMOR GAP, E.P, February 2016

FIGURE 6.6-3 : GENERAL VILLAGE STRUCTURE IN THE PROJECT STUDY AREA

Youth group is active at the community level. The number of members of each youth group varies from place to place. The group in Betano village has 2 representatives from each sub-village. The youth groups help in community functions when required such as in religious ceremonies, or when the communities ask for their assistance.

6.6.5 Land Ownership

Information about land ownership in relation to land use was derived from the interview of key informants performed by TEAM Consulting Engineering and Management Co., Ltd and TIMOR GAP, E.P. in February 2016.

Besides natural forest, land in this area is used for farming and housing. Farm land accounts for about 90% of the total land area while residential area accounts for the remaining. The average land holding per household is around 1.5-2 ha.

For land ownership, some households in these communities have no land right document. Land ownership documents could be Land Certificate or Tax Receipt for residential land.

Officially, land belongs to the government. However, land is controlled by family, at the local level. Land transition is within family and within village area.

6.6.6 Natural Resources Utilization

Information about natural resources utilization was also derived from the interview of key informants. It was performed by TEAM Consulting Engineering and Management Co., Ltd and TIMOR GAP, E.P in February 2016.

Natural resources utilizations can be classified into 3 categories of, medicine, housing and fuel. The medicine herbs such as those for curing digestion system and malaria are collected from forest nearby communities, all year round. Apart from collecting woods for buildings and fuel, villagers also collect firewood for sale.

6.7 CULTURAL COMPONENTS

6.7.1 Cultural Heritage

The study of cultural heritage has been based on information obtained from: (i) Final Report of the Strategic Environmental Impact Assessment, Tasi Mane Project-Betano Petroleum Refinery and Beaço LNG Plant (TIMOR GAP, E.P., 2012)[30] and (ii) interviewing District Officers of Ainaro and Covalima; sub-district officers of Ainaro, Suai, Zumalai and Hato-Udo, Chiefs of Leolima, Raimea, Tashilin, Zulo, Foho-Ailico, Beco and Labarai villages; and Chief of Ainaro Ki'ik sub-village (Bobe community) and Hutseo sub-village (Bonuc community).

Findings show that the majority of the people here are Austronesian (Malayo-Polynesian) and Papuan, speaking four languages of Mambai, Tetum Prasa, Tetum Terik and Bunak. Among these, Mambai is preferred language.

Most of the people practice Roman Catholic. Very small number of people practice Protestant/Evangelical, Muslim and others.

The people strongly respect to sacred places, which are common in communities. They are in form of stream, rock, tree, house or bush. Sacred sites, churches, cemeteries and historic grave sites are located outside the project site.

6.7.2 Archeological Sites and Historic Sites

Timor-Leste has an incredibly rich and diverse cultural heritage. In each part of the country, there are languages, dances, music and other forms of social and artistic expression that cannot be found anywhere else in the world which was managed to sustain vibrant and meaningful traditions that date back thousands of years. Timor-Leste has been nominally Catholic since early in the Portuguese colonial period. Based on the information from the result of field survey in February 2016, there is an old port of Portuguese in the Betano sub-village as shown in ***Photo 6.7-1***. This port is located about 1.7 kilometer to the south of condensate pipeline. Another historical site is in the Ainaro district as shown in ***Photo 6.7-2***. The historical site is in the Suai sub-district called "Ave Maria Church" that located about 5.8 kilometer to the west of the condensate pipeline as shown in ***Photo 6.7-3.***

[30] Prepared by WorleyParsons



Source : Field survey by TEAM Consulting Engineering and Management Co., Ltd, February 2016.

PHOTO 6.7-1 : OLD PORT OF PORTUGUESE





Source : Field survey by TEAM Consulting Engineering and Management Co., Ltd, February 2016.

PHOTO 6.7-2 : HISTORIC SITE IN AINARO DISTRICT



Source : Field survey by TEAM Consulting Engineering and Management Co., Ltd, February 2016.

PHOTO 6.7-3 : AVE MARIA CHURCH

6.7.3 Sacred Sites

Based on the information from the result of field survey in February 2016, there are sub-villages along the condensate pipeline between KM 35+000 to KM 50+000 namely Bonoc and Bobe sub-villages, which are the old settlement communities. There is a cemetery in the Bobe sub-villages as shown in ***Photo 6.7-4***. This cemetery is located about 650 meter to the north of condensate pipeline.



Source : Field survey by TEAM Consulting Engineering and Management Co., Ltd., February 2016.

PHOTO 6.7-4 : CEMETERY IN BOBE SUB-VILLAGE

6.7.4 Unique Landscape

All the natural visual components of the project area do not form a picturesque unique landscape. The current landscape quality is considered at a moderate level.

CHAPTER 7

CLIMATE CHANGE

CHAPTER 7

CLIMATE CHANGE

This chapter discusses the climate change relevant to activities of the proposed project during the pre-construction, construction, operation, and decommissioning phases. As prescribed in the format requirements for an Environmental Impact Statement (EIS), the climate change discussions cover: (i) historic weather observation, and trends; (ii) future projections under projected climate change; (iii) implications for the proposed project, or the environmental as a results of these trends and projections; and (iv) the proposed measures to mitigate potential impacts.

7.1 HISTORIC WEATHER OBSERVATION AND TRENDS

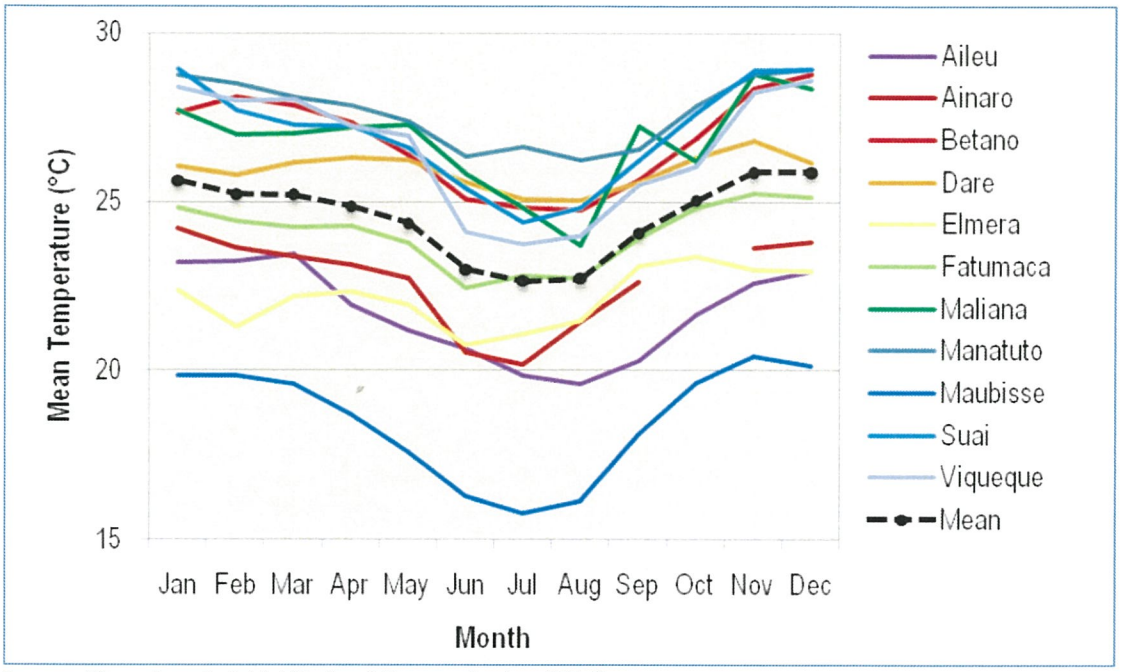
Timor-Leste ratified the United Nations Framework Convention on Climate Change (UNFCCC) in October 2006, and subsequently the Kyoto Protocol to UNFCCC in October 2008. As a party to the UNFCCC, Timor-Leste has an obligation to report its National Communication to the Conference of the Parties (COP). Timor-Leste submitted the National Adaptation Programme of Action in 2011 (NAPA: 2011) and Initial National Communication in 2014 (INC: 2014), respectively

According to the INC: 2014, the weather observation data of Timor-Leste during 1901-2009 include mean monthly temperatures and mean monthly rainfalls. The details are summarized as follows:

- ***Temperatures***

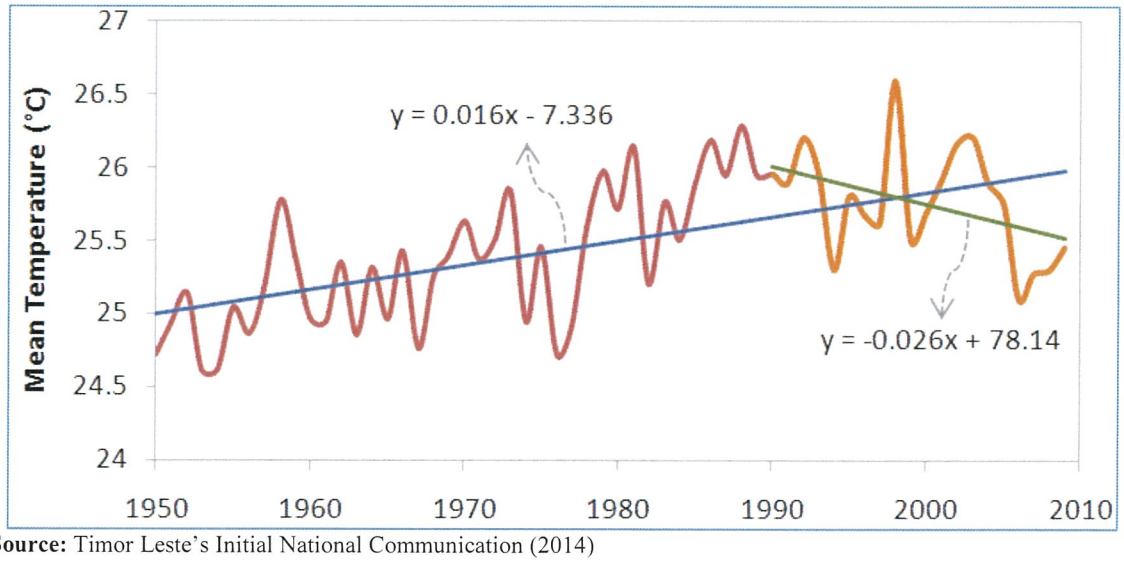
Figure 7.1-1 shows the monthly mean temperatures of 11 climate stations in Timor-Leste. The monthly mean temperatures ranged from 20 °C to 30 °C during the wet season and 16 °C to 27 °C during the dry season.

Figure 7.1-2 shows the annual mean temperatures over the reporting period. The data show that the annual mean temperature increased over the reporting period at an average rate of 0.016 °C/year. However, over the last two decades of the reporting period, the annual mean temperatures decreased at an average rate of about 0.016 °C/year. Nevertheless, the INC: 2014 projected the rising trend of annual mean temperatures in the long term considering the future economic growth of the country.



Source: Timor Leste's Initial National Communication (2014)

FIGURE 7.1-1: MONTHLY MEAN TEMPERATURE OF 11 CLIMATE STATIONS IN TIMOR-LESTE DURING 1901-2009



Source: Timor Leste's Initial National Communication (2014)

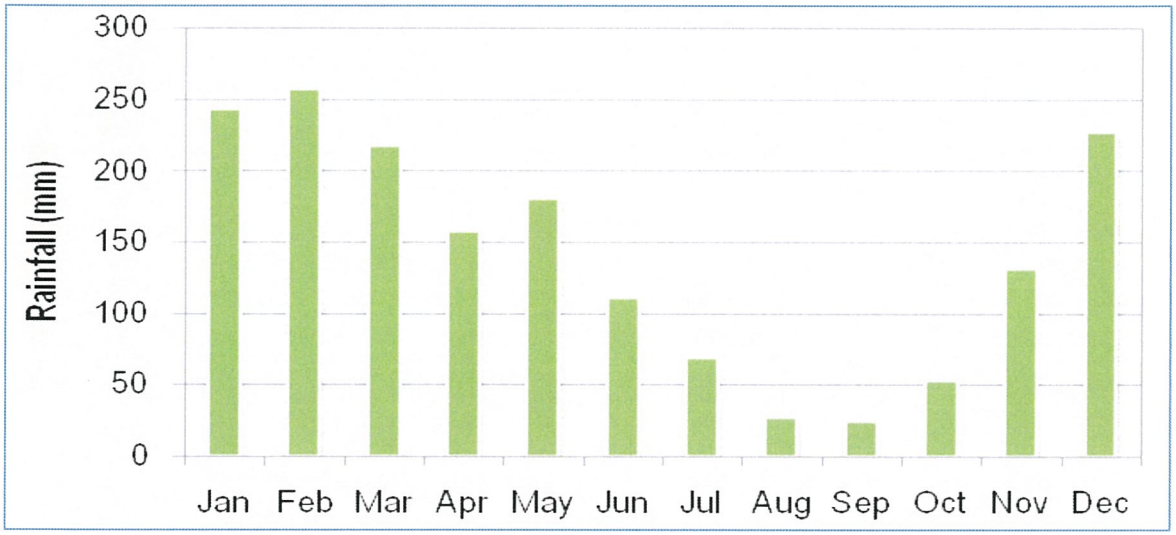
FIGURE 7.1-2: TREND OF ANNUAL MEAN TEMPERATURE OVER TIMOR-LESTE

- ***Rainfall***

Figure 7.1-3 shows the monthly rainfall records of 36 stations in Timor-Leste. The highest monthly rainfalls of about 250 mm were found in January and February. The lowest monthly rainfall of about 25 mm was experienced in August and September.

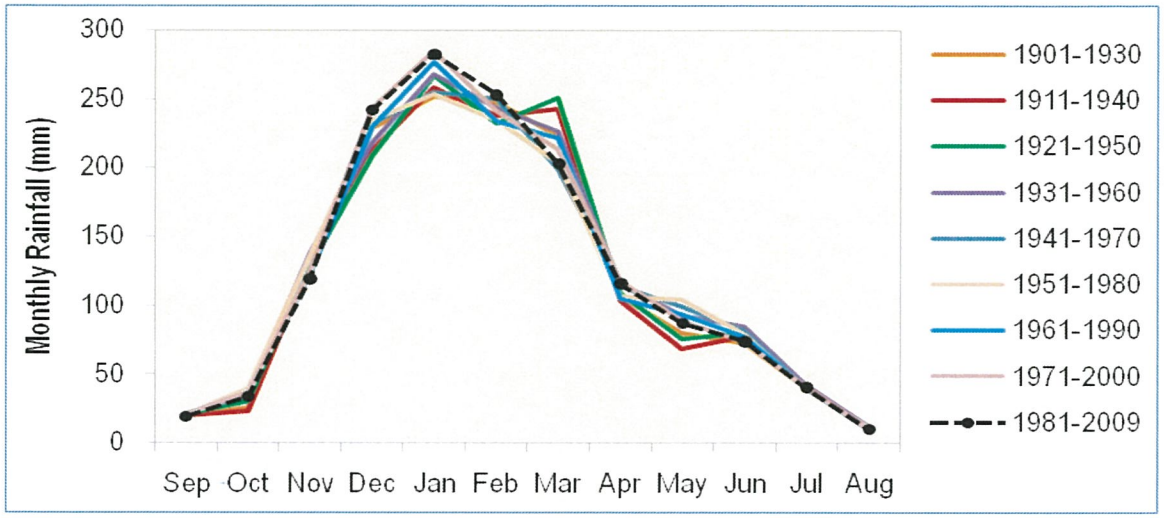
Figure 7.1-4 shows the comparison of mean monthly rainfalls of 10 consecutive periods, each period covering 30 year data. Significant changes in the monthly rainfalls are noted in the wet season, especially during December, January, and March.

Moreover, the decadal annual rainfall over Timor-Leste was plotted as shown in ***Figure 7.1-5***. The graph exhibits an increasing trend of the decadal annual rainfalls at a rate of about 6.4 mm./decade.



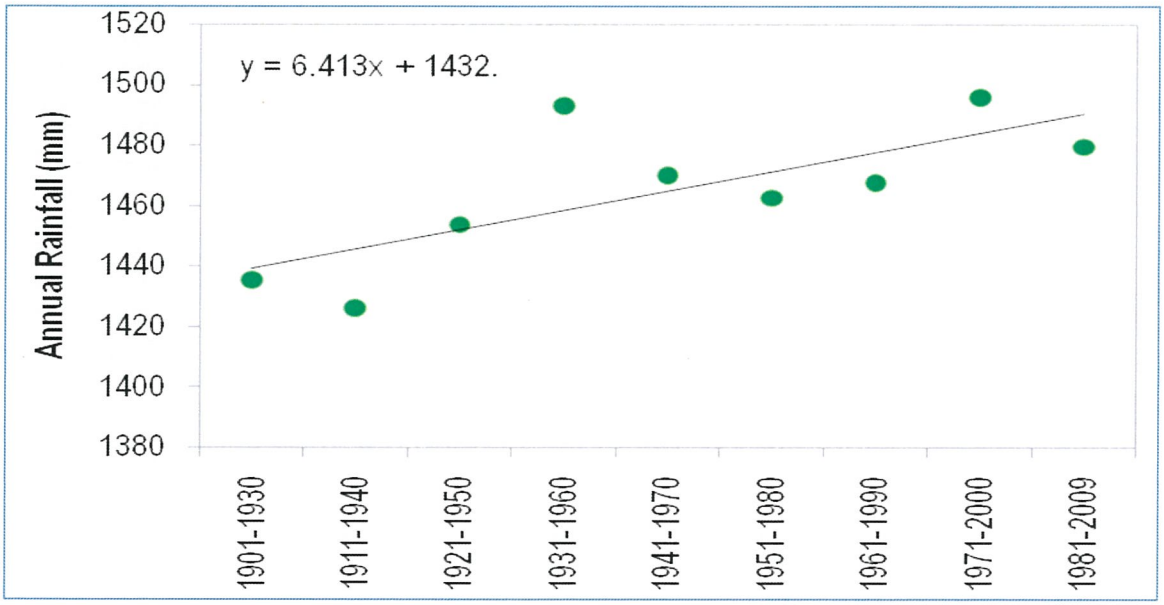
Source: Timor Leste's Initial National Communication (2014)

FIGURE 7.1-3 : MONTHLY MEAN RAINFALL OVER TIMOR-LESTE DURING 1901-2009



Source: Timor Leste's Initial National Communication (2014)

FIGURE 7.1-4 : COMPARISON OF MONTHLY MEAN RAINFALL OVER TIMOR-LESTE



Source: Timor Leste's Initial National Communication (2014)

FIGURE 7.1-5 : DECADAL TREND OF MEAN ANNUAL RAINFALL OVER TIMOR-LESTE

7.2 FUTURE PROJECTIONS UNDER PROJECTED CLIMATE CHANGE

According to the INC: 2014, the projections of climate change of Timor-Leste were made based on the historic weather data using the multi-model. The predicted results are summarized below:

(1) ***Temperature:*** In the long term, at an increasing rate of 0.016 °C/year, the annual temperature over Timor-Leste is likely to increase by 1 °C by the year 2040. After 2040, under the high emission scenario (RCP8.5), the annual temperature may increase up to 3 °C by the year 2100, while the low emission scenario (RCP2.6) predicted an increase up to 0.5 °C.

(2) ***Rainfall:*** The historic weather data suggests some shifts in the peak of the wet season during 1901-2009. In the long term, the rainfall pattern may change. Depending on the emission scenarios used in the projections, the beginning of the wet season may delay about 20 days, while that of the dry season about 11 days. Moreover, the extreme rainfall events will become more intense as a result of decreasing numbers of tropical cyclones albeit with stronger intensity (Pacific Climate Change Science Program 2011).

7.3 IMPLICATIONS FOR THE PROPOSED PROJECT

7.3.1 Source of Potential Impact

The potential impact on the climate change of project activities is the emissions e of greenhouse gases (GHGs) consisting of carbon dioxide (CO_2), nitrous Oxide (N_2O), and methane (CH_4). The sources of GHGs emissions at each phase of the project are summarized below:

(1) ***Pre-construction and Construction Phases:*** The main source of GHGs during these phases is the operation of diesel-engined equipment such as backhoes, bulldozers, and trucks, etc. The quantities of GHGs emissions could be estimated from information on the number and types of diesel engine equipment, their hours of operation, and GHGs Emission Factor. Considering the Project construction plan, the number, type of diesel engine equipment, and their hours of operation could be roughly estimated.

(2) ***Operation Phase:*** The main source of GHGs during this phase is the electricity consumed for the pumping operation. However, the quantities of GHGs emission is very small and can be negligible.

(3) ***Deactivation Phase*****:** The operation of diesel engine equipment such as truck, backhoes, and bulldozers, etc. However, deactivation or decommissioning of the pipeline system will be carried out at the end of the pipeline life, in accordance with prevailing legislation and industry best practicable technology available at that time. The activities will be reverse of the construction. The pipeline would be cleaned before decommissioning. The pipe bridges will be demolished and the pipes will be removed for disposal as scrap. The pipes under the ground or the rivers would be left as they are since those pipes are empty, there will be no impacts on soil and water including communities nearby. The pig station will be demolished. This plan should be prepared at least 12 months before the

decommissioning. The decommissioning phase would be from 6 to 12 months. An EIS would be required for environmental clearance of the decommissioning plan.

At this EIA stage, the quantities of GHGs emissions in the decommissioning phase are roughly estimated based on an assumption that the GHGs emission would be one-fourth of those to be used in the construction.

7.3.2 Predicted GHGs Emissions

The total quantity of GHGs Emission during these phase is calculated by simple mathematical model or equation together with the emission factors from Off-road Mobile Source Emissions (South Coast Air Quality Management District; SCAQMD, 2016). Details are provided in ***Appendix 7A,*** and a summary is given below. The contribution of the Project to the GHGs emissions would be highest during the pre-construction and construction phases, about 0.0043 Mt of CO_2e throughout 3 year of these phases. This amount of GHGs emissions is about 0.29% of the total GHG emissions of Timor-Leste in 2010 (1,482.61 Gg of CO_2e or 1.48 Mt of CO_2e/year, total GHG emissions excluding land use change and forestry) as estimated in the INC: 2014.

Phase	Source	GHGs Emission (Mt of CO_2e)
Pre-construction and Construction Phases	The operation of diesel engine equipment such as backhoe, bulldozer, and Truck, etc.	*0.0043*
Operation Phase	The electricity consumed for pumping operation	-
Deactivation Phase	The operation of diesel engine equipment such as backhoe, bulldozer, and Truck, etc.	*0.0011*

7.3.3 Evaluation of the Significance of Impacts

In the context of Timor-Leste, the annual contribution of this Project to the GHGs emissions of the country during the project for all phases could be considered Low. Evaluation of the impact is shown below.

Categories	Level of Impacts		
	Pre-construction and construction	Operation	Deactivation
Impact category	Indirect impacts	Indirect impacts	Indirect impacts
Impact duration	Long	Long	Long
Impact extent	Regional	Regional	Regional
Impact magnitude	Insignificant	Insignificant	Insignificant
Impact severity	Insignificant	Insignificant	Insignificant
Control priority	Low	Low	Low

7.4 PROPOSED MEASURES TO MITIGATE POTENTIAL IMPACTS

Despite the insignificant contribution of the Project to the country's GHGs emissions, the Project Proponent should implement measures to minimize the GHGs emissions by adopt relevant measures specified in INC: 2014.

CHAPTER 8

ALTERNATIVES

CHAPTER 8

ALTERNATIVES

All documents on the pipeline design we have received have no information on the alternative design selection. We have drafted this from our understanding.

This chapter reviews the justification from techno-economic and environmental grounds of the selected pipeline alignment, pipeline installation, and river crossing.

8.1 ALIGNMENT ALTERNATIVES

As the highway alignment is already fixed, the pipeline alignment has to follow the highway alignment for the following reasons:

(1) The highway alignment is the shortest route from Betano to Suai Supply Base.

(2) A new pipeline alignment will increase the construction cost of the pipeline and will take more time in land acquisition.

(3) A new pipeline alignment will require a new road for routine inspection and maintenance of the pipeline. Therefore, it will require more land than using the highway alignment.

8.2 PIPE INSTALLATION ALTERNATIVES

For the sections on land, the pipeline can be laid on-ground on precast concrete sleepers or other strong supporting material, or underground. Advantages and disadvantages of the two installation alternatives are compared in ***Table 8.2-1***.

TABLE 8.2-1

COMPARISON BETWEEN ON OR ABOVE GROUND AND BELOW AND BELOW GROUND ALTERNATIVES

Considerations	On or Above Ground	Below Ground
A. Cost Implications		
External coating	Not required	Required
Cathodic protection	Not required	Required
Painting as external coating	Required	Not required
Insulation	Applicable, if required	Not required
Pipe support	Required	Not required
Fencing	Required	Not required
Traffic obstruction	Obstruction	No obstruction
Risk of accidental damage	High	Low
Maintenance	Easy	More difficult
Risk of vandalism	High	Low
Construction time	Shorter, no excavation	Longer, need excavation
B. Environmental Implications		
Fencing (blocking traffic)	Required	Not required
Environmental disturbances during construction	Less	More, noise and dust
Risk of accidental fire or explosion from pipe damage	High, wide area	Low, smaller area

8.3 RIVER CROSSING ALTERNATIVES

There are four methods of pipeline river crossing: (i) open trench method; (ii) bridge connection; (iii) suspension connection; and (iv) trenchless crossing under the river bed.

(1) Open Trench Method: This method requires excavation of pipe trench on the river bed using a dry open cut trench method. In dry open cut methods water flow is maintained by damming and over pumping or using temporary "flume" pipes installed in the bed of the watercourse. Alternatively, the river bed could be dredged or excavated. The pipe is then laid into the trench along the river bottom. The trench is backfilled, and covered with concrete mats. Dredging often results in water & river bottom degradation. This method has a larger environmental footprint, and the pipe is more exposed to damage from third party impacts, including ship anchors and underwater debris. If a leak does occur, pipe is just a few feet from entering the river. By nature, open trench is underground.



Open Trench Method

(2) Bridge Connection Method: Pipe is routed along existing bridges and water crossings. This type of crossing poses risk to bridge traffic, and there are environmental risk as waterways are exposed to spills. Pipe is exposed to third party impact, the most common form of damage to pipelines. Increasing governmental regulation is being focused on this type of crossing.



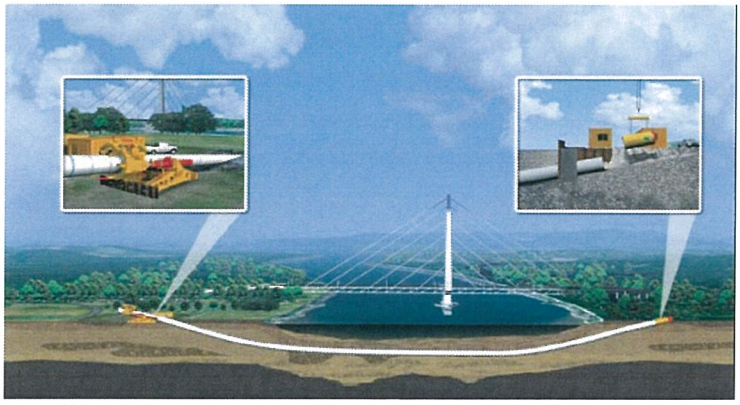
Bridge Connection Method

(3) New Aerial Pipeline Bridge Method: In this method, pipelines are installed above the water surface. Pipe support structure would be required for long span. Alternatively, Suspension Connection Method may be used in which pipelines are supported like a suspension bridge. This method is often used in remote areas when the horizontal directional drilling method is not possible due to subsurface conditions, length and/or pull load of the pipe. Pipe exposure is an environmental risk.



New Aerial Pipeline Bridge Method

(4) Trenchless Crossing Method: There are several techniques and methods for underground and trenchless installation. They all belong to the category of ramming, fluid assisted drilling, and micro-tunneling methods. Mainly roads and railway tracks are crossed with ramming and drilling techniques; the other method, horizontal directional drilling (HDD), is also used for undercrossing larger rivers and their foreland. The trenchless method is the obvious alternative, not only when obstacles occur along the pipeline course, but also when sensitive natural habitats need crossing and damage has to be avoided. The choice of the right method depends mainly on pipe diameter, length of the bore, geology and geo-technical conditions. The dimensions, depth, excavating and set-up of the start and target pits, the size (dimensions) of the required working space as well as the measures for ground water drainage differ from one method to the other.



Trenchless Crossing Method

8.4 ALTERNATIVE SELECTION

8.4.1 Inappropriate Methods

There are 3 inappropriate methods.

The open trench method is ruled out considering difficulties in trench excavation during high flows and damage to the river beds. Damming the rivers would also be a major task with high construction costs and impacts on river ecosystems.

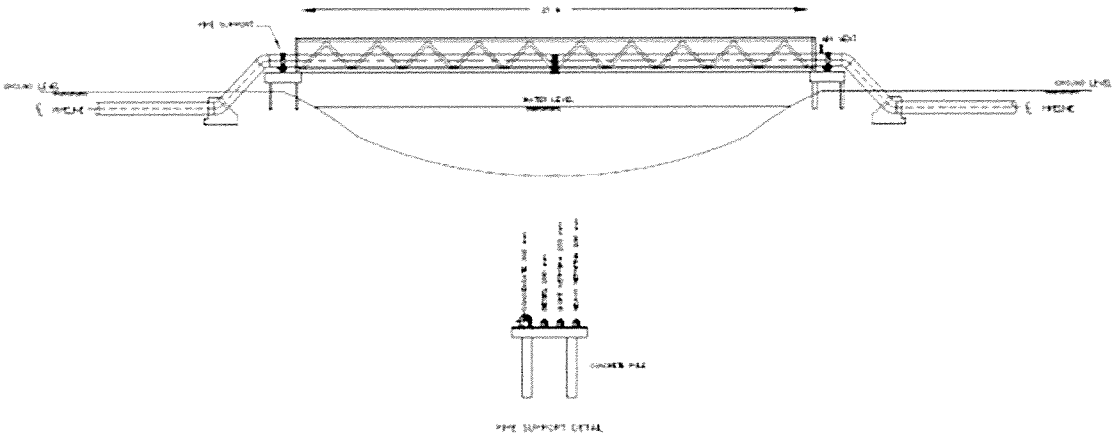
The bridge connection method is ruled out as the highway bridges are not structurally designed for carrying four steel pipes and bridge vibration from traffic could damage the pipes.

The trenchless methods are also considered inappropriate considering the following factors:

- The methods will require special machines which have to be brought in from overseas and return to the country of origin after the pipe installation is completed. Therefore, the methods would be expensive and consume time.
- Four pipes will have to be installed as near each other as possible. This would be difficult for the trenchless methods.
- Not all stream crossings are candidates for bores or drills. A significant amount of staging area is required on both sides of the stream to successfully compete bores. Even more is required to complete the HDD method. If the slope to the stream side is steep, wooded, or unstable as in the Project area, it is not possible to establish the staging area and mobilize the equipment to complete the hole.
- Directional drilling works best in relatively soft, consolidated materials such as dense clay or sandstone. These materials are conducive to drilling and have the mechanical integrity for the hole to remain open. However, if cobbles and boulders are present as in the streams and rivers in the Project area, directional drilling may not be practical because the hole cannot be maintained to pull the pipe through.
- There is a paucity of information on conditions under the river beds.

8.4.2 Appropriate Method

The new aerial pipeline bridge method is selected for pipeline installation crossing streams and rivers cutting the pipeline alignment. The pipeline may be supported by in-river columns or by truss structure without in-river columns. ***Figure 8.3-1*** shows typical pipeline supports for crossing small rivers. For the two large rivers (Mola 400 m width and Karaulun 800 m width), a number of in-river support columns will be required. Detailed designs of the pipeline crossing of these two rivers are being prepared.



TYPICAL : PIPE CROSSING FOR SMALL RIVER(25-50 m)

FIGURE 8.3-1 : TYPICAL PIPELINE SUPPORT DESIGNS FOR SMALL RIVER CROSSING

CHAPTER 9

IMPACT ASSESSMENT AND MITIGATION MEASURES

CHAPTER 9

IMPACT ASSESSMENT AND MITIGATION MEASURES

9.1 SCOPE OF THE ASSESSMENT

A. Meaning of Environmental Impact

The meaning of Environmental Impact is provided in Decree Law No. 5/2011, Dated February 9, as follows:

A set of positive and negative alterations in the environmental and social parameters comprising, among others, the people and their economic and social structures, air, water, fauna, flora or in their habitats, within a specific period of time and in a specific area, resulting from the execution of the project. The impacts will be analyzed comparing the situation that would have occurred during this period of time and in this area had the project not been implemented;

The above meaning of environmental impact indicates changes in the natural and social environment that are caused by the project implementation. Such changes will take place over a period of time (temporal scope) and in a specific area (geographical or spatial scope).

The above meaning of environmental impact also indicates that environmental impact also covers social impact. However, MREIS prescribes Social Impact Assessment to be presented as a section (MRESI, Section 9) separate from the section on Impact Assessment and Mitigation Measures (MREIS, Section 8). The Consultant notes that the content of the Social Impact Assessment section detailed in MREIS is similar to that of a social assessment for project preparation. The scope covers direct social impacts such as land acquisition, social development issues related to the proposed project, and stakeholder participation to ensure equitable sharing of project benefits.

B. Project Phases

Impact assessment will cover the pre-construction phase, construction phase, operational phase, and decommissioning (or deactivation) phases as appropriate. However, impact assessment of the pre-construction phase, except involuntary resettlement, should be combined with that of the construction phase for the following reasons:

- For a civil work construction project, project activities during the pre-construction and construction phases normally create similar environmental disturbances such as fugitive dust, noise, gaseous emissions, and waste disposal. Similar mitigation measures are therefore applied during the pre-construction and construction phases of the Project.

- The project construction contract always covers both the pre-construction and construction phases. Therefore, it is more practical to have only one environmental management plan (EMP) that covers both phases of the Project and implemented by one contractor. It should be noted that some types of projects may employ two different contractors, one for the pre-construction phase and another for the construction phase. For example, a dam construction project may engage one contractor for clearing a large land area to be inundated, and another contractor for the dam construction.

C. Geographical Scope: Impact Area

A project will have various impact areas, one for each environmental disturbance. An impact area is defined as the area extending from the project activity to a point at which its impact is no longer noted. In the impact assessment, the impact area needs to be defined for each environmental disturbance. ***Table 9.1-1*** presents impact areas of various environmental disturbances that would be expected in this Pipeline Project.

TABLE 9.1-1

DEFINITIONS OF THE IMPACT AREA

Environmental Issues	Impact Area
Noise	Area from the noise source to a point at which the noise will attenuate to an acceptable level
Fugitive dust on the construction site	Area around the construction site to a point at which the dust level returns to the level before the construction
Fugitive dust caused by materials transportation	Area along the road to a point at which the dust level returns to the level before the construction
Sites for disposal of construction wastes	The area covering the disposal site area and the sensitive receptors
Terrestrial ecosystem	The area is about 40 m land strip adjacent and along the 30-m highway corridor or construction corridor.
Water quality	Rivers where the pipeline will cross.
Disposal of water after hydrostatic testing	The Receiving waters.
Background ambient air quality	In the construction corridor and nearby communities
Background ambient noise level	In the construction corridor and nearby communities
Land acquisition	The entire areas of affected land due to project implementation.
Archeological impacts	The construction corridor
Risk of the pipeline fire and explosion	In the pipeline corridor and area near the pipeline alignment
Cultural impacts	In the villages near the construction corridor
Environmental management areas	The entire construction corridor

Source : TEAM Consulting Engineering and Management Co., Ltd, 2016

D. Temporal Scope

A temporal scope covers the duration or period over which the impact assessment will cover. It normally covers the duration of project activity that causes environmental changes and the duration over which the environmental changes will be measured. ***Table 9.1-2*** presents typical temporal scope of various types of environmental changes.

TABLE 9.1-2

TEMPORAL SCOPE

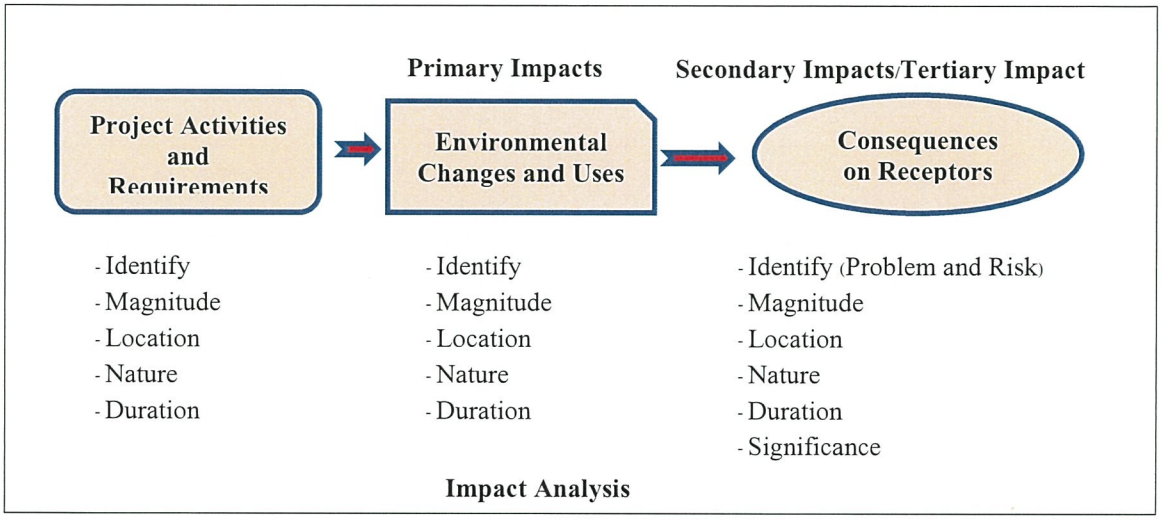
ES Issue	Impact Area
Noise	Over the construction duration, hourly and daily average noise level
Fugitive dust on the construction site	Over the construction duration, hourly and daily average dust level
Fugitive dust caused by transport of materials	Over the construction duration, hourly and daily average dust level
Soil contamination	Over the project life
Terrestrial ecosystem	Over the construction and operation periods
Turbidity caused by in river construction of pipe supports	Over the construction duration, hourly and daily average turbidity level
Water quality	Over the construction and operation periods
Coastal water quality	During the hydrostatic testing
Background ambient air quality	Over the construction period, hourly and daily averages of air quality
Land acquisition	During the site preparation period
Archeological impacts	Over the construction and operation periods
Cultural impacts	Over the construction and operation periods
Environmental management areas	Over the construction and operation periods

Source : TEAM Consulting Engineering and Management Co., Ltd, 2016

9.2 METHODOLOGY AND APPROACH

Step 1-Impact Analysis

The first major step in environmental impact assessment is "Impact Analysis" as shown in a diagram in ***Figure 9.2-1***. The Impact Analysis is essentially a cause-effect analysis consisting of the following tasks.



Source : TEAM Consulting Engineering and Management Co., Ltd, 2016

FIGURE 9.2-1 : IMPACT ANALYSIS PROCESS

(1) Identify Environmental Issues of the Project

Environmental issues of the Project are identified based on the information on the nature and scope of project activities during the pre-construction, construction and operational, and deactivation phases, and the information on existing environmental conditions of the project area. Environmental issues are separated into environmental problems and environmental risks.

An environmental problem is environmental change that, based on existing knowledge and experience, will certainly occur. For example, fugitive dust will be an environmental problem during the pre-construction and construction phases as it will certainly be created from clearing and grading of the pipeline corridor and excavation of pipe trench, and will pollute ambient air along the pipeline corridor.

An environmental risk is a potential environmental change that may or may not occur subject to the occurrence of some undesirable events. For example, oil leak is an environmental risk which may occur if the maintenance and security are not adequate.

Direct impacts of project activities and requirements on the environment could be considered as ***primary impacts***. Ambient environmental standards are applied to the primary impacts while source or emission standards are applied to project activities.

The magnitude, nature, and duration of the environmental changes or primary impacts will be governed by the location, magnitude, nature, and duration of project activities or requirements.

The outcome of this first tasks is a list of identified environmental problems and risks during the pre-construction, construction, operation, and decommissioning or deactivation phases of the Project.

(2) Identify Sensitive Receptors of Each Identified Environmental Issues

Based on the location of each environmental issue, identify sensitive receptors that could be adversely affected by the environmental change.

The primary impacts caused by project activities and requirements could have consequences on ***receptors*** which could be ecosystems, communities, or workers in geographical areas that the primary impacts occur. The consequences could be considered as ***secondary impacts***. In some cases, the secondary impacts could have consequences on other receptors. For example, loss of agricultural land (secondary impact) caused by the land acquisition (primary impact) could have impacts on livelihood of the affected families. The consequences of the secondary impacts could be considered as ***tertiary impacts***.

Step 2-Assessment of Each Environmental Issue

Figure 9.2-2 shows a diagram of the methodology for impact assessment for this Pipeline Project. The methodology is explained below.

In this step, impact assessment of each environmental issue will be carried out to assess its significance. For each environmental issue, the following tasks will be carried out:

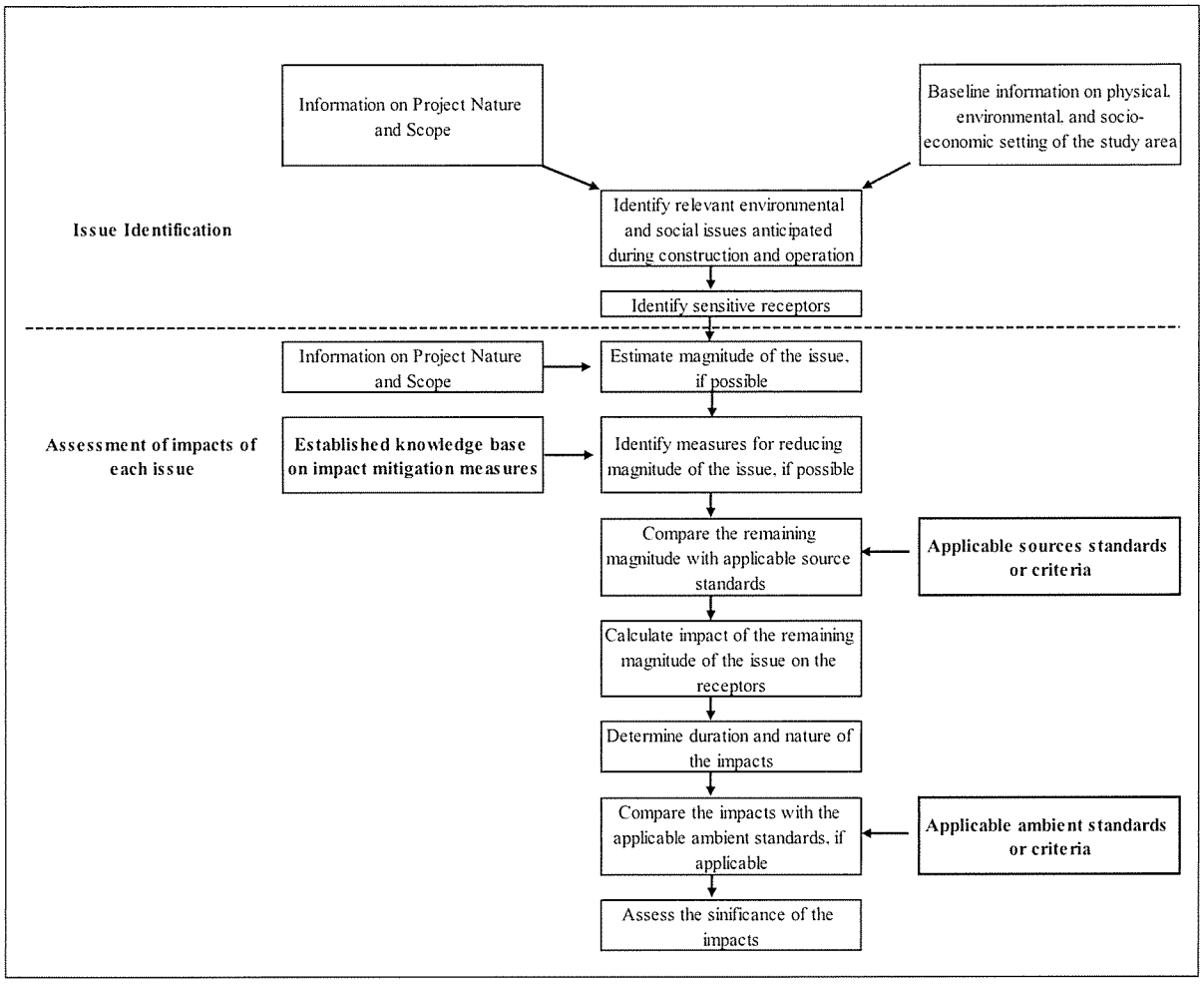
(1) Estimate Magnitude of the Environmental Issue

The magnitude of the environmental issue is estimated from the relevant project information. The measurement of the magnitude of an environmental issue depends on the nature of the issue.

Examples: (i) the magnitude of the construction waste disposal issue is the total amount of construction waste that will have to be disposed of; and (ii) the magnitude of the traffic issue is the number of truck loads to be generated during the construction phase.

(2) Identify Best Practicable Measures to Minimize the Magnitude of the Issue

Regardless of the level of its impact, the Project should attempt to minimize magnitude of the environmental issue through best practicable practices or measures to be implemented through design, construction method, good construction practices, and operational management, as relevant.



Source : TEAM Consulting Engineering and Management Co., Ltd, 2016

FIGURE 9.2-2 : METHODOLOGY FOR THE IMPACT ASSESSMENT OF EACH ENVIRONMENTAL ISSUE

Examples: (i) a piling method with a low noise level should always be used; and (ii) the construction site should be frequently sprayed with water to suppress fugitive dust.

(3) Estimate the Remaining Magnitude of the Issue

The remaining magnitude of the issue can be estimated from the efficiency of the adopted mitigation measures reported in various references.

Examples: the remaining amount of fugitive dust after water spraying can be calculated from reported efficiency of water spraying in suppressing fugitive dust.

(4) Compare the Remaining Magnitude of the Issue with Applicable Source Standards

Environmental issues related to pollution such as wastewater issues can be referred to applicable source standards, such as effluent quality standard.

If the remaining magnitude of the issue does not meet the applicable source standards, additional measures will be required to further reduce the remaining magnitude of the issue.

Some environmental issues, such as fugitive dust and construction wastes, have no source standards. In this case, the assessment can proceed to the next step.

(5) Calculate or Estimate the Impact of the Remaining Magnitude of the Issue on Ambient Environmental Quality

A good example is the air pollution issue. This step will calculate the dispersion of the remaining amount of TSP in the ambient air around the project construction site. The results will be increases in TSP value in the ambient air at various locations around the project construction site and identified sensitive receptors.

(6) Determine the Duration and Nature of the Impact

Most primary impacts caused by construction activities and requirements are transient and reversible. Few impacts are permanent and irreversible. Examples:

- Transient environmental changes- increased ambient noise levels and fugitive dust during construction.
- Irreversible and permanent environmental changes-conversion of forest and agricultural area into the pipeline corridor.

(7) Compare the Resulting Ambient Environmental Quality with the Applicable Ambient Environmental Quality Standard.

An example is the construction noise issue. If the resulting ambient noise levels at the sensitive receptors exceed the maximum permissible noise limits prescribed in the ambient noise standard, it will be necessary to implement measures for noise blocking at the sensitive receptors.

It is also possible that the ambient environment is so severely polluted that the ambient environmental quality standard cannot be met. If this is the case, the project could worsen the pollution problem. Pollution from other sources will need to be reduced or the project moves to other locations.

Step 3-Determine Significance of the Impact

In environmental management, it is necessary to prioritize key environmental issues. Significance in this context is therefore related to priority that the project environmental management will accord to the issue.

Significance of the impact will be determined by severity and extent of the impacts which, in turn, will depend on the magnitude of the issue, and natural and socio-economic characteristics of the impact area. For example, the significance of impact of fugitive dust during construction will depend on the amount of dust released into the air, wind speed and direction, and land use and population density of the impact area.

Normally, if the ambient environmental quality standards are complied with the impacts on receptors should be negligible.

The impact of an environmental issue is divided into 5 levels based on six criteria or considerations as shown in ***Table 9. 2-1***. The criteria will need to be modified to make them specific and relevant to each environmental issue.

TABLE 9.2-1

LEVEL OF IMPACT OF THE ISSUE IN ENVIRONMENT MANAGEMENT

Consideration	Level of Impact or Significance of the Issue in Environmental Management				
	Critical	**Major**	**Moderate**	**Minor**	**Insignificant**
Magnitude of the issue	Very large	Large	Medium	Small	Very small
Nature of the issue	Irreversible	Irreversible	Reversible	Reversible	Reversible
Duration of the issue	Permanent	Long	Relatively short	Short	Very short
After implementing best available measures					
- The remaining magnitude can meet the source standards	No	No	Yes	Yes	Yes
- Impacts of the remaining magnitude on ambient environmental quality					
- Resulting ambient environmental quality can meet the ambient standards	No	Yes	Yes	Yes	Yes
Sensitivity of the impacted area	Very high	High	Medium	Low	Relatively Low

Source : TEAM Consulting Engineering and Management Co., Ltd, 2016

The impact assessment will be made for the impact without control and the impact with control or residual impact. The five impact levels are:

- Level 5 Critical- the impact is irreversible with extensive and severe ecological damages or socio-economic damages. The issue cannot be resolved. The project plan will need to be changed, relocated or abandoned.
- Level 4- Major- the impact will be substantial but it can be effectively reduced using both engineering and management measures. The residual impact will be minor.
- Level 3- Moderate- the impact is moderate in terms of extent and severity and it can be effectively reduced using simple measures. The residual impact will be insignificant.
- Level 2- Minor- the impact is small in magnitude and confined to a small area. It can be easily managed through good construction practices. The residual impact will be negligible.
- Level 1- Insignificant- the impact is very small compared to Level 2 impact and can be easily mitigated through good construction practices. The residual impact will be negligible.

9.2.1 Formulation of Measures to Address the Problems

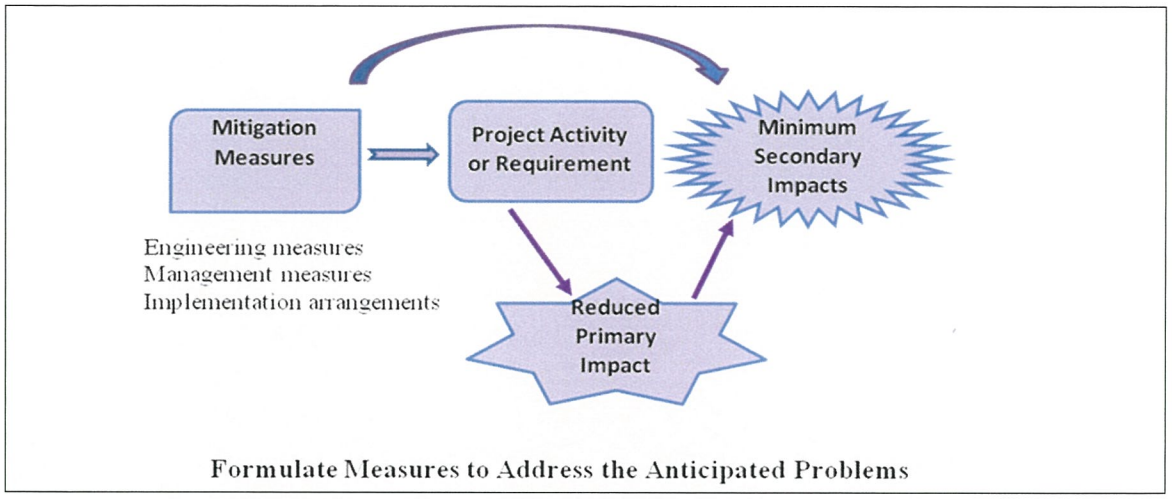
Measures for mitigating environmental impacts could be directed at project activities or requirements that cause the impacts or at the receptors to reduce the impacts on the receptors. Measures could be:

- Engineering measures to be incorporated in the design for implementation by the contractors
- Management measures to be implemented in construction management or operational management of project facilities during the operation phase

It is necessary to design effective implementation arrangements of the measures. Mitigation measures during the construction phase will have to be implemented by the contractors under supervision of construction supervision engineers engaged by the project proponent. The project proponent will oversee the implementation of mitigation measures through its project manager. Mitigation measures during the operation phase will be implemented as part of the operational management by the operational organization to be set up by the project proponent.

It should be noted that the measures will be applied to the project activities and requirements to reduce the primary impacts resulting in reduced secondary impacts. Some measures could be applied directly to the receptors to minimize the impacts on the receptors.

Figure 9.2-3 is a diagram showing the mitigation measure concept.

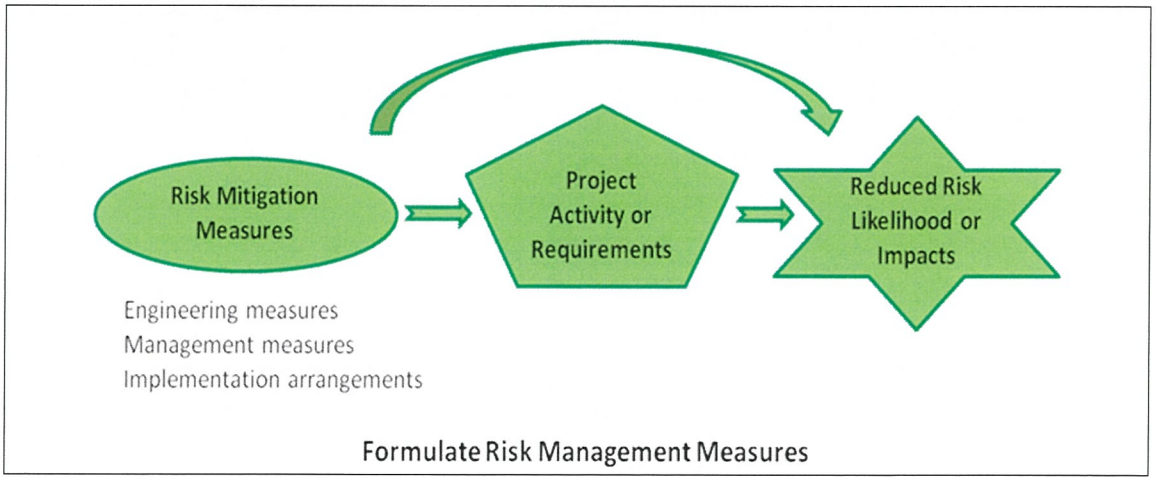


Source : TEAM Consulting Engineering and Management Co., Ltd, 2016

FIGURE 9.2-3 : MITIGATION MEASURE CONCEPT

9.2.2 Formulate Risk Management Measures

As earlier pointed out, an environmental issue could be a risk. Measures will have to be formulated to manage the identified risks. ***Figure 9.2-4*** is a diagram showing the risk management logic. It involves an undesirable event which may or may not occur, and if it occurs will have adverse impacts on the receptor. In risk analysis, a risk event has to be identified and its likelihood of occurrence and severity of its impact (if it occurs) has to be assessed. Mitigation measures for risk management include measures to minimize the likelihood of occurrence or reduce the impacts. A contingency plan is required to handle the situations if the risk event occurs despite the implementation of risk mitigation measures. Finally, effective implementation arrangements for risk management will need to be designed.



Source : TEAM Consulting Engineering and Management Co., Ltd, 2016

FIGURE 9.2-4 : ENVIRONMENT RISK MANAGEMENT LOGIC

9.3 IDENTIFICATION OF IMPACTS

9.3.1 Information on Project Construction and Operation

9.3.1.1 Pre-Construction Phase

Typically, pre-construction activities of development projects will include land acquisition and relocation of affected families, site preparation, and construction of temporary facilities to support the construction works. For this Pipeline Project, the required land for the Project and the highway project has already been acquired by GoTL. Land acquisition and resettlement issues are social impacts in nature and are discussed in Chapter 7 Social Impact Assessment.

A. Site Preparation

Site preparation works will cover a narrow pipeline corridor and small areas where pipe jagging will be carried out. Site preparation works will involve vegetation clearing and land grading to create the pipeline corridor. Slope cutting and rock blasting are not expected in the site preparation. As the pipeline corridor is 40 m wide, the land clearing will cover 240 ha.

B. Construction of Temporary Facilities and Utilities

As the pipe construction will move along the long corridor, the contractor would establish one or two base camps along the pipeline corridor and two to three work camps for material storage and equipment parking. Each base camp would have the following *temporary facilities:*

- Perimeter fence and guard house;
- Space for storage of pipes and materials;
- Shed for keeping construction equipment and vehicles;
- Offices for project owner, contractor, and consultants;
- Accommodations for staff and guest visitors;
- Utilities including power supply, water supply, communication system, drainage, and sewage disposal;
- Worker camps;
- Medical clinic; and
- Canteen.

At this stage of Project preparation, quantitative information on these temporary facilities and utilities is not available. However, the magnitude of construction and erection of these temporary facilities will be small.

9.3.1.2 Construction Phase

The scope of construction will cover the pipeline system, including the laying of pipeline and installation of associated facilities and equipment, testing, and commissioning of the pipeline system. The construction will be mostly civil works and mechanical works.

A. Construction Process

The pipeline construction will basically be a linear assembly line, where the equipment and workers move along the pipeline route at a constant pace, each performing an assigned task. The work process begins with the preparation of the right-of-way or the pipeline corridor, which serves as the work site, and ends with installation of the pipe and the restoration of the land surface.

There will be no all slightly obstruction to the movement of vehicles during the pipeline construction due to good traffic flow of existing traffic (as shown in ***Section 4.5.9***). Furthermore, the construction and work site are taken place only at the ROW.

The following are the major work steps involved in the construction process:

1) Right-of-way preparation

(This task is already discussed in the preconstruction phase). The purpose of this work step is to provide a smooth and even work area and to facilitate the movement of equipment onto and along the pipeline route.

2) Pipe Stringing

Stringing is the delivery and distribution of pipe along the right-of-way. Special trucks are normally used to safely haul the pipe from storage yard to the right-of-way.

3) Trenching

Trenching or ditching is merely the excavation of trench in which to lay the pipe. The trench can be excavated using a backhoe or a specially designed wheel type ditching machine. The trench would be about 1.5 m deep and 3.5 m wide to accommodate 4 pipes with 0.5 m spacing.

It should be noted that the areas containing rock which blasting is used sometimes have been cleared for preparation of the ROW. They are in the mountainous areas which a far distance from the communities. Furthermore, the communities' resettlement are located in the plain areas.

4) Bending

Individual pipe sections may be bent to ensure that the completed pipe contour matches the bottom contour of the trench. The bending is done alongside the trench using specialized equipment which handles the pipe with little or no damage to the exterior coating.

5) Welding

Butt welding of the pipe joints is completed in a series of steps beginning with the line-up of the two surfaces to critical tolerances, followed by numerous welding passes. Typically, the welding is done manually and, on large diameter pipe, two welders have work on one weld, working on opposite sides of the pipe. Welds are visually inspected and examined by x-ray and hydrostatically tested to determine their quality and acceptability.

6) External Coating

After acceptance of weld and pipe connections, the area adjacent to the connecting point is cleaned and coated to prevent corrosion. Prior to movement into trench, the entire pipeline segment is tested for coating defects and if any defects are found, it would be corrected.

7) Lowering-In

The pipe is normally lowered into the trench in long segment of pipe joint. This critical step is closely coordinated and supervised. The lifting and movement of the pipe segment is done by "side boom'' tractors which have ability of making discrete vertical and horizontal movement.

Impacts associated with OHS and potential risk events and mitigation/prevention measures to minimize the risk are addressed in ***Table 9.5-1, Section 9.5.2.2***.

8) Backfilling

After the pipe has been placed in the trench, the soil taken from the trench or another selected material is placed in the trench. Special care is taken to ensure that there is sufficient material underneath the pipe as well as above it and also to prevent damage to the coated pipe. If the pipe is laid in rocky or rough soils, a padding of selected material (dirt or sand) is used to support and isolate the pipe from large rocks, etc.

9) Crossings

Pipeline crossing local road shall be installed using pipe jagging method, a large diameter steel casing pipe is bored and jagged under the road and the pipeline is installed through the local road up to the other side.

Pipeline crossing small river or channel (width<50m) shall be installed on pipe bridge or pipe rack above river. Pipe bridge shall be made by concrete pole and the pipeline will be laid on them with anchor support pipe. There are 2 different sizes of pipe bridges depending on the width of rivers as follows:

- Pipe Bridge with span of 25 m. or more for rivers with the width of 25-50 m,
- Pipe Bridge with span of 6 m. for rivers with the width <25m.

Pipeline crossing large river (width>50m) shall be installed on pipe bridge or pipe rack above river. For the two large rivers (Mola 400 m width and Karaulun 800 m width), a number of in-river support columns will be required.

For supervising the pipeline installation and checking for leak, pipeline leak detector shall be used for monitoring pipeline system. The pipeline inlet and outlet conditions such as pressure, temperature, density and volumetric flows shall also be monitored by direct measurement and also re-constituted from metering after separation. On-line pipeline integrity monitoring software in the SCADA system will perform overall pipeline mass balance, pipeline hydraulics and rate of change pressure calculation to check for small leak on a long-term basis and for leak on a short-term basis as well.

10) Welding inspection and tests

The completed condensate pipeline is subjected to x-ray test for approval before backfill in case of underground pipe and for overall integrity check for above ground pipe. The % of x-ray tests to be conducted will be as specified in design. For example 10% of total number of welds in the installation in all pipe shall be subjected to radiographic inspection or ultrasonic inspection, the welds shall be selected at random during contract supervision.

When radiographic or ultrasonic examination of all or part of a weld reveals unacceptable defect, one further weld in the group represented by this weld shall also be tested to the same extent.

If this further weld shows no acceptable defect, the defects in the first weld shall be repaired and then re-examined by the original method. If the repair is satisfactory, that group of weld shall be accepted. If the further weld is unacceptable, all weld in the group shall be similarly examined.

11) Hydrostatic test

The completed pipeline is subjected to a hydrostatic test before backfill in case of underground pipe and for overall integrity check for above ground pipe. After venting all air from the complete pipeline, water shall be pumped in up to a pressure of not less than 1.25 times the internal design pressure and this pressure shall be held continuously for 4 hrs. During this time, the pressure and temperature are recorded to determine if there is any leakage.

12) Cleaning

The final process of pipeline construction after finishing installation, the pipeline internals shall be cleaned because after installation and testing there will be a lot of welding slag which will remain inside the pipe. Normally, pipeline cleaning uses "Pig Cleaning Method". Pig is made of an elastic, high density polyurethane. Pig cleaning is especially useful for construction of a long distance pipe, underground pipes. Pig cleaning is a cleaning method using air, nitrogen, liquid chemicals and special cleansing devices considering special requirements of the work.

B. Construction Workforce

The total manpower input for construction of the Project is estimated at about 3,060 man-months, or a total of about 255 man-years (see ***Table 9.3-1***). The construction would take about 3 years to complete. Therefore, the average number of workers on site would be about 85. The number of workers will be small initially and increase to peak in the second year. Based on the construction schedule in ***Figure 2.5-1***, the peak number of workers is estimated at not more than about 150. This peak number will be used in planning for waste management of the worker camps.

The contractor will develop construction camps to accommodate 150 people for the workforce engaged in construction activities. Details of the worker camps are not available at the time of preparing this draft EIS. However, the contractor would establish one or two base camps at suitable locations along the pipeline corridor. Base camps will be equipped with decent living quarters and facilities, and basic sanitation amenities.

TABLE 9.3-1

ESTIMATES OF MAN-MONTHS FOR PROJECT CONSTRUCTION

Work Category	Estimated Man Month
	Man Month (%)
Piling Work	
1. Civil Work • Steel Structure Work • Mechanical Work	674 (22 %)
2. Site Tank Fabrication Work • Piping Work • Electrical Work • Instrument Work • Painting & Installation Work	2,280 (74.5 %)
3. Pre/Commissioning	106 (3.5 %)
Total Man Month	**3,060 (100 %)**

Source : TIMOR GAP, E.P. , 2016

C. Water Supply and Power Supply

Water supply and power supply will be provided for the workforce and hydrotesting. The water requirement of the construction workforce at peak would be about 22.5 m^3/day based on per capita consumption of 150 l/day.

Water required for the hydrostatic test is calculated from the total volume of the four pipes. For the 60 km length, about 9,900 m^3 of clean water will be required. The water will be provided by the water supply system of the Betano Refinery.

Power supply to the worker camps would be from a mobile diesel generator or from the power transmission line from the existing power plant.

9.3.1.3 Pipeline Operation and Maintenance

The operation and maintenance of the pipeline system would require not more than 30 persons. The number of personnel is based on 24 hours operation with three shifts. The pipeline operation and maintenance will have to strictly follow the guidelines to be issued by the designer. The operation will use a computerized SCADA system for monitoring and control of flows and pressure of the fluids in the pipeline. Periodically, the pipeline will have to be inspected and cleaned using pigging, the practice of using devices known as "pigs" to perform various maintenance operations on a pipeline. The devices are also known as "scrapers" or "Go-devils". "Smart pigs" (also known as "intelligent" or "intelligence" pigs) are used to detect anomalies in the pipe such as dents, metal loss caused by corrosion, cracking or other mechanical damage. These devices are launched from pig-launcher stations and travel through the pipeline to be received at any other station down-stream, either cleaning wax deposits and material that may have accumulated inside the line or inspecting and recording the condition of the line.

9.3.1.4 Deactivation Phase

Deactivation or decommissioning of the pipeline system will be carried out at the end of the pipeline life, in accordance with prevailing legislation and industry best practicable technology available at that time. The activities will be reverse of the construction. The pipeline would be cleaned before decommissioning. The pipe bridges will be demolished and the pipes will be removed for disposal as scrap. The pipes under the ground or the rivers would be left as they are since those pipes are empty, there will be no impacts on soil and water including communities nearby. The pig station will be demolished.

The timing and activities undertaken during the decommissioning phase will not be planned until closer to the end of field life. Detailed decommissioning plan will be prepared and submitted to the relevant authorities prior to commencement of activities. This plan should be prepared at least 12 months before the decommissioning. The decommissioning phase would be from 6 to 12 months. An EIS would be required for environmental clearance of the decommissioning plan.

9.3.2 Identified Environmental Issues and Impacts

Environmental issues and impacts are identified into three phases of pre-construction and construction, operation and deactivation.

9.3.2.1 Environmental Screening Matrix

The screening process was conducted to review project activities with systematic analysis by using all environmental components in MREIS plus OHS issue. The screening process is the very first important step for environmental impact assessment to provide detail information for the assessment of main issues related to human and environmental impact.

Screening process for this project uses matrix analysis to screen environmental impact causing by the project for each phase of development ***(Table 9.3-2)*** which are "Activity or event of the project as shown in matrix rows" and Environmental components as shown in matrix columns". The significant of environmental components are represented by symbol scale; it is described by the assignment of a symbol scale as follows:

- ○ = Not relevant
- ● = Insignificant
- ▲ = Significant

The analysis of the significant of impacts from the activities of each environmental components plus OHS issue is shown in ***Table 9.3-2*** and summarized as follows:

(1) Pre-construction phase

Major activities during pre-construction phase will be land acquisition. This activity is to prepare the site ready for construction of the pipeline project. The main environmental issues is loss of economic crops and natural vegetation, and wildlife habitats. Therefore, the potentially affected environmental components in to be considered are land use, use of forests and other natural resources, agriculture, community and family structures, land ownership and, any types of common or individual rights on natural resources. The screening matrix is shown in ***Table 9.3-2***.

(2) Construction phase

Major activities during construction phase will be land clearing, transport of pipe and other materials, trench excavation, pipe welding and laying, back filling, in-river construction of pipe supports, hydrostatic testing, worker camps, and construction waste management. The main environmental issues are loss of natural vegetation and wildlife habitats, increase of noise, fugitive dust and emissions from vehicles and machines, waste disposal, increasing water turbidity from foundation construction, contamination of surface water from hydrostatic test water discharge, contamination of groundwater and soil from worker camps, and chance find or damaging cultural heritage, archeological site and historic site. For groundwater and soil pollution from disposal of construction waste from

worker camp and pipe laying, the Consultant would evaluate impact and propose mitigation measures in worker camp and construction wastes.

Therefore, the potentially affected environmental components to be considered are air, noise, surface water, wildlife, forest, cultural heritage, archeological site, historic site and OHS. The screening matrix is shown in ***Table 9.3-2***.

(3) Operation phase

Major activities during operation phase will be pigging for pipeline inspection, and inspection and maintenance of pipeline corridor. However, there is a probability of other major and unexpected risks such as natural force/events (e.g. earthquake, landslide, flooding etc.), corrosion, third party damage (e.g. excavation, traffic accident, vandalism, fire/explosion), incorrect design & operation (e.g. equipment/mechanic failure and human errors) as shown in ***Figure 2 of Appendix 9B.***

The main environmental issues are pigging waste, accident, pipe leakage and explosion. For impact on soil or water around disposal sites of the pigging wastes, the Consultant would evaluate impact and propose mitigation measures in pigging wastes. Therefore, the potentially affected environmental components to be considered is OHS. The screening matrix is shown in ***Table 9.3-2***.

(4) Deactivation phase

Major activities during deactivation phase will be removing cathodic protection and oil products from the pipeline, cleaning the pipeline by flushing it with fresh water, air, or inert gas, cutting up the pipeline and removing cut sections from the ground, demolishing pipeline crossing structures, and demolishing the pumping stations, pigging stations, and block valve stations. The main environmental issues are fugitive dust and noise caused by heavy machines and equipment, disposal of waste, hazardous waste, and oil products and wastewater from cleaning of storage tanks and pipeline. The impacts will be similar to those occur during construction period. The screening matrix is shown in ***Table 9.3-2***.

Remark : For this Project, the time for deactivation of the pipeline system would come in the distant future when a decision is made by the Pipeline Company to cease permanently the operations of pipeline systems. As the deactivation is the event in distant future, the demolition EIA would need to considerably update the Deactivate Environmental Plan (DEMP) to prepare a new DEMP. The new DEMP will reflect conditions related to technologies, laws and regulations, and land use along the pipeline corridor which would be much different from the present conditions.

9.3.2.2 Key Environmental Issues of the Project

Based on the screening matrix presented in ***Section in 9.3.2.1***, key environmental issues during pre-construction and construction, operation and deactivation, could be identified as shown in ***Table 9.3-3***.

TABLE 9.3-2
ENVIRONMENTAL SCREENING MATRIX

Potentially Affected Environmental Components	Pre-construction and Construction Phase										Operation Phase		Deactivation Phase			
	*Land Acquisition**	*Land clearing*	*Transport of pipe and other materials*	*Trench excavation*	*Pipe welding, and laying*	*Back filling*	*In-river construction of pipe supports*	*Hydrostatic testing*	*Worker camps*	*Construction Waste Management*	*Pigging for Pipeline Inspection*	*Inspection and Maintenance of Pipeline Corridor*	*Removing any cathodic protection and oil products*	*Cleaning the line by flushing it with fresh water, air, or inert gas.*	*Cutting up the pipeline and remove cut sections from the ground*	*Demolish pipeline crossing structures , pumping stations, and pigging stations*
Physical components																
Climate	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Topography	○	●	○	●	○	●	○	○	○	○	○	○	○	○	●	○
Geology	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Air	○	●	●	▲	●	▲	●	●	○	●	○	○	▲	○	▲	▲
Noise	○	▲	●	▲	●	▲	●	●	●	○	○	○	▲	▲	▲	▲
Surface waters	○	●	○	●	○	○	▲	▲	▲	▲	▲	●	▲	▲	●	▲
Groundwater	○	○	○	○	○	○	○	○	▲	▲	▲	○	▲	▲	○	○
Coastal waters	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Marine waters	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Soil	○	●	○	●	●	●	●	●	▲	▲	▲	○	▲	▲	●	●
Ecological Components																
Wetlands	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Mangroves	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Corals	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Fisheries	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Protected areas and national parks	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Wildlife	○	▲	●	●	●	●	●	●	●	○	○	○	●	●	●	●
Forests	○	▲	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Coastal resources	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Economic Components																
Employment sectors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Infrastructure facilities	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Land use	▲	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Use of forests and other natural resources	▲	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Fishing	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Agriculture	▲	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Tourism	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Other industries	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Social Components																
Population and communities	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Health profiles of communities	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Institutions, schools and health facilities	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Community structures, family structures	▲	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Land ownership	▲	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Any types of common or individual rights on natural resources	▲	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Cultural components																
Cultural heritage	○	▲	○	▲	○	○	○	○	○	○	○	○	○	○	○	○
Archeological sites	○	▲	○	▲	○	○	○	○	○	○	○	○	○	○	○	○
Historic sites	○	▲	○	▲	○	○	○	○	○	○	○	○	○	○	○	○
Sacred sites	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Unique landscape	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
OHS																
Occupational health and safety of personnel	○	▲	▲	▲	▲	▲	▲	●	▲	●	▲	▲	▲	▲	▲	▲

Remark: * Land Acquisition is obvious shown in the pre-construction phase.
○ Negligible/Not relevant ● Insignificant Impact ▲ Significant Impact

Source: TEAM Consulting Engineering and Management Co., Ltd, 2016 has applied from USAID Environmental Procedures Training Manual for USAID Environmental Offices and USAID Mission Partners AFR Edition : March 2002.

TABLE 9.3-3

IDENTIFIED ENVIRONMENTAL ISSUES

Project Activities	Environmental Issues	Generic Impacts on Receptors	Nature of Impacts
Pre-construction and Construction Phases			
1. Land Acquisition	Conversion of land from its existing conditions to the pipeline corridor	Loss of land ownership and livelihoods, terrestrial ecosystem	Significant social impacts, insignificant ecological impacts
2. Land clearing	Loss of economic crops and natural vegetation, and wildlife habitats	Impacts on terrestrial ecosystems, agro-ecosystem, and livelihood.	Permanent, occurred along the entire length of the pipeline corridor
3. Transport of pipe and other materials	Noise, fugitive dust, emissions, and vibration from vehicles	Discomfort and health risks to communities along the route	Reversible, occurred only during the construction period
4. Trench excavation	Noise, fugitive dust and emissions from excavating machines	Discomfort and health and safety risks to communities along the route	Reversible, occurred only during the construction period
	Archeological chance finds	Damaged artifacts	
5. Pipe welding, and laying	Waste materials disposal	Discomfort and health risks to communities along the route	Reversible, occurred only during the construction period
6. Back filling	Noise, fugitive dust, and emissions from machines	Discomfort and health risks to communities along the route	Reversible, occurred only during the construction period
7. In-river construction of pipe supports	Water turbidity	Impacts on aquatic ecosystem	Reversible, occurred only during the construction period
8. Hydrostatic testing	Disposal of water after the testing	Impacts on the receiving waters	Reversible, occurred only during the construction period
9. Worker camps	Waste disposal	Water and soil pollution	Reversible, occurred only during the construction period

TABLE 9.3-3

IDENTIFIED ENVIRONMENTAL ISSUES (CONT'D)

Project Activities	Environmental Issues	Generic Impacts on Receptors	Nature of Impacts
Operation phase			
1. Pigging for pipeline inspection	Pigging wastes	Impacts on soil or water environment around the disposal sites of the pigging wastes	Occasionally occurred during pigging operations
2. Operating the pipeline and pumping stations	Accidental risks (spill, fire, and explosions)	Fire, soil and ground/surface water contamination	Risks, low likelihood of occurrence
Deactivation or decommissioning of the pipeline system			
1. Removing any cathodic protection and oil products 2. Cleaning the line by flushing it with fresh water, air, or inert gas. 3. Cutting up the pipeline and removing cut sections from the ground 4. Demolish pipeline crossing structures , pumping stations, pigging stations, and block valve stations	Fugitive dust and noise caused by heavy machines and equipment	Discomfort, health risk and safety to worker and communities at and nearby the deactivation site	Reversible, occurred only during the deactivation period
	Disposal of waste, hazardous waste, and oil products	Potential contamination of soil and groundwater	Occurred during the deactivation period
	Wastewater from cleaning of storage tanks and pipeline	Water and soil pollution	Occurred during the deactivation period

Source : TEAM Consulting Engineering and Management Co., Ltd., 2016.

Due to the closely related activities of the pre-construction and construction which most of them are integrated and cannot be distinguished, the Consultant, therefore, combine environmental issues of these two phases into one.

Based on the information on the Project construction, operation and decommissioning, environmental issues and impacts of the Project could be identified as shown in ***Table 9.3-3***.

During the pre-construction and construction phases, only the impacts of land clearing are permanent while the impacts of other environmental issues are transient and occur at one location in the pipeline corridor over a short duration as the construction moves along the corridor.

During the operational phase, the impacts will be pigging waste and accident risks. Only occasional pigging of the pipeline will generate a small volume of petroleum wastes.

During the deactivation phase, the impacts are similar to those of the construction and will occur during the demolition period.

9.4 SIGNIFICANCE OF THE IDENTIFIED IMPACTS

9.4.1 Pre-Construction and Construction Phases

9.4.1.1 Loss of Agricultural Land and Forest Land

A. Project Land Requirements

The Project will require a 60 km land strip for: (i) the pipeline construction corridor; (ii) two pumping stations; (iii) two pigging station; (iv) control building; (v) base camp; and (vi) two satellite camps. One pumping station will be constructed within the Betano Refinery premise, and another pumping station within the Suai Supply Base complex. The pig station and the control building will also be located within the betano Refinery premise near the pumping station. Therefore, the Project will require land only for the pipeline construction corridor, block valve, base camp, and satellite camps.

The total land requirement is roughly estimated by the Consultant at about 244.3 ha. for the purpose of environmental impact assessment. ***Table 9.4-1*** presents the estimates of land requirements while details of the estimates are given in ***Appendix 9A***. The construction corridor will account for almost all of the total land requirement. The estimates will be subject to revision by the pipeline contractor as part of detailed construction planning. The number of base camp and satellite camps and their locations will be finalized by the pipeline contractor. The camps would be located adjacent to the construction corridor where road access is convenient.

TABLE 9.4-1

PRELIMINARY ESTIMATES OF LAND REQUIREMENTS

Project Requirement	Land Required (m^2)
Pipeline construction corridor	2,400,000
Block valve station	1,600
One base camp	35,000
Two satellite camp	6,400
Total (m^2)	**2,443,000**
Total (ha)	**244.30**

Source : Calculated by TEAM Consulting Engineering and Management Co., Ltd, 2016

It should be noted that the base camp and satellite camps are temporary requirements. Only the pipeline corridor and the block valve station will be permanent requirements. After the construction is completed, the camp sites should be returned to land owners or converted to green areas.

B. Loss of Agricultural Land and Forest Land

Selection of the camp sites is flexible and it can avoid environmentally or socially sensitive areas. The alignment of the pipeline construction corridor is less flexible as it needs to run adjacent to the highway.

From the existing maps and satellite imageries of land use along the highway, and ground checks at some locations during the field works in February and April 2016, it is established that the pipeline construction corridor (and the highway) will traverse various types of agricultural land and forest land. The area for each type of land use is estimated from the maps as summarized in ***Table 9.4-2***.

C. Evaluation of the Significance of Impacts

The data in ***Table 9.4-2*** shows that the pipeline corridor on 90 m width and 60 km length will result in the loss of agricultural land of about 205 ha and the forest land of about 255 ha. The loss of agricultural land will be relatively small compared to the total agricultural land of the southern coastal areas of RDTL. Therefore, the impact of the Project on agriculture will be insignificant.

The impacts of the loss of forest land would also be insignificant for the following reasons:

- The total forest land loss is small compared to the total forest areas of RDTL.
- The corridor does not traverse any environmentally sensitive areas.
- The affected forest areas are mostly in degraded conditions with no endangered flora and fauna species.

- The combined pipeline and the highway corridors will not block wildlife passage to the coastal areas for foods or for other ecological needs. Therefore, the combined corridor of about 90 m wide would not disturb the link between the coastal ecosystem and the terrestrial ecosystem. However, traffic on the highway could pose accidental risk to animals crossing the highway.

TABLE 9.4-2

ESTIMATES OF AREAS FOR VARIOUS TYPES OF LAND CROSSING BY THE PIPELINE CORRIDOR

Existing Use of Land	Area (ha)	
	100 m strip*	**90 m strip****
Forests	**282.80**	**254.52**
-Mixed deciduous	125.25	112.73
-Mixed deciduous and teak and palm tree plantation	137.39	123.65
-Riparian forest	20.16	18.14
Agricultural land	**227.39**	**204.65**
-Paddy field	61.03	54.93
-Field crops	76.97	69.27
-Orchards	85.78	77.20
-Mixed teak and orcards	3.61	3.25
Built up area	**19.37**	**17.43**
-Residential area	13.85	12.47
-Others	5.52	4.97
Misceelaneous	**68.98**	**62.08**
-Idle land	49.33	44.40
-Shrubs	1.73	1.56
-Water	17.92	16.13
Total	**598.54**	**418.98**

Remark : * Study area covers 100 m strips (50 m of each side)

** ROW of the Highway which covers condensate pipeline area

Source : Calculated by TEAM Consulting Engineering and Management Co., Ltd, 2016

The evaluation of significance of the impacts is summarized below:

Impact category	Direct impacts
Impact duration	Permanent throughout the project life
Impact extent	Confined to within the pipeline construction corridor
Impact magnitude	Small, as the impacts are spread along the 60 km corridor
Impact severity	Low, no impact on the terrestrial ecosystem
Control priority	Low, but use of land on the pipeline corridor is prohibited

9.4.1.2 Fugitive Dust

A. Sources

Potential sources of fugitive dust include:

- Site clearing including removal of vegetation and top soil;
- Excavation works, soil stripping and re-grading;
- Movement of heavy vehicles on unpaved roads and surfaces in transporting pipes and other materials; and
- Deposition of dust from haulage trucks onto local roads.

The fugitive dust would be experienced along the pipeline construction corridor and the transport route. At this juncture, the transport route of the Project has not been planned. It is likely that pipes and other materials required for the construction under this Project will be shipped to the temporary jetty at the Betano refinery site. From there, the materials will be transported by trucks to the base camp and satellite camps of the Project.

In addition to control of fugitive dust along the construction corridor, efforts will need to be made to minimize fugitive dust generated by trucks along the transport routes.

B. Sensitivity of Receptors

The construction corridor passes a number of communities. The nearest receptor is Betano Polytechnic Collage in Bemetan sub-village only about 20 m from the corridor. Therefore, fugitive dust could have impacts on communities near the corridor.

C. Magnitude of Fugitive Dust Emission at Sources

The amount of fugitive dust generated in the construction will depend primarily on the nature of construction works, soil characteristics, soil moisture content, types of construction equipment, and wind speeds.

In principle, the magnitude of fugitive dust emission could be calculated for each step of the construction process. However, considering the lack of detailed information on the construction steps, a global estimate has to be adopted using the emission factor which established by the US.EPA (AP-42, U.S. EPA. 2005). The emission factor for TSP is 2.69 Mg/ha/month of construction activity.

The assessment of impacts of fugitive dust is based on the total construction corridor area of about 240 ha, and the construction period of 30 months without commissioning using two construction teams. The construction would therefore progress on average about 8.0 ha/month or 4.0 ha/month for each team. Assuming a working period of 8 hours/day, and 30 working days/month, with the above emission factor, the emission rate will be 0.36 tons/day or about 12.5 grams/sec (g/s). However, with fugitive dust control by water spraying twice a day as recommended by US.EPA (AP-42, US EPA 2005), fugitive dust emission could be reduced as much as 75%. Therefore, the emission factor of TSP will be reduced from 12.5 to 3.1 g/s.

The emission rate of PM-10 will be estimated using the PM-10 and TSP ratio of 0.52 recommended by South Coast Air Quality Management District, USA (SCAQMD, 1991 and 1994). Therefore, the emission rate of PM-10 will be 6.5 g/s with no control measure and 1.6 g/s with control measure.

D. Fugitive Dust Control Targets

The fugitive dust control target will be based on the World Bank's ambient air quality standard. This standard prescribes the concentration of TSP and PM-10 not exceeding 230 and 150 μg /m^3, respectively. The TSP and PM-10 level at the receptors will not exceed this limit.

E. Predicted TSP and PM-10 Levels at the Receptors

The dispersion of fugitive dust can be predicted by the Box Model recommended by Hanna, Briggs and Hosker (Handbook on Atmospheric Diffusion, 1982).

The Box Model is represented by the following formula:

$$C = \frac{Q}{d \times w \times m}$$

Where; C = Concentration of TSP and PM-10 (g/m^3)

d = Width of the construction area perpendicular to wind direction

= 40 m. (Most of wind direction is Southeast and Southwest)

w = Average wind speed = 0.6 m/s. (The minimum average wind speed of Betano and Suai Weather station.)

m = Average Daytime Mixing Height = 1,500 m

Q = Emission rate of TSP and PM-10 dispersion into ambient air (g/s)

TSP: In the no control case, the concentration of TSP would be 411 $\mu g/m^3$ exceeding the World Bank's ambient air quality standard of 230$\mu g/m^3$. With water spraying, the concentration of TSP would be reduced to 151 $\mu g/m^3$ meeting the standard.

PM-10: In the no control case, the concentration of PM-10 would be 214 $\mu g/m^3$ exceeding the World Bank's ambient air quality standard of 150 $\mu g/m^3$. With water spraying, the concentration of PM-10 would be reduced to 79 $\mu g/m^3$ meeting the standard.

The results of fugitive dust prediction at the perimeter of the construction site are presented in ***Table 9.4-3*** below:

TABLE 9.4-3

PREDICTED CONCENTRATIONS OF TSP AND PM-10 AT THE CONSTRUCTION SITE PERIMETER

Emission Rate		Concentration, $\mu g/m^3$		
		Box Model	**Measurement**	**Total**
TSP				
Without Dust Control	= 12.5 g/s	346	65[1/]	411
With Dust Control	= 3.1 g/s	86	65[1/]	151
PM-10				
Without Dust Control	= 6.5 g/s	180	34[2/]	214
With Dust Control	= 1.6 g/s	45	34[2/]	79

Remark: 1/ The maximum background ambient TSP assumed by the result of PM-10 measured at Suai Market of 34 $\mu g/m^3$ and the PM-10/TSP ratio of 0.52 (SCAQMD, 1991 and 1994).
2/ Measurement results from The Tasi Mane Project-Suai Supply Base, Environmental Impact Assessment, 2012

As the nearest receptor, the Betano Polytechnic Collage, is about 20 m away to the north of the construction site, the impact of fugitive dust on this receptor will be smaller than the above predicted levels at the perimeter of the construction site.

F. Evaluation of the Significance of Impacts

Receptors of the fugitive dust impacts will be construction workers and communities along the construction corridors. The impacts are considered significant and require mitigation measures.

Impact Category	Direct impacts
Impact Duration	Transient during the land clearing and trenching area
Impact Extent	Confined to within the construction corridor
Impact Magnitude	Moderate, Confined to within the construction corridor
Impact Severity	Moderate with control at sources
Control Priority	High to protect health of receptors

9.4.1.3 Gaseous Emissions

A. Sources

Diesel-powered heavy construction equipment, vehicles and generator sets are the major sources of gaseous emissions during the construction. The emissions will include typical pollutants such as NO_x, SO_x, CO, and particulate in the exhaust gases discharged from the engines.

B. Sensitivity of Receptors

The construction corridor passes a number of communities. The nearest receptor is Betano Polytechnic Collage in Bemetan sub-village only about 20 m from the corridor. Therefore, fugitive dust could have impacts on communities near the corridor.

C. Estimates of Emission Loads

Emission loads of various pollutants could be estimated from information on the number and type of diesel-engine construction equipment and vehicles, and their hours of operation. At this stage of project planning, such information is not available.

D. Evaluation of the Significance of Impacts

As the pipeline construction will use a small number of heavy construction equipment for land clearing and trenching along the long construction corridor, emissions from the construction equipment would be small and disperse along the construction corridor. Therefore, the impacts of gaseous emissions on the construction workers would be moderate. The impact is evaluated as shown below. The issue is considered low priority for control during the construction period. Nevertheless, best practicable measures will be required for the contractor to minimize the impacts.

Impact category	Direct impacts, transient, reversible
Impact duration	Throughout the land clearing and trenching period for 24 months
Impact extent	Local, confined to within the pipeline construction corridor
Impact magnitude	Moderate, Confined to within the construction corridor
Impact severity	Moderate with control at sources
Control priority	High to protect health of receptors

9.4.1.4 Noise

A. Sources

Based on construction experience and the nature of construction of this Project, noise will be mostly generated by operations of heavy construction equipment during land clearing, pipeline lowering, and backfilling, etc.

B. Sensitivity of Receptors

The construction corridor passes a number of communities. The nearest receptor is Betano Polytechnic Collage in Bemetan sub-village only about 20 m from the corridor. Therefore, fugitive dust could have impacts on communities near the corridor.

C. Magnitude of Noise Levels at Sources

The noise levels resulting from construction activities would vary greatly depending on factors such as the type of equipment, the specific equipment model, the operations being performed, and the overall condition of the equipment.

According to Construction Noise Handbook (FHWA, 2006), the noise levels generated by various construction equipment and specific construction operations at 50 feet or 15 meter from the source is summarized in ***Table 9.4-4***.

The construction equipment which generates the highest noise level is Grader or Scraper. The Grader and Scraper are used to clearing and removal of vegetation and top soil during the preparation of Right-of-Way. The maximum noise level generated by Grader or Scraper is 85 dB(A) at 50 feet from source, and Acoustic Usage Factor is 40%.

D. Noise Control Targets

The targets of construction noise control at the receptors are dictated by the adopted noise standards. For the Project, the construction noise control will be designed to achieve two conditions:

- The construction noise will not increase the ambient noise level at the designated receptors higher than 70 dB(A) for Leq-24 hrs. (U.S. EPA. (1974) and WHO (1999)).
- The construction noise will not increase the ambient noise level at the designated receptors higher than 55 dB(A) for Leq-1 hr. and increasing of ambient noise level is not more than 3 dB(A) (IFC (2007)).

TABLE 9.4-4

CONSTRUCTION NOISE REFERENCE LEVELS AND USAGE FACTORS

Equipment Description	Acoustical Usage Factor (%)	L_{max} @ 50 feet (dBA)
All Other Equipment > 5 HP	50	85
Backhoe	40	80
Compactor (ground)	20	80
Compressor (air)	40	80
Concrete Mixer Truck	40	85
Concrete Pump Truck	20	82
Crane	16	85
Dozer	40	85
Dump Truck	40	84
Front End Loader	40	80
Generator	50	82
Grader	40	85
Pickup Truck	40	55
Pumps	50	77
Scraper	40	85

Source: Construction Noise Handbook, FHWA, 2006

E. Predicted Noise Levels at the Receptors

The noise level at the receptors due to the noise source can be calculated using the following equation

Leq or Lp = E.L. + 10 log(U.F.) – 20 log(D/50) – 10G log (D/50) ..... 1)

Where: Leq = The Leq at a receiver resulting from the operation of a single piece of equipment over a specified time period, dB(A)

E.L. = The noise emission level of the particular piece of equipment at the reference distance of 50 feet, dB(A)

G = Constant that accounts for topography and ground effects

= 0 (Hard ground)

D = Distance from the receiver to the piece of equipment, feet

U.F. = Acoustic Usage Factor that accounts for the fraction of time that the equipment is in use over the specified time period, dimensionless

The resulting ambient noise level will be the net effect of the noise level given by Equation 1) and the background noise level without the Project. The resulting ambient noise level can be calculated using the following equation:

$$Lp_{Total} = 10\log\left(\sum_{i=1}^{n} 10^{Lpi/10}\right) \quad \text{..... 2)}$$

Where; LpTotal = Total Sound Pressure Level, dB(A)
Lpi = Sound Pressure Level, dB(A)
n = Number of Sound Pressure Level

The noise levels from operating time of equipment can be conversed to any required period by using the following equation.

$$Leq_T = Lp + 10\log\frac{t}{T} \quad \text{..... 3)}$$

Where; Leq_T = Sound Pressure Level in any period (T), dB(A)
Lp = Sound Pressure Level of a source, dB(A)
t = Period of sound from a source, hr.
T = Period of sound needed to know, hr.

The prediction of the construction noise impact caused by the Grader or Scraper during the preparation of right-of-way, on the Betano Polytechnic Collage which is 20 meter away, can be summarized in ***Table 9.4-5***. The results are described as below;

Without Control Measure: The Leq-1 hr. will be 78.7 dB(A) and the total Leq-1 hr. is 78.7 dB(A), exceeding the IFC standards of 55.0 dB(A). Furthermore, the increase in ambient noise level is 33.2 dB(A) greater than 3 dB(A) as specified in IFC Standards.

The Leq-24 hr. will be 73.9 dB(A) and the total Leq-1 hr. is 73.9 dB(A), exceeding the U.S. EPA. (1974) and WHO (1999)) standards of 70.0 dB(A).

With Control Measure: The Leq-1 hr. will be 53.7 dB(A), and the total Leq-1 hr. will be 54.3 dB(A), in accordance with the IFC standards of 55.0 dB(A). However, the increase in the ambient noise level will be 8.8 dB(A) greater than 3 dB(A) as specified in IFC Standards.

The Leq-24 hr. will be 48.9 dB(A) and the total Leq-24 hr. will be 50.5 dB(A), in accordance with the U.S. EPA. (1974) and WHO (1999)) standards of 70.0 dB(A).

TABLE 9.4-5

CALCULATIONS OF AMBIENT NOISE LEVELS AT THE RECEPTOR

1 Receptor

Receptor Name:		Betano Polytechnic Collage	
Distance from Source, D	=	20	m.
	=	66	ft.

2 Noise Source

Equipment Type:		Grader or Scraper	
Maximum Noise Level, E.L.	=	85	dB(A)
Reference Distance	=	50	ft.
Acoustic Usage Factor, U.F.	=	0.40	
Topography/ground Constant, G	=	0	(Assumed Hard Ground)

3 Noise Level at Receptor,LP2

Particulars	No Control Measures	Control Measures	Standards
Impact -Leq - 1 hr.			
LP0-Ambient	45.5	45.5	
LP1-Source	85.0	60.0[1/]	
LP2-Effect of Source	78.7	53.7	
LPT-Total Noise Level	78.7	54.3	55.0[2/]
Increase of Noise Level	33.2	8.8	3.0[2/]
Impact -Leq - 24 hr.			
LP0-Ambient	45.5	45.5	70.0[3/4/]
LP1-Source	85.0	60.0[1/]	
LP2-Effect of Source	73.9	48.9	
LPT-Total Noise Level	73.9	50.5	

Remark: 1/ Installation of temporary acoustic wall or noise barrier (Steel 18 ga with 1.27 mm. thickness) with transmission loss of 25 dB(A).

2/ General EHS Guidelines: Environmental Noise Management, IFC, 2007

3/ Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, U.S. EPA. 1974.

4/ Notification of Guidelines for Community Noise, World Health Organization (WHO), 1999.

With an effective control measure, these noise levels resulting from the construction could be considered as moderately loud with a significant effect over the existing ambient levels. However, the construction equipment is the mobile source and the peak noise level generated would be temporary and intermittent. In addition, the duration of pipeline construction near a receptor will be short. The noise impacts will decrease as the construction moves away from the receptor.

F. Evaluation of the Significance of Noise Impact

The ambient noise levels at the construction site would be increased by about 8.8 dB(A), exceeding the IFC Standards of 3.0 dB(A). Therefore, impacts of the construction noise on the nearest receptor would be significant and will have to be controlled. The construction noise issue deserves high control priority. The impact of construction noise on the sensitive receptors is summarized below:

Impact category	Direct impact
Impact duration	Throughout the construction period in each construction area. More significant during the land clearing and trenching.
Impact extent	Local confined to the construction corridor.
Impact magnitude	Resulting ambient noise levels not comply with the applicable standard.
Severity	Medium
Control priority	High

9.4.1.5 Construction Wastes

A. Sources

Wastes generated at the construction site can be divided into three categories:

Construction, demolition, and land-clearing (CDL) waste: Includes all non-hazardous solid wastes resulting from site clearing, excavation, concrete works, steel works, piping works, installation of equipment, and construction of buildings. CDL wastes for this Project will consist of vegetation removed from the site before site preparation works, construction debris, packaging materials, and remnants of pipes, glasses, and other inert building materials.

Non-construction waste: Includes wastes generated in worker camps, canteens and offices such as paper, food and beverage containers, food wastes, and other domestic items. This waste category will be discussed in the section on worker camps.

Hazardous wastes: Includes such wastes as spent lubricating oil, paints, and chemicals used in the construction. Most of the hazardous wastes are in liquid form.

However, wastes from worker camps are dealt with in the next section on Worker Camps. This section covers only CDL wastes and hazardous wastes.

These waste materials will need to be adequately managed to minimize their environmental impacts.

B. Sensitivity of Receptors

The receptors in this case will be soil and ground water at the disposal sites.

C. Estimates of Waste Quantities

CDL Wastes

At present, there is no information on the quantifies and types of CDL wastes. However, it would be useful to establish a rough estimate of the CDL wastes to serve the purpose of EIA at this stage. The estimate will need to be updated by the contractor as a part of the preparation of detailed construction planning.

For a general construction project, the amount of CDL wastes can be estimated using the quantity of waste per unit area quoted in various documents as shown in ***Table 9.4-6*** below. The low estimates in the three references are similar, i.e. about 1.9-1.963 tons/100 m^2. These rates would not be suitable for this Pipeline Project as they will give unrealistically high quantifies of CDL wastes. At the rate of 1.9 tons/100 m^2 and the construction corridor of 2,400,000 m^2, the quantity of CDL wastes would be as high as 45,600 tons or 760 tons per km of the pipeline corridor. This quantity of CDL is unrealistic for the Project and is not adopted.

TABLE 9.4-6

AMOUNT OF CONSTRUCTION WASTES FOR NON-RESIDENTIAL BUILDINGS

Reference	Amount of Construction Wastes
Zender Environmental, www.zender-engr.net, 2016	3.89 lb/ft^2 (1.90 tons/100 m^2)
www.steelconstruction.info/Construction_and_demolition_waste	Ranging from 11.1 to 1.9 tons/100 m^2 gross internal areas depending on the level of management performance.
thegreenestbuilding.org	4.02 lb/ft^2 (1.963 tons/100 m^2)

In an Environmental and Social Impact Assessment Report on the SCP Expansion Project in Azerbaijan, the total amount of CDL wastes was estimated at 5,045 tons to be generated from the construction of 300 km of a 56 inches pipeline. This gives an average quantity of CDL wastes at 16.82 tons/km. The total amount of CDL accounts for only about 1.85% of the total weight of pipes (272,706 tons).

If the generation rate of 1.85% of the total pipe weight is adopted, the Project would generate about 237 tons over the 60 km of the pipeline construction corridor. The average daily rate is 0.2 tons/day over the construction period of 36 months. The Consultant will use this rough estimate as the basis for determining the mitigation requirements.

Hazardous Wastes

A waste may be considered hazardous if it exhibits one or more of the following characteristics:

- Ignitability - a liquid with a flash point below 140 °F (solvents, mineral spirits, etc.)
- Corrosivity - a water-based liquid with a pH of less than or equal to 2.0 or a pH of greater than or equal to 12.5 (battery acid, alkaline cleaning solvents, etc.)
- Reactivity - an unstable substance that readily undergoes violent chemical reactions with water or other substances (hydrogen sulfide, bleach, etc.)
- Toxicity - a harmful substance due to the presence of metals or organic compounds (lead paint, adhesives, etc.)

Examples of hazardous wastes generated in the construction of this Project include:

- Used oil, hydraulic fluid, or diesel fuel;
- Soil contaminated with toxic or hazardous pollutants
- Waste paints, varnish solvents, sealers, thinners, resins, roofing cement, adhesives, machinery lubricants, and caulk;
- Cleanup materials (such as rags) contaminated with the items listed above;
- Drums and containers that once contained the items listed above;
- Mercury containing wastes such as fluorescent bulbs, broken mercury switches, batteries, or thermostats
- Other items that may have inseparable hazardous constituents.

The amount of hazardous wastes related to construction activities is normally roughly estimated at 1% to 2% of the total amount of wastes. The SCP Expansion Project estimated the amount of hazardous wastes at 196 tons or about 3.74% of the total amount of CDL wastes and hazardous wastes.

If this 3.74% rate is adopted, the quantity of hazardous wastes of the Project would be about 9 tons or about 0.25 tons/month.

D. Evaluation of the Significance of Impacts

It is not possible to predict the impacts of construction wastes on soil and ground water at the disposal sites. Considering the small quantities of wastes that could cause pollution, insignificant impacts are most likely. The impacts of construction wastes on the natural environment are assessed in the table below. The issue is considered high control priority.

Impact category	Direct impact on soil and water environment
Impact duration	Throughout the construction period of about 36 months
Impact extent	Local soil and ground water pollution, mainly confined to within the disposal sites.
Impact magnitude	Large, considering the waste quantities
Impact severity	Medium, significant impact on the natural environment
Control priority	High

9.4.1.6 Worker Camps

A. Sources

The base camp and the two satellite camps have three issues; (i) wastewaters; (ii) solid wastes; and (iii) living conditions. These three have to be adequately addressed to comply with the applicable environmental quality standards and the worker camp standards.

B. Sensitivity of Receptors

The receptors in this case will be: (i) soil and ground water at the solid waste disposal sites; (ii) natural water courses into which the wastewaters will be discharged; and (iii) the workers who will be affected by living conditions in the camps.

C. Estimates of Waste Quantities

Wastewaters

Wastewaters generated in the camps will be wastewaters from kitchen, canteen, toilets, bath rooms, and wash water. Based on the per capita water use of 150 liters/person/day, the wastewater generated by 120 persons in the base camp will be about 15.3 m^3/day assuming about 85% of the water consumed become wastewaters. The wastewater generated by 15 workers at each satellite camp will be about 1.9 m^3/day.

Solid Wastes

The quantity of solid wastes generated by 150 persons is estimated at 150 kg/day assuming the generation rate of 1 kg/day. Based on an average density of 195 kg/m^3[1/,2/], the total volume of solid wastes is estimated at about 0.8 m^3/day.

[1/] Integrated Solid Waste Management, Tchobanoglous, 1993
[2/] Solid Waste Management in Asia Urban Development, World Bank 2001.

D. Living Conditions

The estimates of camp areas are based on the standards in the "Workers' accommodation: processes and standards: A guidance note by IFC and the EBRD" (see *Appendix 9A).*

E. Evaluation of the Significance of Impacts

The wastewaters and solid wastes issues would not have significant impacts on the receiving environment considering their small quantities. However, the issues, if not properly addressed, would create sanitation problems such as odor and fly infestation. Therefore, impacts on the workers will be significant. Evaluation of the significance of impacts is summarized below:

Impact category	Direct impact on the workers, and on soil and water environment
Impact duration	Throughout the construction period of about 36 months
Impact extent	Local soil and ground water pollution, mainly confined to within the disposal sites and the camp sites.
Impact magnitude	Large, poor environmental sanitation of the camp sites
Impact severity	Medium, significant impact on the workers
Control priority	High

For the Living Conditions of the camps, there will be no impacts if the recommended standards are strictly adopted.

9.4.1.7 Hydrostatic Test Water

A. Source

Each of the four installed pipes will be hydrotested to ensure that it is free from material defects and is suitable for the containment of petroleum liquid that it will transport at the design operating pressure. After the testing, the test water will be discharged at a suitable location and at a rate that will not cause physical impacts to the receiving waters. Traces of water remaining in the pipe will be removed by pigging. The volume of water discharged from the pigging will be very small compared to the volume of hydrostatic test water and can be neglected.

B. Sensitivity of Receptors

The receptor will be a natural receiving water that the test water will be discharged into. The point of discharge will be determined by the contractor as part of detailed planning of the hydrostatic testing. The receiving waters could be one of the rivers intersecting the pipeline corridor to be identified in the detailed hydrostatic testing plan.

C. Estimates of Wastewater Quantity

The maximum volume of water for the hydrostatic test is the total capacity of the pipe as shown in ***Table 9.4-7***. However, the contractor may carry out the test in shorter sections and may reuse the test water. Consequently, the required volume of water for the hydrostatic test could be less than the figures shown in the table. The contractor will be required to prepare a detailed operational plan for the hydrostatic testing of the pipeline.

TABLE 9.4-7

MAXIMUM VOLUME OF WATER REQUIRED FOR HYDROSTATIC TEST OF THE PIPELINE

Particulars	Pipe 1	Pipe 2	Pipe 3	Pipe 4
Length, km	60	60	60	60
Diameter, m	0.3	0.2	0.2	0.2
X-area, m^2	0.07071	0.03143	0.03143	0.03143
Volume, m^3	4243	1,886	1,886	1,886
Total Vol, m^3	**= 9,900**			

Source : Calculated by TEAM Consulting Engineering and Management Co., Ltd., 2016.

D. Evaluation of the Significance of Impact

The test water discharged from the pipe would be discolored or stained by rust. Although the color is visible, the concentration of iron compounds is normally very low and can be discharged into the receiving waters with insignificant impacts on water quality. However, the test water should be sampled and tested for its quality before allowing its discharge into the environment. Evaluation of the significance of this impact issue is summarized below:

Impact category	Direct impact, transient
Impact duration	During the test water discharge period.
Impact extent	Downstream of the discharge point.
Impact magnitude	Very small
Impact severity	Insignificant
Control priority	Low

9.4.1.8 River Water

A. Source

River water quality, especially turbidity, would be affected to some extent by in-river construction of pipe support columns.

B. Sensitivity of Receptors

The receptors will be 4 small rivers (width <50 m.) and 8 large rivers (width >50 m.) where in-river pipe support columns will be constructed. Percussive piling would be necessary to construct the column foundation. The construction activity could cause re-suspension of river bed deposit, thus increasing water turbidity.

C. Magnitude of the Impacts

The number of support columns for a pipeline bridge will be determined by the river width and the design span width. The Karaulan River, the widest river, would require support columns. As all rivers to be crossed are shallow, the foundations may be laid by temporarily filling up or enclosing the specific location, over which piers can then be cast. Alternatively, when the soil is not very 'good' in the top layer, temporary rigs are erected and piles are driven inside the bed. The superstructure can then be constructed either by taking support from the already erected piers, or by temporary platforms / mud-islands in the water, or through barges (though rarely in shallow waters).

Considering the size of support columns, the foundation works in the rivers would result in a small increase in river water turbidity around the site. A small turbidity plume would be observed over a short distance before the turbidity returns to its normal level.

D. Evaluation of the Significance of Impact

The impacts of pipeline bridge construction on river water quality would be insignificant in all the rivers where pipeline bridges are to be constructed. Evaluation of the significance of this impact issue is summarized below:

Impact category	Direct impact, transient
Impact duration	Short, during the foundation construction.
Impact extent	Downstream of the foundation sites.
Impact magnitude	Very small
Impact severity	Insignificant
Control priority	Low

9.4.1.9 Impacts on Archeological, Historic and Sacred Sites

A. Sources

The selected pipeline corridor will not pass any known archeological, historic and sacred sites. However, during the site clearing and excavation of pipe trench, the Contractor may discover artifacts which potentially could have archeological, historic, religious, or cultural value.

Based on the field survey in February 2016, there are two communities along the condensate pipeline between KM 35+000 to KM 50+000. These two communities, Bonuc and Bobe sub-villages, are reportedly old settlement communities and have one common cemetery. This cemetery is located about 650 m to the north of condensate pipeline. Therefore, there is a possibility that some artifacts are present under the pipeline corridor.

B. Sensitivity of Receptors

The pipeline corridor is not known to have archeological sites. The possibility of discovering artifacts of value would be remote.

C. Magnitude of the Impacts

The magnitude of impacts cannot be assessed. The impacts would depend on archeological value of the found artifacts. Without appropriate measures, the unearthed artifacts could be damaged or could have been disposed of as wastes.

D. Evaluation of the Significance of Impact

The impacts are considered medium and should receive high control priority. Evaluation of the significance of this impact issue is summarized below:

Impact category	Direct impact, transient
Impact duration	Throughout the land clearing and trenching period 24 months
Impact extent	Confined to within the pipeline construction corridor
Impact magnitude	Medium
Impact severity	Medium
Control priority	High

9.4.2 Operational Phase

9.4.2.1 Wastes from Pigging

A. Sources

During the operational phase, the pipeline will be occasionally cleaned using pigs. The pigging will generate a small volume of waste which is remnants of the petroleum product that the pipe carries.

B. Sensitivity of Receptors

The receptors will be soil or water environment around the disposal sites of the pigging wastes.

C. Estimates of Waste Volumes

The Project Proponent's estimates of the pigging wastes are presented in ***Table 9.4-8***. On average, the pigging wastes would be about 2.2 m^3 per month. The estimates are based on a maximum 2 pig operations per month.

TABLE 9.4-8

ESTIMATES OF PIGGING WASTE VOLUME

Fluid Name	Pipe Dia. (m)	Pipe Receiver Vol (m^3)	Pigging (times/month)	Waste (m^3/month)*
Condensate	0.3	0.5	2	1
Light Naptha	0.2	0.2	2	0.4
Heavy Naphtha	0.2	0.2	2	0.4
Diesel	0.2	0.2	2	0.4
Total				**2.2**

Remark : Calculated by TEAM Consulting Engineering and Management Co., Ltd., 2016

Source : TIMOR GAP, E.P., 2016

D. Evaluation of the Significance of Impact

The impacts of pigging wastes would be small considering the small volume of wastes. However, proper treatment of the pigging wastes is required. Evaluation of the significance of this impact issue is summarized below.

Impact category	Direct impact
Impact duration	Throughout the operational phase.
Impact extent	Around the disposal sites.
Impact magnitude	Very small
Impact severity	Small
Control priority	Medium

9.4.2.2 Operational Risk Assessment

Accidental fires and explosions of petroleum pipelines are not rare incidents. The past incidents could be traced back to defective design, installation, and operation and management, as well as accidental and intentional damage to pipeline. The Consultant therefore assesses operational risks of the pipeline based on the information on the pipeline design and construction, existing conditions of the areas where the pipeline corridor will traverse, and theories and principles of risk assessment for oil pipeline. The risk assessment is presented in ***Appendix 9B***. Its major findings are as follows:

A. Areas Vulnerable to Accidental Risks

Pipeline sections vulnerable to leakage are sections around connection points, sections where a third party can easily get access to, and sections laid above ground. In the context of this Project, the following sections are identified as sections prone to leakage:

- Tie-in point at Suai Supply Base and Betano Refinery
- River crossing where the pipeline will be laid on pipe bridge or pipe rack.

B. Likelihood of Occurrence

The likelihood of occurrence of accidental incidents for each pipe is estimated at 3.94×10^{-3} times/km./year, or 3.94 times in 1,000 year. This level of likelihood of occurrence can be defined as *Possible*. The severity level of incident is Catastrophic.

C. Severity of the Accidental Fires

The extent and severity of thermal radiation in case of a fire accident of the pipeline is studied using a mathematical model BREEZE HAZ developed by Trinity Consultants Inc. as suggested by USEPA. The study considers impacts from Jet Fire and Pool Fire ignition for all hole sizes of the pipe leakage and under calm wind situation. The calm wind situation is the worst case scenario as the thermal radiation is high during a calm wind situation than a windy situation.

The worst case scenario would be the condensate pipeline is ruptured and ignited as Jet Fire. Based on the thermal flux at 12.5 kW/m^2, which will cause 1% lethality if receptors stay in the affected area for 1 minute, this lethal level of thermal flux will cover an area with about 258 m radius from the center of leakage point. The affected area for each potential point can be described as follows:

- ***Tie-in Point at Suai Supply Base:*** The most affected area is Suai Supply Base area and undeveloped area. At present, no communities exist in this area. Therefore, about 200 persons working in Suai Supply Base will be affected and the number of fatalities would be less than 2 (assuming 1% of total). About 100 persons could suffer from burns and require medical attention (assuming 50% of total). This level of impacts could be considered Moderate.

- ***Tie-in Point at Betano Refinery:*** The most affected area covers Betano Refinery, power plant, agricultural area, and undeveloped area. No houses are in this impact area. Therefore, the affected people will be personnel of Betano Refinery and the power plant, which would number at about 200. The incident could cause less than 2 death (assuming 1% of total) and less than 100 injuries from burns (assuming 50% of total. This level of impacts could be considered Moderate.

- ***River Crossing Point***: The river crossing points include Karaulan River, Ukasa River, Buiru River, Belulic River, Malo River, Loumea River, Foura River, and Raiketan River. The most affected area is undeveloped area, agricultural area, and few residential areas with about 20-30 households at each point with 100-180 people (assuming one household has 5 to 6 people). The impact at each point would be less than 2 deaths (assuming 1% of people in the residential area) and less than 90 injuries from burns (assuming 50 % of people in the residential area). This level of impacts could be considered as Moderate.

To minimize the accidental fire risk, the Project will ensure that all safety aspects, equipment, and system be included in the design, construction, and operation and maintenance of the pipeline. Generally accepted international standards, such as American Society of Mechanical Engineers (ASME) and American National Standards Institute (ANSI); ASME/ANSI B31.1, B31.4, will be strictly adhered to in these Project activities. The SCADA (Supervisory Control and Data Acquisition System) to be used in the operational control of the pipeline should be able to shut down the pipeline system immediately to minimize the impacts.

Despite these risk mitigation measures, residual risks still remain. Therefore, an emergency response plan will need to be prepared to cope with the eventuality.

9.4.3 Deactivation Phase

Environmental issues during demolition of the pipeline system will include, hazardous wastes, groundwater contamination, soil contamination, noise and gases emission, and occupational health and safety of demolition workers. They are similar to the corresponding issues during construction.

9.5 MITIGATION MEASURES

9.5.1 Pre-Construction and Construction Phases

9.5.1.1 Loss of Agricultural Land and Forest Land

A. Compensation Measures for the Loss of Forest Land

A reforestation program is recommended for the Project Proponent to implement on appropriate sites.

B. Targets

The target of the reforestation program should be about 250 ha which is equal to the forest area lost to the Project.

9.5.1.2 Fugitive Dust

A. Mitigation Measures to Reduce Fugitive Dust at Sources

At all the construction sites, measures should be implemented to reduce fugitive dust emission. The most common measures are:

- Water spraying twice a day at and around the construction areas and access roads during site preparation and grading.
- Enforce a speed limit for vehicles and trucks in the construction sites not to exceed 40 km/hr. Construction activities shall be kept as planned so that the disturbed areas will be minimized at any time.
- Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance.
- Prohibit the open burning of waste in the construction area.
- Dust masks should be provided (where applicable) to all construction workers.

These measures especially water spraying twice a day together with strict implementation of other dust suppression measures should be able to reduce fugitive dust emission as much as 75% (U.S. EPA. (AP-42, U.S. EPA. 2005)).

It should be noted that the dust suppression efficiency of water spraying will depend on the volume of water use per unit area and the frequency of spraying. A 75% efficiency could be expected.

B. Additional Mitigation Measures

No additional mitigation measures would be required at the construction site.

However, fugitive dust along the transport routes should be minimized. Measures to be implemented by the EPC contractor should include:

- Enforce speed limit for trucks not to exceed 40 km/hr when passing the communities.
- Cover construction materials by canvas during transportation, materials should be dampened, if necessary, before transportation.
- Establish a vehicle washing facilities to minimize the quantity of material deposition on public roads.
- Establish a checkpoint at project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions.

9.5.1.3 Gaseous Emissions

A. Mitigation Measures to Reduce Emissions at Sources

The contractor will be required to adopt best practices to minimize gaseous emissions at sources through the following management measures:

- Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites;
- Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. The engines of the construction equipment fleet must be routinely maintained by qualified mechanics to ensure their proper conditions during operations.
- Provide adequate training to the equipment operators in the proper use of equipment.
- Use the proper size of equipment for the job.
- Use the equipment fitted engines with latest low emission technologies (repowered engines, electric drive trains). For example, the diesel generator set to be used must be equipped with modern pollution control equipment.
- Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).
- Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.
- Take measures to manage the movement of construction vehicles entering and leaving the construction sites to avoid, or mitigate and manage the potential for vehicle emissions impacting on adjacent properties, except where such residential or activities from an arterial road to be used for access to or from the construction site. Measures for construction fleet management are to be provided in the construction vehicle management plan and the construction traffic management plan. Such measures may include avoiding or minimizing queuing on streets approaching the worksites or adjacent to other sensitive activities;

- For stationary plant and equipment powered by diesel motors, take measures to avoid or mitigate and manage the potential impacts of exhaust emissions on adjacent residential or other sensitive activities. For example, ensure all construction vehicles and stationary plant and equipment powered by diesel motors are fitted with emission control measures, and are regularly maintained to manufacturers' specifications.

B. Emission Control Targets

Ambient air quality at the construction site will comply with the applicable ambient air quality standards.

C. Additional Mitigation Measures

No additional mitigation measures apart from the source reduction measures would be necessary. However, heavy equipment operators could be provided with masks, if deemed necessary, to minimize the impact of particulates.

9.5.1.4 Noise

A. Mitigation Measures to Reduce Noise at Sources

Possibilities are limited for reduction of noise levels of construction equipment. The contractor and the subcontractors may rent construction equipment from suppliers and would not be at liberty to improve them. It is difficult to design practicable noise retrofit kits to endure the environment of the construction sites. Therefore, the contractor and his subcontractors should be required to use equipment that has best noise performance.

B. Additional Mitigation Measures

(1) Physical Measures

- The noise reduction at the perimeter could be achieved using an acoustic wall or a sound barrier (Steel 18 ga with 1.27 mm. thickness which transmission loss of 25 dB (A) or equivalent) at least 3 m high with adequate length to block the noise emanating to the receptor.
- Provide ear plugs or ear muffs to workers operating in the excessive noise areas.

(2) Management Measures

The following management measures should be implemented to complement the physical measures.

- Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures.

- Speeds of vehicles in the construction site will not be more than 40 km/hr.
- Noise performance requirements of construction equipment will need to be clearly stated in contract specifications.
- Temporary sound barriers or shielding should be installed for non-mobile equipment.
- The contractor will be required to regularly monitor ambient noise levels at the receptors, particularly during the noise generation period such as piling.

The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address

9.5.1.5 Construction Wastes

A. Mitigation Measures for Waste Reduction at Sources

Reduction of construction wastes at sources could be achieved through good design and best practices in construction management. The subject of good design is discussed in the next section.

Best Practices in Construction Management

The construction will adopt the following practices to minimize waste quantities at sources: waste segregation, waste collection and storage, waste reuse and recycling, waste disposal, and on-site record keeping.

Waste Segregation

- The contractor will design and implement a waste segregation system and procedure and communicate it to all construction personnel to strictly adhere to the segregation procedure;
- An appropriate number of containers with adequate volume and appropriate materials will be provided at strategic locations to support the segregation. Each waste category will be segregated into recycling, reuse and disposal sub-categories.

Waste Collection and Storage

- Daily collection and transport will be organized and carried out for each sub-category of segregated wastes;
- A roofed storage area with adequate space will be provided for storing the segregated wastes waiting for the on-site or off-site reuse or recycling;
- The storage area for hazardous waste will need to be specially designed to prevent spills or leaks onto the soil.

Waste Reuse and Recycling

- Chipping and mulching of vegetation cleared during construction and reuse of mulched material for landscaping purposes;
- Reuse of excavated material as fill at approved fill sites;
- Topsoil free of weeds to be stockpiled and stored for re-use, if possible;
- Collection and return of packaging materials (e.g. pallets) to suppliers wherever practicable;
- Use of recycled materials to the limits of design in concrete, road base, asphalt and other construction materials;
- Remove any contamination inadvertently deposited in recyclable waste material containers. Provide cleanup of excessive contamination at recycling vendor locations when such contamination is not controlled at the project site;
- Collection and recycling of used oils by a licensed contractor;
- Collection by a licensed contractor of empty oil and fuel drums and other containers for return to recycling facilities.

B. Waste Control Targets

There are no quantitative standards for construction waste management on site. However, the control targets should be on soil and groundwater quality standards if the construction wastes are to be disposed in the Project area.

The performance of construction waste management will be evaluated by the following qualitative indicators:

- No wastes are haphazardly dumped inside or outside the construction site;
- No public complaints related to the management of construction wastes.

C. Additional Mitigation Measures

The remaining wastes that cannot be reused or recycled will have to be properly disposed off to minimize environmental impacts. The following approach should be considered:

General Requirements

- An efficient construction waste management system should be established and implemented. Construction waste will need to be classified and sorted out at source for disposal. The disposal methods will depend on the types of wastes: direct reuse in the construction, sale and recycling of materials, land filling for inert materials and specific treatment method for each type of hazardous materials.
- Haphazard disposal of construction waste in or off the construction site will be prohibited.
- No burning of wastes will be allowed.

Construction and Land Clearing Wastes

- Site preparation waste should be disposed at a suitable landfill site to be selected by contractors with approval of concerned authority.
- The construction wastes may be disposed off by landfill.

Hazardous Wastes

- Hazardous wastes will be handled by a licensed hazardous waste contractor. If this service is not available, the contractor will need to find appropriate arrangements for incineration, safe permanent storage, or other appropriate methods of disposal.
- A Hazardous Waste Management System covering waste classification, separation, collection, storage, transfer and disposal should be set up and operated. The waste management system will comply with applicable regulation of the government, if any.

9.5.1.6 Work Camps

Solid Wastes

- Provide adequate number of refuse bins or containers with tight covers, daily collection of disposal.
- The collected solid wastes will need to be disposed of by sanitary landfill. Waste recycling may not be practical as there would be no market nearby for sorted out materials that can be recycled.

Wastewaters

- Toilet wastes will be separated from grey water or salvage.
- Kitchen and canteen waste water will be discharged into oil and grease trap tank before draining into a temporary retention pond within worker camp site areas.
- Toilet wastes at the two satellite camps could be discharged into septic tanks and drain fields considering small volume.
- Toilet wastes at the base camp should be treated in a package plant. The septic tank effluent could be used in dust suppression or plant watering. Alternatively, toilet wastes and other wastewaters could be treated in a package sewage treatment plant.

9.5.1.7 Hydrotest Water

Appropriate structure will be required to minimize damage on river bank when discharging the hydrotest water. No treatment before discharging would be required.

9.5.1.8 Impacts on Archeological, Historic and Sacred Sites

A. Mitigation Measures

If it is necessary to realign some sections of the pipeline corridor, the contractor must ensure that the realigned corridor will not pass historic and scared places.

The contractor shall prepare a detailed description of the Chance Find Procedure of the pipeline. The Procedure shall clearly prescribed actions to be taken by the contractor in the case of a chance find. Generally, the actions will include:

- Site supervisor/foreman shall order construction workers to stop immediately the construction activities in the area of the chance find
- Inform concerned authority, including local leaders, for proper management if historic is found.
- Delineate and mark clearly the discovered site or area and prohibit physical activities in the area without prior approval of the concerned authority.
- Install temporary site protection measures (warning tape and stakes, avoiding signs).
- Strictly enforce any no-go area needed to protect the site.
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the responsible Ministry takes over.
- If it is necessary to relocate a cemetery and grave yard, cultural ceremony should be arranged prior to the relocation.

9.5.2 Operational Phase

9.5.2.1 Pigging Wastes

The pigging wastes could be sent to the wastewater treatment system of the refinery. In case of the pigging station is located at Suai Supply Base, the waste need to be gathered there. They then will be taken to Betano Refinery later.

9.5.2.2 Measures for Mitigating Operational Risks

Risk mitigation measures are listed in ***Table 9.5-1***.

TABLE 9.5-1

POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK

Potential Event	Mitigation/Prevention Measures
1. Third Party Damage	
1.1 Excavation - Ease to access by third party - No pipeline signal or marker	- The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. - The pipeline signal or marker will be installed along the pipeline route. - Regular survey patrol driving along the pipeline right of way. - The minimum cover of buried pipeline shall be accordance with ASME/ANSI B31.4 standards.
1.2 Traffic Accident - No pipeline signal or marker	- The pipeline signal or marker will be installed along the pipeline route. - The traffic signal shall be installed while pipeline laid above ground.
1.3 Vandalism	- The project shall be educated the people who living in the vicinity area, in order to make the community understand and participate in the process of project development. - The project shall be built-up the relationship with the local communities.
1.4 Other damage, i.e., Fire/Explosion, arcing of Electronic from the other etc.	- The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. - The pipeline signal or marker will be installed along the pipeline route. - Regular survey patrol driving along the pipeline right of way.
2. Incorrect Design	- The pipeline designed in accordance with the international standards (ASME/ANSI B31.4, ASME/ANSI B31.1, API RP 1102, etc.) - The pipeline material conforming to API 5L Specification.

TABLE 9.5-1

POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK (CONT'D)

Potential Event	Mitigation/Prevention Measures
3. Incorrect Operation	
3.1 Mechanical/Equipment Failure	– The pipeline operation shall be done in accordance with the international standards (ASME/ANSI B31.4, ASME/ANSI B31.1, etc.) – Regular maintenance and inspection the equipment, machines to be in good conditions.
3.2 Incorrect Installation	– Installation of machinery and equipment shall be in accordance with codes applicable to the specific type and their installation manual or guidelines. – After installation, machinery or equipment shall be tested under conditions approximating actual operations to assure their proper functioning.
3.3 Human Errors – No operation skill – Staff is not physically or mentally fit for duty – Negligence or inadequate attention to details of staff	– Staff training to be provided on a regular and continuing basis. – Physical check up programs for staff relevant to their tasks as required by regulations or safety standards – Random checks of drug use. – Instilling work safety discipline into staff
4. Natural Forced	
4.1 Earthquake	– The pipeline is designed in accordance with the following criteria: • Design Code ASCE: 7-10 • Load Combination shall be as per ASCE 7-10 • Site Class: B • Risk Category: IV • Seismic Design Category: D • Design return period: 475-year

TABLE 9.5-1

POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK (CONT'D)

Potential Event	Mitigation/Prevention Measures
4.2 Storm	– The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. – The pipeline signal or marker will be installed along the pipeline route. – Regular survey patrol driving along the pipeline right of way.
4.3 Hit of Lightning	– The pipeline shall be provided the lightning or fault currents prevention systems in accordance with NACE RP-O1-77 Guidelines.
4.4 Flood/Heavy Rain	– The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route.
4.5 Volcano Eruption	– According to TIMOR LESTE: Natural Hazard Risks map provided by United Nation Office for the Coordination of Humanitarian Affairs (OCHA), there are no actives volcano within the project area and vicinity.
5. Corrosion	– The pipeline shall be used 3LPE for External Coating, that consist of a three layers coating system comprising: • First layer (inner): Fusion Bonded Epoxy (FBE). • Second layer (intermediate): Chemically Modified Polyethylene Copolymer • Third layer (outer): High-density high molecular weight UV stabilized Polyethylene (HDPE) – Three layers shall be used for Painting (External Coating for A/G) – The Cathodic Protection (CP) shall be provide to prevention the corrosion. – Pre-cast concrete sleeper shall be used for above-ground pipeline instead of steel structure in order to avoid corrosion problem.

9.5.3 Deactivation Phase

Activities Generated Impacts

Major activities during deactivation phase will be removing cathodic protection and oil products from the pipeline, cleaning the pipeline by flushing it with fresh water, air, or inert gas, cutting up the pipeline and removing cut sections from the ground, demolishing pipeline crossing structures, and demolishing the pumping stations, pigging stations, and block valve stations.

Impacts

The main environmental issues are:

- Fugitive dust and noise caused by heavy machines and equipment,
- Disposal of waste, hazardous waste, and oil products;
- Wastewater from cleaning of storage tanks and pipeline; and
- Occupational health and safety of demolition workers

Mitigation Measures

The impacts will be similar to those occur during construction period, but in a smaller scale due to smaller scope and shorter period. Hence implementation of mitigation measures will be similar to those recommended for the construction phase. They will be implemented and controlled by the demolition contractor. The contractor will be required to adopt the best practice to minimize these impacts.

9.6 INCORPORATION OF MITIGATION MEASURES INTO PROJECT DESIGN

The following impact mitigation measures are recommended to be incorporated into the design of the pipeline system:

9.6.1 Construction Wastes

There are five key principles that design teams can use during the design process to reduce waste. They are summarized below together with questions the design team should address to design out waste.

(1) Design for reuse and recovery

Design for reuse of material components and/or entire buildings have considerable potential to reduce the environmental burdens from construction. Much of this is common sense as, with reuse, the effective life of the materials is extended and thus annualized burdens are spread over a greater number of years. Reuse, in the waste hierarchy is generally preferable to recycling, where additional processes are involved, some of which will have their own environmental burdens.

(2) Design for materials optimization

Good practice in this context means adopting a design approach that focuses on materials resource efficiency so that less material is used in the design, i.e. lean design, and/or less waste is produced in the construction process, without compromising the design concept.

Three main areas offer significant potential for waste reduction. They are:

- Minimization of excavation
- Simplification and standardization of materials and component choices
- Dimensional coordination.

(3) Design for waste efficient procurement

Designers have considerable influence on the construction process itself, both through specification as well as setting contractual targets, prior to the formal appointment of a contractor/constructor. Designers need to consider how work sequences affect the generation of construction waste and work with the contractor and other specialist subcontractors to understand and minimize these. Once work sequences that cause site waste are identified and understood, they can often be 'designed out'.

(4) Design for deconstruction and flexibility

Designers need to consider how materials can be recovered effectively during the life of the building when maintenance and refurbishment is undertaken or when the building comes to the end of its life.

9.6.2 Wastewaters

The contractor will be required to prepare detailed design of a wastewater management system for the base camp and the two satellite camps. The wastewater management system will consist of a collection system and a simple treatment system. The proposed design concept is based on the principle of wastewater segregation, treatment and reuse as briefly described below:

- Toilet wastes will be separated from grey water or salvage.
- Kitchen and canteen waste water will be discharged into oil and grease trap tank before draining into a temporary retention pond within worker camp site areas.
- Toilet wastes will be discharged into a septic tank (or more than one septic tank) with a hydraulic retention time of about 5 days. The volume of toilet wastes is estimated at about 20% of the total volume of domestic wastewater, the septic tank effluent (seepage) will be discharged into a drain field. Alternatively, toilet wastes and grey water could be treated in a package sewage treatment plant.
- Grey water will be discharged into a retention pond.
- The retention pond will be designed as an oxidation pond with a hydraulic retention time of about 7 days.

9.6.3 Hydrotest Water

A retention basin for storing the hydrotest water for gradual discharge or for reuse.

9.7 DETERMINATION OF ANY RESIDUAL IMPACTS

Residual impacts of the identified environmental issues in the construction and operational phases will be insignificant if the recommended mitigation measures are implemented.

CHAPTER 10

SOCIAL IMPACT ASSESSMENT

CHAPTER 10

SOCIAL IMPACT ASSESSMENT

This chapter identifies and assesses significance of impacts of the Project on households and communities in and near the pipeline construction corridor. Only impacts which are socio-economic and socio-cultural in nature are considered since social impacts related to physical environment disturbances such as noise and dust, are already discussed in Chapter 6. The Consultant found the outline and content of social impact assessment prescribed in Section 9 of the MREIS not relevant to the social impact context of this Project (explained below). Therefore, the chapter is structured along the line of Chapter 6 as appropriate.

10.1 THE SOCIAL IMPACT ASSESSMENT FRAMEWORK

10.1.1 Difference between Social Assessment versus Social Impact Assessment

The Consultant notes that although the title of Section 9 of the MREIS is *Social Impact Assessment*, the term *social assessment* is used in Section 9 a, and that the prescribed content is essentially for project social assessment.

A social assessment or social analysis of a proposed project is a study of social aspect of the project to assess its social viability. It complements other key studies needed for determining project viability and formulation, such as economic analysis, financial analysis, institutional analysis, and environmental analysis. Therefore, the scope of project social analysis or social assessment is relatively broad and normally covers the following issues:

- Verification of project demand to ensure that the demand is real and related to project beneficiaries;
- Equitable sharing of project benefits among project beneficiaries;
- Removal of non-physical barriers to enable project beneficiaries to access project benefits;
- Sustainable operation and maintenance of project facilities; and
- Mitigation *of project impacts on some project beneficiaries.*

Therefore, social impact assessment is only a part of project social analysis. Social impact assessment is carried out as a part of the EIA while social analysis is carried out as a part of project feasibility study.

Normally, project social analysis is crucial for the preparation of rural development projects such as irrigation development, rural water supply, and agricultural development projects. For these rural development projects, project beneficiaries are clearly identified and targeted, and their participation is critical to project viability and sustainability.

It should be noted that this Condensate and Petroleum Products Pipeline Project is not a rural development project. It is conceived to support the operation of the proposed Betano refinery which will respond to the national demand on energy security and value addition of the raw condensate produced in the country. The Project has no identified individual beneficiaries.

Therefore, the outline and content of social impact assessment prescribed in Section 9 of MREIS is not relevant to social impact assessment of this Project.

10.1.2 Purpose and Objectives of Social Impact Assessment

Social impact assessment of this Project is about its impacts which are social in nature, not about social aspect of the Project. The purpose of social impact assessment of this Project is to ensure the harmony between the Project and communities along the selected pipeline construction corridor. This means that: (i) the affected people will not be made worse off by the Project; (ii) measures should be taken to minimize conflict between the Project and the surrounding communities, and (iii) the Project should take measures to enable local peoples to benefits from employment opportunities created by the construction and operation of the Project. These three requirements guide the social impact management of this Project.

In connection with the above stated purpose, the objectives of social impact assessment are established as follows: (a) identify relevant social impact issues of the Project; and (b) prepare a social management plan as part of the EMP to meet the three requirements of social management of the Project. The social management plan will cover the pre-construction, construction, and operational phases.

10.1.3 IFC's Performance Standards Related to Social Impacts

IFC's eight performance standards for development projects discussed in ***Section 3.6.1*** could help in identifying social impact issues. In the context of this Project, PS2-Labor and Working Conditions, PS4-Community Health, Safety and Security, and PS5-Land Acquisition and Involuntary Resettlement are relevant to social impact assessment. Based on the information on social and cultural aspects of the villages near the Project site in ***Section 4.6 and 4.7***, respectively, PS7-Indigenous Peoples and PS8-Cultural Heritage are not relevant to this Project. There are no indigenous peoples and there are no places of cultural and heritage value in the Project site and the nearby communities.

10.2 SOCIO-CULTURAL, INSTITUTIONAL, HISTORICAL AND POLITICAL CONTEXT

10.2.1 Socio-Cultural Context

The proposed pipeline will be laid between Betano Refinery in Betano Village and Suai Supply Base in Camanasa village. It will be laid in a 40 m land strip adjacent and along the 30-m highway corridor. Along its 60 km length, the pipeline traverses administrative areas of 8 villages in Covalima, Anairo, and Manufahi districts. The eight villages are: (i) Raimea, Tashilin, and Zulo villages in Covalima district; (ii) Beco village and Labarai village of Suai sub-district in Covalima district, (iii) Leolima village and Foho-Ailico village of Hatu-Udo sub-district in Ainaro district, and (iv) Betano village of Same sub-district in Manufahi district. Information on socio-economic conditions of these communities is presented in ***Section 4.6***.

In general, most families in the eight villages have low income and most people of working ages have low education. These factors have implications on social impact mitigation. Naturally, they would have high expectations of the Project in terms of direct benefits from employment and business opportunities. However, their low levels of education would be constraint for them to benefit from the Project.

Each of the eight villages consists of a number of sub-villages or communities scattering within the village administrative area. Twelve sub-villages are located within 500 m from the pipeline corridor as shown in ***Table 10.2-1***.

TABLE 10.2-1

COMMUNITIES WITHIN 500 M FROM THE PIPELINE CORRIDOR

Location	Coordinates		Distance (m)	Direction from the Corridor
	E	N		
Batano Polytechnic (Bemetan sub-village)	798784	8987473	20	S
Lalica sub-village	798150	8987937	300	N
Bobe sub-village	787540	8984000	0	Traversed
Bonuc sub-village	782780	8983625	0	Traversed
Harekain sub-village	773150	8984150	500	S
Leonti sub-village	772000	8984450	390	S
Raifila sub-village	771460	8984625	300	S
Karetamute sub-village	769850	8984930	150	N
Autuik sub-village	760460	8997840	500	N
Haemanu sub-village	757780	8976150	300	N
Meop sub-village	756540	8974850	460	S
Harekain sub-village	773150	8984150	500	S

Remark: The pipeline and highway corridor will traverse two community areas.

10.2.2 Institutional Context

Social activities of the Project will need to be planned and implemented in consultation with local authorities and village chiefs. Their participation would be critical to the success of social programs of the Project.

10.2.3 Historical Context

The coastal area, including the Project site, has experienced three development projects-the highway project, the Karaulan River irrigation project, some other irrigation projects along Cassa and Zumalai sub-districts, and the power plant project. Experience of the people in social impact management of the three projects would have bearing on the people's trust in social impact mitigation measures proposed by the Project and their cooperation with the Project in implementing the measures.

10.2.4 Political Context

At the national level, the Betano Refinery Project is accorded high priority by the Government. Therefore, this Project, being a key support of the refinery, would also enjoy full political support at the national, regional, and district levels.

10.2.5 Roles of NGOs

Being a new country, Timor-Leste's socio-economic development attracts attention of foreign and local non-governmental organizations. Few NGOs are around the Project site and are interested in social impact issues of the Project, and other development projects in the region, particularly land acquisition and involuntary resettlement, and benefits of the Project to local people. The interest of NGOs could affect the Project in both directions.

10.3 SOCIAL IMPACTS DURING CONSTRUCTION

The Consultant identifies four key social issues of the Project based on: (i) the nature and magnitude of Project activities and requirements; (ii) information on socio-economic settings of the villages along the construction corridor; and (iii) IFC's performance standards applicable to social impacts of projects. The four key social impact management areas in the construction phase are: (i) land acquisition and resettlement; (ii) conditions of worker camp; (iii) influx of workers; and (iv) community health, safety and security. The subjects of occupational health and safety for workers, employment and working conditions are dealt with in the CEMP as they are requirements not impacts. Impacts of the four identified social issues, their significance, and mitigation measures are discussed below.

10.3.1 Land Acquisition and Resettlement

A. Scope and Impacts of the Issue

The proposed pipeline will be laid adjacent and along the ongoing highway project. Therefore, the land acquisition of this Project and the ongoing highway project will be cumulative.

Based on 90 m width and 60 km length, the combined pipeline and highway construction corridors will occupy 418.98 ha of land, including the river water area. ***Table 10.3-1*** presents estimates of various types of land on the 90 m corridor based on the estimates for the 100 m land strip presented in ***Section 4.5.3***. The dominant land categories are forests including teak plantation (47.25% of the total) and agricultural land (37.99%). Being the linear structure, the land requirement per km is small. Of the total 418.98 ha, about 346 ha would be privately owned or used (total of agricultural land, teak plantation, and built up area). The remaining would be state owned. Therefore, social impacts of the land acquisition would be related to about 346 ha.

TABLE 10.3-1

ESTIMATES OF AREAS OF VARIOUS LAND USE ALONG THE PIPELINE CORRIDOR

Existing Use of Land	Area (ha)		Area (ha/km)	
	100 m strip*	90 m strip**	100 m Strip*	90 m Strip**
Forests	**282.80**	**254.52**	**4.72**	**4.25**
-Mixed deciduous	125.25	112.73	2.09	1.88
-Mixed deciduous and teak and palm tree plantation	137.39	123.65	2.29	2.06
-Riparian forest	20.16	18.14	0.34	0.31
Agricultural land	**227.39**	**204.65**	**3.79**	**3.41**
-Paddy field	61.03	54.93	1.02	0.92
-Field crops	76.97	69.27	1.28	1.15
-Orchards	85.78	77.20	1.43	1.29
-Mixed teak and orchards	3.61	3.25	0.06	0.05
Built up area	**19.37**	**17.43**	**0.32**	**0.29**
-Residential area	13.85	12.47	0.23	0.21
-Others	5.52	4.97	0.09	0.08
Miscellaneous	**68.98**	**62.08**	**1.15**	**1.03**
-Idle land	49.33	44.40	0.82	0.74
-Shrubs	1.73	1.56	0.03	0.02
-Water	17.92	16.13	0.30	0.27
Total	**598.54**	**418.98**	**9.98**	**6.98**

Source : Calculated by TEAM Consulting Engineering and Management, 2016.

Remark : * Study area covers 100 m strips (50 m of each side).
** ROW of the Highway which covers condensate pipeline area.

The acquisition of this 346 ha of land in theory could raise three issues: (i) compensation to owners or users of the land; (ii) relocation of houses located on the corridor; and (iii) impacts on livelihood of people whose land is acquired. The first issue has already been resolved by the Government when the land required for both the highway and the pipeline was acquired as one package at fair rates agreed to by the sellers and buyer. This is only for the first phase from Suai to Zumalai with the distance of 31 km. The second issue would affect Bobe and Bonuc sub-villages where the corridor will cut through the communities. About 10 houses in each of these two affected communities will need to be relocated. The third issue is relevant as land loss regardless of compensation could have impacts on livelihood of the land sellers. This issue is more significant to the affected peoples who will be relocated.

B. Significance of the Impacts

As the compensation for land acquisition has already been paid in full amount to all eligible affected people, the impacts of land acquisition will be confined to the second and third issues. Their impacts, particularly on Bobe and Bonuc communities, are considered significant. The issues, if not amicably resolved, could affect Project implementation and reputation of TIMOR GAP, E.P..

The Consultant has noted that the land acquisition for the Betano Project attracted attention of NGO and the affected communities in 2013. According to one article entitled "Complaints of Stakeholders"[1], the affected people expressed three concerns related to the land acquisition and resettlement: (i) rates of compensation for their land; (ii) delay in payment as happened in the past land acquisition for the Central Electricity complex in Betano; and (iii) adverse impacts on their livelihood if they have to move to the resettlement area provided by the Government in Nova Betano new town. Their concerns are legitimate and the Project Proponent will have to take appropriate measures to positively respond to their concerns.

The impacts of land loss on livelihood of each family would depend on the extent of land loss. There is no information on the extent of land loss of each affected family. Therefore, it is not possible at this stage to assess impacts of the land loss on livelihood of the affected people. However, as the land corridor is a narrow strip, most land owners would lose only small parts of their land. The impacts on livelihood would be most significant for the affected people in Bobe and Bonuc communities who would loss all their land. The could also be a small number of families in other communities who may lose the entire land plots.

The livelihood impact aspect of land acquisition is normally not considered if the land is acquired by the Government. Only projects financed by international agencies that the livelihood impact has to be considered. Therefore, the impacts of land acquisition could be considered insignificant.

[1] Fundasaun Mahein, 2013, September 18, Press Release Refinery Project and Petrochemicals: Major Development or Major Threat?

C. Mitigation Measures

The land acquisition and resettlement will need to be based on a sound resettlement action plan (RAP). The TOR for this EIA does not include preparation of a RAP. Therefore, the Consultant has no time and budget to prepare a RAP for the Project. Preparation of the RAP for this Project is a major undertaking as (i) detailed surveys of affected people, their land and properties to be acquired, and the proposed resettlement site will need to be carried out; (ii) a practical livelihood development program will have to be designed for both the relocated people and the land sellers who need assistance in livelihood development. A typical outline of a RAP is presented in ***Appendix 10A***.

10.3.2 Conditions of Worker Camp

A. Scope and Impacts of the Issue

The project construction will take about 3 years to complete and will use about 150 workers at construction peak. The workers will be hired by the contractor and subcontractors. It is expected that most of the workers will be recruited from villages in the project area and beyond. Most skilled technicians and professionals would come from the country of origin of the contractor and subcontractors. Most of the workers would be accommodated in the base camp and some would stay in two satellite camps (see ***Section 6.4.1.6***). The location of the base camp and the satellite camps will be determined by the contractor with consent of the Project Proponent.

Considering the international status of this Project, the design and operation of its worker camp should follow international guidelines as much as possible. Inadequate space and facilities and inadequate management of the worker camp could have such impacts as: (i) unhygienic living conditions with implications on health of workers; (ii) pollution or contamination of the natural environment outside the worker camp, such as fly infestation, water pollution, and odor; and (iii) exposure of workers on accidental risks or worker safety.

B. Significance of the Impacts

The impacts are considered significant as they could affect workers' productivity, environmental quality, and health condition of the nearby communities.

C. Mitigation Measures

The design, operation, and management of worker camps is the responsibility of the main contractor and subcontractors. Therefore, the Project Proponent will ensure that the construction contract will cause the main contractor and subcontractors to meet all requirements of the design, operation, and management of the worker camp. Broad requirements for the worker camp should be as follows:

1) The worker camps should be made of decent materials that could withstand heavy rains and storms. The worker camps should be adequately ventilated and lighted.

2) The sleeping quarters should be planned to provide a sleeping space of at least 4 m^2 per worker. Professional staff should be provided separate rooms, two to four persons per room.

3) The number of toilets and baths should be 1 unit for 20 workers.

4) A common canteen should be planned to accommodate at least 150 persons.

5) Common areas for cloth washing and drying should be provided with adequate water supply and drainage.

6) Recreational facilities should include two televisions sets installed in the canteen, and a recreational area for reading and playing indoor games. Daily newspapers, books, table tennis, board games and DVD show should be made available in the recreational area. Space for outdoor sports may also be provided.

7) One shop should be set up to sell sundry goods to the workers.

8) Fly, insect and rodent control needs to be strictly implemented in integration with solid waste collection.

9) Medical services should be provided at a small clinic served by a doctor. The clinic will have 2 sick beds. The doctor will treat minor injuries, deliver first aid, and provide direction on the best course of care (Tirana or local care). For serious injuries and emergencies a contract should be established with the provincial hospital which can provide good quality hospital and medical facilities.

10) Fire and safety plan for the camps should be prepared. Fire extinguishers need to be provided in each camp. Clear fire escape routes should be clearly marked with no obstructions. Workers will need to be informed on fire safety arrangements. Fire drills may be required.

11) Basic camp infrastructure will include:

- Power supply: The supply will be sufficient to ensure normal living and working supply for critical aspects.
- Telecommunication: internet access should be provided.
- Water supply: The source of supply will be ground water taken from a deep well to be bored within the site. A water storage tank will be provided as part of the water supply system with adequate capacity for 1-2 days of demand.
- Drinking water: Clean drinking water will be provided in small tanks.
- Drainage: Drainage in the worker camp area will be adequate to ensure no water pools in the area.
- Sanitation: Wastewater will be drained separate from the storm drainage system to a wastewater treatment plant.
- Solid wastes: Solid wastes bins will be provided at various locations, such as canteen and sleeping quarter. A solid waste collection system will need to be established to ensure daily hauling of all domestic solid wastes to the disposal site.

12) Establish and enforce codes of conduct within and outside the worker camps covering camp security, fire safety, drug using, drinking, smoking, and visiting guests.

13) Security guards will be in charge of the security of camp.

14) Transport: Transport services should be provided on weekends or during the week, if necessary, from the project site to nearby communities. The scope of transport services will depend on the demand which should be determined during the construction. At a minimum, one 40-seat bus should be provided.

10.3.3 Impacts Related to the Influx of Workers

A. Scope and Impacts of the Issue

The influx of several hundreds of workers during the three-year construction period could have both positive and negative impacts on the local communities as follows:

Creation of Demand for Local Goods and Services: The influx of workers will create demands for local goods and services, such as foods, handicrafts, and personal services such as hair cutting. These demands would be met locally and would create business opportunities to local people. This impact is therefore positive in nature.

Competing Use of Local Resources: The influx of workers could compete with the locals for limited local resources such as foods, water, health service, and infrastructure services. This completion could have impacts on the locals such as increased food prices, and inconveniences in using infrastructure.

Health Risks: Without proper management, the influx of workers could pose health risks to the communities. Communicable diseases such as sexually transmitted diseases, TB and hepatitis could be areas of concern.

Conflicts with Locals: Workers from other areas, including foreign workers, could have conflicts with locals due to differences in culture, value and ways of life.

B. Significance of the Impacts

The above negative impacts are considered moderately significant as the number of workers is not very large. The positive impact provides a good opportunity for the Project to contribute to the local economy. The positive impact will be small considering only 150 workers. Despite the low level of impacts, this issue merits attention of the Project Proponent.

C. Mitigation Measures

Demand for Local Goods and Services

The contractor should ensure that local provision of goods and services to the workers will be orderly and clean, and will not create unsanitary conditions near the worker camp. If possible, provisions should be made near the worker camp for local people to provide their services. For example, a market place could be arranged for local people to sell their goods.

Competing Use of Local Resources

The contractor should avoid using local resources as much as possible. However, as the number of workers is only 150, the need for this mitigation measure should be determined when the location of the worker camps are known.

Health Risk

The contractor will need to design and implement an effective program for control of communicable diseases among the workers. Such program should include:

- Health screening of job applicants before employment;
- Periodic health examination or health surveillance program of workers for early detection of communicable diseases;
- Onsite health clinic and referral system; and
- Health awareness training for the workers on hygiene and sanitation, good housekeeping practices, communicable and infectious diseases.

The communicable diseases control program is related to the sanitation and hygiene program for the worker camp.

With proper and strict control, the health risk to the communities in the project area could be minimized.

Conflict with Locals

Non-local workers should receive information and a briefing to make them aware of cultural sensitivity of the locals.

In addition, a liaison forum or committee should be established to promote good relation between the workers and the communities. The communities-workers relation committee should monitor the work camp integration, identify any potential or emerging issues, promote good practices and act as a formal channel of communication between the local communities and the worker camp. The committee should have not more than 8 members representing the contractor, the Project Proponent, the workers, and community leaders or local authorities.

The committee should meet as regularly as necessary and at least once a month for the first 6 months. It should continue throughout the life of the work camp.

The committee should receive detailed information on the establishment of the worker camp, its specifications, facilities and provisions (utility services, food, transport, health etc.), codes of conduct, worker profiles, etc. The purposes are to identify and discuss potential issues, and to formulate measures for timely and effectively handling of the issues. The committee should also receive regular reports summarizing key monitoring information, findings and trends of such matters as health of workers and local services, numbers and types of grievances made, and social activities designed to foster relation between the communities and workers.

The local communities should be kept informed of the establishment of the committee and its activities through such means as village meetings and local radio. The local communities should be encouraged to discuss/report any concerns, grievances or issues.

It should be noted that the communities-workers relation committee is different from the tripartite committee proposed in CEMP for addressing grievances related to the construction activities.

10.3.4 Community Health, Safety and Security

A. Scope and Impacts of the Issue

This issue will be of concern to the communities near the construction corridor. As Bobe and Bonuc communities will be relocated, they will not be considered as receptors of the impacts of this issue. The significance of this issue will depend on the distance between the community and the construction corridor. The issue will be most significant in Karetamute sub-village (150 m from the corridor) and Bemetan sub-village which is only 20 m from the corridor.

IFC's Performance Standard 4-Community Health, Safety and Security prescribes in details its requirements related to community health, safety and security. The requirements are divided into two problem areas: (i) community health and safety; and (ii) security personnel.

The areas of concern under the two problem areas are reflected in the two objectives of PS4 as follows:

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

The first objective is relevant to Community Health and Safety. The areas of concerns are indicated in PS4:

1) Infrastructure and Equipment Design and Safety
2) Hazardous Materials Management and Safety
3) Ecosystem Services
4) Community Exposure to Disease
5) Emergency Preparedness and Response

The first four areas of concern require impact identification, assessment, and formulate mitigation measures. The last area of concern requires a design of an emergency preparedness and response plan.

The second objective is relevant to Security Personnel. The main area of concern is on the conduct of security personnel to be employed during the project construction, which may affect security of the communities.

B. Significance of the Impacts

(1) Infrastructure and Equipment Design and Safety

This area of concern is most relevant to the excavation of pipe trench and transport of pipes and other materials to the construction site. Noise, fugitive dust and gaseous emissions could have impacts on health of the communities. The impacts of these environmental disturbances are already discussed in ***Chapter 6***.

(2) Hazardous Materials Management and Safety

This area of concern is not valid for the construction of this Project. Oil and chemicals considered as hazardous wastes will be stored in the base camp and satellite camps which should be far from the communities. The subject of hazardous wastes is discussed in ***Section 6.4.1.5***.

(3) Ecosystem Services

The project construction will not have impacts on ecosystem services in the project area as it will need less than 150 workers. This area of concern is not relevant.

(4) Community Exposure to Disease

This area of concern is relevant to communicable diseases related to influx of construction workers. The impact is already assessed in ***Section 10.3.3*** and mitigation measures is already proposed.

(5) Emergency Preparedness and Response

Emergency situation during the construction of this Project could happen only in the case related to explosion and fire of the diesel oil storage tank. As its storage volume is not large and its location would not be near communities, there would be no need to prepare an emergency preparedness and response plan for this incident.

In addition, to these five areas of concern identified by IFC, community safety could be affected by: (i) accidental fall of children into the uncovered pipe trench; (ii) increased traffics of trucks transporting construction materials to the pipe laying sites.

C. Mitigation Measures

Mitigation measures for community safety will cover site safety and traffic safety. The following measures are proposed to be included in the construction contract.

- The contractor will undertake a program of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto the construction corridor where the construction is ongoing, the meaning of signs, the dangers of playing on or near equipment or entering fenced areas. This will include presenting in every primary and secondary school in communities along the pipeline route. A community meeting will also be given in every village along the route. Records of the meeting and attendees should be kept. As part of the schools meeting the contractor will present other issues such as construction methods, pipelines and skills required to work in construction to provide benefits;
- The contractor will ensure that signs are put up around work fronts and construction sites advising people of the risks associated with trespass. All signs should be in local languages or in diagram form to ensure those with low levels of literacy understand the signs;
- The contractor will ensure that there is adequate fencing around pipe lay down yards and other similar facilities to minimize the risk of trespass. Fencing will be checked daily to ensure that it is in good condition and to look for any signs of entry;
- When work fronts are within 100 m of an inhabited building, all equipment will be parked overnight in a demarcated area;
- The contractor will select security personnel based on a careful background screening of the applicants and provide their training with regards to human rights and a careful monitoring of their services. The contractor will make security arrangement transparent to the local communities and consult regularly with them about the impact of arrangements on communities. Preference should be given to local applicant in hiring.
- At the intersection of the construction corridor and local roads or trails, a diversion route must be provided during construction with warning signs to vehicles and pedestrians.
- Truck drivers and operators of heavy construction equipment must receive training in public safety in their works.

10.4 SOCIAL IMPACTS DURING OPERATION

As the pipeline operation would require only not more than 30 persons, social impact issues related to workers will not be as significant as the corresponding impacts during construction. During routine operation of the pipeline system, the subjects of OSH, grievance redress mechanism, and emergency preparedness related to personnel will be important and could be combined with those of refinery personnel. They are discussed in the OEMP.

During the operational phase the pipeline will not affect health of the communities. Therefore, pipeline safety is the only issue.

A. Scope and Impacts of the Pipeline Safety Issue

Communities along the pipeline corridor would naturally have concerns over safety associated with the pipeline once it is operational. Particular concerns included; risk of explosions, pipeline ruptures and oil leaks. While such concerns are generally unfounded due to the design of the pipeline (i.e. buried underground, restrictions along the pipeline corridor, and various safety measures), these concerns could affect community wellbeing and their perception of the safety of the area.

B. Significance of the Issue

The pipeline safety issue is considered significant and needs to be adequately addressed to alleviate concern of the communities.

C. Mitigation Measures

The following mitigation measures will need to be implemented to minimize the concern of the communities on pipeline safety:

- The Project Proponent will undertake stakeholder engagement regarding the pipeline operations to present and discuss safety features of the pipeline system. This should be undertaken before the construction and commissioning of the pipeline system;
- The Project Proponent will maintain the Grievance Mechanism throughout the operation of the pipeline so the communities can report their specific concerns; and
- The Project Proponent will undertake a community education program on pipeline safety to alleviate concerns. This will include a program of open community meetings at the committees along the corridor before the completion of construction.

10.5 SOCIAL IMPACTS DURING DECOMMISSIONING

During the decommissioning phase there is a potential for social impacts to occur. However, comparing with the construction, the decommissioning will take a much shorter period and require significantly less workers. If a decision is made to remove the pipes from under the ground, community health, safety, and security issue would be similar in scale to that during the construction. Mitigation measures would be similar.

10.6 LOCAL EMPLOYMENT

Although this subject is not relevant to social impact, local employment is an expectation of the local communities. Therefore, the Project Proponent needs to take measures to ensure that this expectation of the villagers will be met. In this regard, the construction contract will require the contractor to give preference to hiring workers from the nearby villages. Terms of employment will follow relevant rules and regulations of the Government, particularly those related to minimum wage, discrimination, over-time payment, compensation in case of injuries or death related to work, employment termination, and child labor. The workers will be selected using a procedure that is transparent and fair.

To prepare for the hiring of local villagers, the Project Proponent should open for registration of potential candidates for the construction works, prepare their profiles, and determine training requirements. These advance actions will expedite the recruitment of local workers by the contractor. The contractor should be made responsible for the training of workers.

CHAPTER 11

ECONOMIC ASSESSMENT

CHAPTER 11

ECONOMIC ASSESSMENT

This chapter presents an assessment of economic aspect of environmental management of the Condensate and Products Pipeline Route Project, which is different from an economic assessment or analysis of the Project. The assessment covers the pre-construction, construction and operational phases. The presentation in this chapter follows the outline prescribed in Section 10 of the MREIS as much as possible.

11.1 CONCEPTUAL FRAMEWORK

There have been several attempts to include environmental costs and benefits into direct economic costs and benefits in determining economic feasibility of development projects using such indicators as economic internal rate of return or benefit to cost ratio. However, quantification of environmental costs and benefits have to be based on several assumptions which are country and project specific. Consequently, estimates of environmental costs and benefits in monetary value are open to challenge. At present, the environmental economic assessment is still not a standard practice. Qualitative assessment is normally practiced.

The Consultant has found that quantification of environmental costs and benefits of this Project is not possible for the reasons stated above. In addition, the Consultant has not been able to find any reports on economic analysis of the Project to establish plausible economic assumptions needed for valuing the Project's environmental costs and benefits. Therefore, the environmental economic assessment is necessary to be qualitative in nature.

11.2 ECONOMIC LOSS DUE TO ENVIRONMENTAL IMPACTS

The impact assessment in Chapter 9 clearly indicates that waste management will be the main impact issues during the pre-construction and construction phases of the Project. However, the Project will have to install all necessary waste management systems to ensure compliance with guidelines and standards following practices to minimize waste quantities at sources: waste segregation, waste collection and storage, waste reuse and recycling, waste disposal, and onsite record keeping as prescribed by NDPCEI, whichever are more stringent. Residual impacts will be small and will not cause significant impacts on the groundwater resources and livelihood of people living near the project construction. Although the impact could not be quantified, it is expected that they would cause insignificant economic loss due to the following reasons:

Negative Economic Impact

1. Economic loss due to environmental impacts during the pipeline is related to the loss of forest and agricultural land along the pipeline construction corridor. The 90 m width combined corridor of the pipeline and highway will affect 197.96 ha of forest, about half are degraded deciduous forest and teak plantation, and 159.17 ha of agricultural land. There is no data on economic outputs of these areas. Therefore, it is not possible to quantify the economic loss of the conversion of these lands for the pipeline construction.

2. In planning a development project, the costs of land acquisition and resettlement normally have to be estimated and considered as direct project costs in the project financial and economic analysis. These costs are not treated as environmental costs. However, the impacts on livelihood could be considered as social cost. It is not possible in this EIA to prepare estimates of this social cost due to lack of detailed information on the land acquisition and affected people.

3. The influx of workers could compete with the locals for limited local resources such as foods, water, health service, and infrastructure services. This completion could have impacts on the local such as increased food prices, and inconveniences in using infrastructure.

Positive Economic Impact

1. The influx of workers will create demands for local goods and services, such as foods, handicrafts, and personal services such as hair cutting.

2. The demands of influx of workers would create business opportunities to local people.

3. The Project will increase local employment and cash flow in the local economy.

11.3 COSTS, BENEFITS, AND COST-EFFECTIVENESS OF MITIGATION MEASURES

11.3.1 Costs of Mitigation Measures

A. Pre-Construction and Construction Phases

The proposed measures for mitigating environmental impacts during the construction will not require capital investment in permanent facilities. Most of the measures are good construction management practices. Their costs are included in the contract cost and are not normally presented as separate cost items. Expenses or costs in implementing the measures would be only a very small percentage of the total construction cost.

Cost of mitigation measures for environmental and social issues is provided as follows:

Activity	Estimated Cost (2016 price, USD)
Environmental Issues[1/]	
• Solid waste management	
- Waste collection (Refuse bins and containers)	200
- Waste transportation	13,680
- Waste disposal at land fill site	11,940
Social Issues	
- Condition of worker camp	Included in total construction contract cost
- Influx of worker	
- Community health, safety and security	

Remark : [1/] Cost of mitigation measures for fugitive dust, gaseous emissions and noise is included in total construction contract cost.

B. Operational Phase

The total cost of the project is estimated at USD 522 million. The cost of treating pigging wastes will be small compared to the Project's capital investment and operational expenses.

C. Deactivation Phase

Assumed the cost of mitigation measures is about 50% of pre-construction and construction phases and duration of deactivation phase is also about 50% of pre-construction and construction phases.

11.3.2 Benefits of Mitigation Measures

Benefits of mitigation measures are the savings in economic cost between without and with mitigation measures. As environmental cost of the impacts without mitigation cannot be estimated, the benefits cannot be estimated as well.

11.3.3 Cost Effectiveness of Mitigation Measures

All proposed mitigation measures for the Project are conventional and established practices. They are most cost effective compared to other alternative measures. Their cost effectiveness should not be evaluated based on environmental benefits to be gained from the investment. The Project has to comply with international environmental management standards for the industry.

11.4 INTANGIBLE IMPACTS

Intangible impacts are impacts that are not possible to estimate their economic costs. For this Project, the intangible impacts include:

- Visual pollution: the Project will change the scenery of the corridor from green hilly area to an open land strip.
- Psychological impact on people living near the pipeline corridor due to concern on accidental fire or explosion at the pipeline.

CHAPTER 12

SUMMARY OF ENVIRONMENTAL MANAGEMENT PLAN

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SUMMARY OF ENVIRONMENTAL MANAGEMENT PLAN

An environmental management plan (EMP) for the Project is prepared as part of the EIA study process. The Decree Law No. 5/2011 on Environmental Licensing requires an EMP for a proposed development project to be presented as a stand-alone document to be used in conjunction with the EIS. The two documents will have to be submitted to National Directorate for Pollution Control and Environment Impact (NDPCEI) as a single package containing **Volume 1-EIS** and **Volume 2-EMP**. The chapter summarizes the essence of **Volume 2-EMP** as prescribed in the MREIS.

12.1 PURPOSE AND OBJECTIVES OF THE EMP

The purpose of this EMP is to provide a framework for environmental management in all phases of the Project to the parties responsible for environmental management of the Project, including the Project Proponent, the Contractor, and the Entity to be set up for the operations and maintenance of the pipeline and its associated facilities. Each responsible party will use this EMP as the basis for preparing and implementing a detailed EMP specific to its responsibilities, including action plans.

The objective of this EMP is to prescribe what will need to be done to: (i) minimize environmental (and social) impacts of the Project; and (ii) ensure that the environmental performance of the Project in all phases will comply with applicable laws and regulations, conditions of the environmental licensing, international standards and industry best practice.

12.2 CONTENT OF THE EMP AND ITS APPLICATION

As activities and consequential impacts in each Project phase are different in nature, scope and responsible parties, the EMP will consist of three EMPs: (i) Construction EMP (CEMP); (ii) Operational EMP (OEMP); and (iii) Deactivation EMP (DEMP). The three EMPs are implemented within the corporate's environmental policy framework and national legal and institutional framework as applicable to each Project phase.

The economic lifetime of pipeline (the time necessary for depreciation of the initial investment) is typically around 50 years. At that time, the demolition and removal of the pipeline and its facilities would require an EIA and an EMP. As the pipeline, legal framework, technologies, and environmental and socioeconomic settings of the Project area could significantly change over the working life of the pipeline, the DEMP prepared at this EIA stage will not be applicable and will need to be replaced by the new DEMP based on the new EIA. Therefore, the EIA-level DEMP is invariably conceptual in nature as its details would not serve any practical purposes. It mainly serves to indicate the nature of work, complexity, and magnitude of the deactivation task.

This EMP is considered as the EIA-level EMP. It will be applied in the sequential phases of the Project as follows:

- Contractor-CEMP: The contractor will be required to prepare a Contractor-CEMP from the EIA-level -CEMP.
- Contractor-OEMP: As the Contractor will be responsible for testing and commissioning the pipeline, the Contractor will also be required to prepare a Contractor-OEMP from the EIA-level -OEMP.
- Final-OEMP: The Pipeline Company, to be established, will review the Contractor-OEMP to prepare a Final OEMP for implementation during the operational phase.
- Contractor DEMP: The EIA consultant for the deactivation may make use of the EIA-level DEMP in preparing a new EMP or new DEMP.

Figure 12.2-1 presents a diagram of the application of the EIA-level EMP.

12.3 CORPORATE ENVIRONMENTAL AND SOCIAL POLICIES

Website of TIMOR GAP, E.P. indicates that it is certified ISO 9001, ISO 14001, and OHSAS 18001[1] Therefore, TIMOR GAP, E.P. has in place systems needed for quality management of its operations (ISO 9001), environmental management (ISO14001), and occupational health and safety (OHSAS 18001).

In its 2014 Annual Report, TIMOR GAP, E.P. states its environmental and social policy as follows:

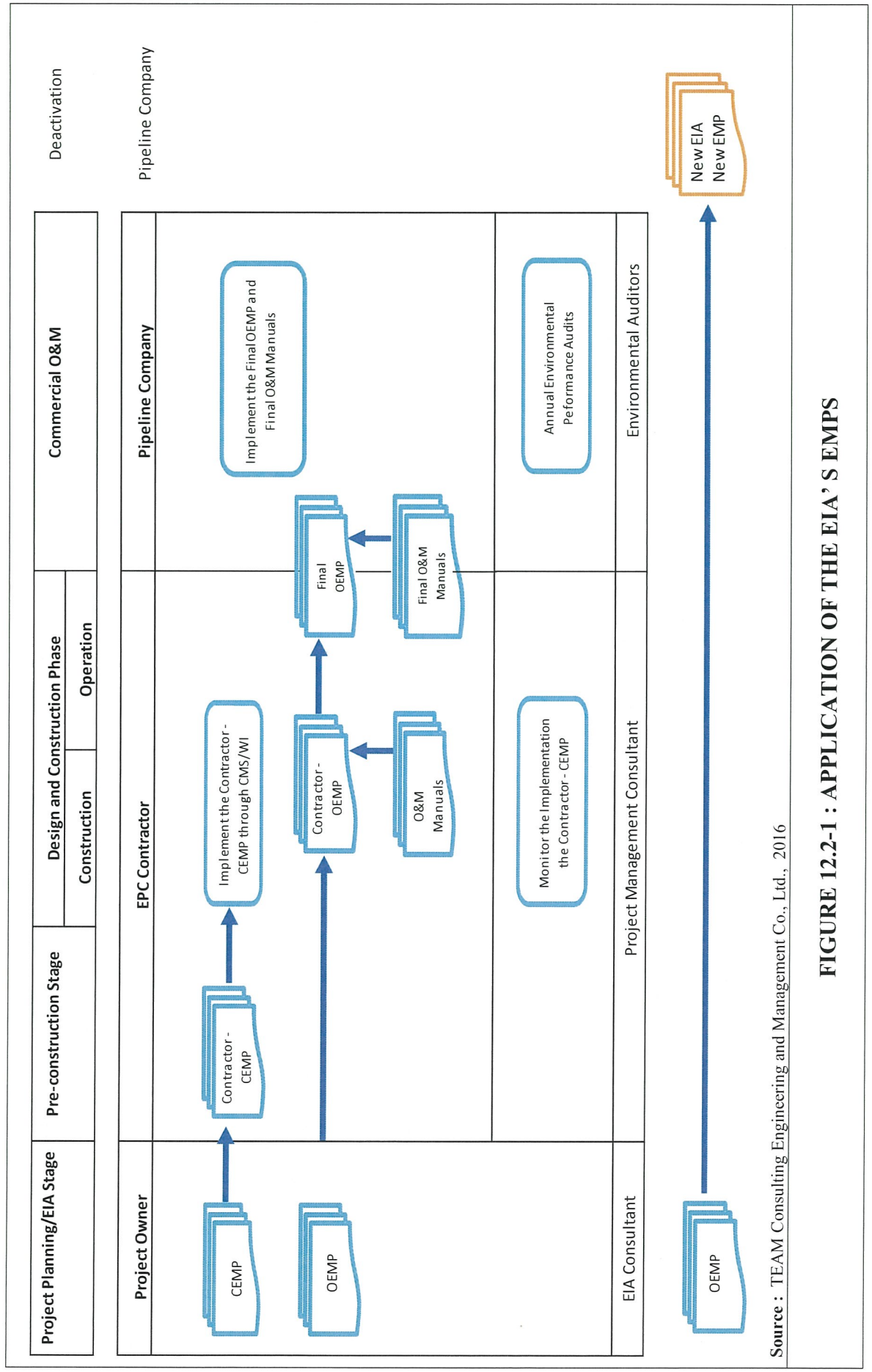
Our company is committed to the promotion of quality, health, safety and environment (QHSE), as well as social responsibility. These are the values that shape the way TIMOR GAP, E.P. conducts its business.

In addition to the policy statement, TIMOR GAP, E.P. prescribes good practices in to what need to be done to implement its environmental policy and environmental policy.

[1] **ISO 9001:2008** is the title of a document (Standard) that outlines the requirements an organization must maintain in their quality system for **ISO 9001:2008** certification. There are several different documents in the **ISO 9000** family of standards, but **ISO 9001-2008** is the only **ISO** standard that requires certification.

ISO 14001 standard is the most important standard within the **ISO 14000** series. **ISO 14001** specifies the requirements of an environmental management system (EMS) for small to large organizations. An EMS is a systemic approach to handling environmental issues within an organization

OHSAS 18001 is an international standard giving requirements related to Health and Safety Management Systems. **OHSAS 18001** enables an organization to have control over, and knowledge of, all relevant hazards resulting from normal operations and abnormal situations, and improve its performance.



Source : TEAM Consulting Engineering and Management Co., Ltd., 2016

FIGURE 12.2-1 : APPLICATION OF THE EIA' S EMPS

Environmental Policy

- Comply with relevant laws and regulation as well as take any additional measures considered necessary;
- Formulate framework for setting and reviewing environmental objectives and targets for all operations;
- Follow a systematic approach to environmental management in order to achieve continual performance improvement;
- Prevent pollution, recycle, reduce wastes, discharges and emissions;
- Conserve natural resources by efficient use in all operations;
- Emphasize every employee's responsibility in environmental performance;
- Ensure appropriate operating practice and training;
- Promote awareness among contractors, suppliers and customers for responsibility towards environmental protection.

Safety and Health Policy

- Advise all employees and contractors of their H&S responsibilities, commit to prevent injury, ill health and ensure continual improvement in H&S performance;
- Ensure that risk management, including assessment and mitigation are undertaken for all operations and are appropriate to the nature and scale of the activities;
- Comply with all applicable laws and regulations;
- Communicate H&S objectives and procedures regularly to employees, contractors and all affected parties;
- Train employees and provide resources to maintain job competencies, including H&S responsibility and accountability;
- Design and construct Company facilities utilizing recognized technology and practices to safeguard property and people;
- Operate and maintain Company facilities to ensure safe operations;
- Require that contractors, suppliers and others adhere to the Company's Health and Safety policy and procedures;
- Prepare for emergencies, contingencies, respond promptly and effectively to any incidents or accidents resulting from operations;
- Report and document all incidents and review performance;
- Promote off-the-job safety and community awareness;
- Establish the H&S programs;
- Review and improve H&S objectives and monitor performance continuously.

Employees who report to work with illegal drugs in their system or report with level of alcohol or other chemical substances that could impair performance are subject to disciplinary action.

It can be concluded that TIMOR GAP, E.P. has adequate policy and institutional framework for effective environmental and social management of this Project.

12.4 THE CONTENT OF EMP IN GENERAL

Environmental management in each phase of the Project is based on the basic principle of management known as the PDCA cycle (see ***Figure 12.4-1***). The PDCA principle consists of four related tasks:

- Plan (P) – what need to be done to minimize the anticipated impacts;
- Do (D) – implement the plan;
- Check (C) – monitor and evaluate the results of implementation; and
- Act (A) – taking corrective actions to improve the results, if found inadequate

Therefore, an EMP for each phase of the Project is about what need to be done and how it should be done to address the identified significant environmental issues (P); what arrangements will be required for implementing the measures (D); what need to be measured and how it should be measured to monitor the environmental performance (C); and what will be mechanisms and procedures for taking corrective actions to improve the environmental performance.



Source : TEAM Consulting Engineering and Management Co., Ltd., 2016

FIGURE 12.4-1 : PDCA CYCLE FOR ENVIRONMENTAL MANAGEMENT

Based on the above conceptual framework, the CEMP, OEMP and DEMP will need to cover the following subjects:

1) Environmental issues or problems that will have to be controlled considering significance of their impacts;

2) Targets or performance benchmarks for the control of each identified issue related to applicable laws, regulations or good practices;

3) Mitigation measures to be implemented to address each identified issue;

4) Requirements for monitoring, evaluating and reporting of the implementation of mitigation measures to provide feedback information on whether the environmental performance deviates from the prescribed benchmarks;

5) Corrective actions process, if the environmental performance is below the benchmarks; environmental incident response, and emergency plan;

6) Arrangements for implementing the EMP, including setting up an environmental management system (EMS), organizational structure, assignment of responsibilities, documentation, training, communication, and management review; and

7) Involvement of stakeholders or affected people in environmental management, including public grievance redress mechanism.

12.5 SUMMARY OF EMP

Key issues of environmental management plan (EMP) which comprise activities, potential impacts, sampling location, mitigation measures, mitigation cost, mitigation responsibility, parameter to be monitoring and monitoring frequency are summarized based on each phase of implementation, as shown in ***Table 12.5-1, Table 12.5-2*** and ***Table 12.5-3*** respectively.

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Land requirement for establishment of base camp, office, corridor with space, pipe laydown area with materials and shed including satellite camp	Loss of about 255 ha of forest land and 205 ha of agricultural land in relation to land requirement.	• Built up area in Bobe and Bonuc sub-villages where the corridor cut through the communities. • Agricultural land and forest land which are within 90 m strip of pipeline corridor.	• Compensation for forest and agricultural land • Compensation and relocation for affected persons in Bobe and Bonuc sub-villages	Compensation cost will be covered by the Ministry of Public Works, Transport and Communication.	• The Ministry of Public Works, Transport and Communication. • The Project Proponent to coordinate with the Ministry of Public Works, Transport and Communication.	To be managed and identified by the Ministry of Public Works, Transport and Communication.	To be managed by the Ministry of Public Works, Transport and Communication.
Fugitive dust Site clearing, excavation work, move of heavy equipment and vehicles along the dirt road will generate fugitive dust	Fugitive dust includes: • TSP about 411 $\mu g/m^3$ compared to standard of exceeding 230 $\mu g/m^3$. • PM_{10} about 214 $\mu g/m^3$ compared to standard of not exceeding 150 $\mu g/m^3$	• At construction site such as stockpiles, vehicles and roads leaving the construction sites • At sensitive area of the two nearest communities to the pipeline corridor, namely Bonuc and Bobe sub-villages.	• Spray water at and around the construction areas and access roads during site preparation and grading. • Limit speed for vehicles and trucks not to exceed 40 km/hr. • Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance. • Prohibit the open burning of waste in the pre-construction area. • Dust masks should be provided (where applicable) to all workers. • For construction site including spoil placement sites: – Use watering or other effective techniques on unsealed areas; – Rehabilitate construction sites and spoil placement as soon as the land becomes available. • Take measures (e.g. rumble bars and wheel wash bays) to ensure dust-creating material (earth or similar material) is not transported from the construction sites to roads or other areas in the public domain. • Cover all trucks carrying spoil or other loose materials. • Clear and remove all loose earth and similar material spilled or deposited within the construction sites and the transport routes from trafficked areas. • Take measures to avoid impacts of dust on adjacent properties such as: – Modify construction methods; – Increase dust suppression measures; or – Cessation of work when no other reasonable or practical measure is available.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Total Suspended Particulate (TSP-24 hrs) • Particulate Matter less than 10 micron (PM10-24 hrs) Nitrogen dioxide (NO_2) • Wind speed and direction (WS/WD)	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Gaseous emissions Operations of diesel-powered heavy construction equipment, vehicles and generator sets will generate gaseous emissions during the construction.	• Gaseous emission will be mostly generated by typical pollutants such as NO_x, SO_x, CO, and particulate in the exhaust gases discharged from the engines. • Its effect would be on health of construction workers.	• Construction site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages.	• Manage the movement of construction vehicles entering and leaving the construction sites to avoid the potential for vehicle emissions impacting on adjacent properties such as avoiding or minimizing queuing on streets approaching the worksites or adjacent to other sensitive activities; • Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites; • For stationary plant and equipment powered by diesel motors, take measures to avoid or mitigate and manage the potential impacts of exhaust emissions on adjacent residential or other sensitive activities such as all equipment powered by diesel motors are fitted with emission control measures, and are regularly maintained to manufacturers' specifications. • Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. • Provide adequate training to the equipment operators in the proper use of equipment. • Use the proper size of equipment for the job. • Use the equipment fitted engines with latest low emission technologies. • Perform on-site material hauling with trucks equipped with on-road engines • Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Nitrogen dioxide (NO_2) • Sulfur oxides (SOx) • Vehicle motors idling for periods exceeding 5 minutes while in queues to access construction sites (on-going). • Inspect the position of stationary plant and equipment powered by diesel engines to ensure exhaust emissions are directed away from sensitive activities and neighboring properties (initially on establishment).	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.
Noise level Operations of heavy construction equipment during land clearing, pipeline lowering, and backfilling, etc. would generate noise.	• Loud noise will disturb and cause annoyance to hearing capacity of the people in surrounding area. • Loud noise over long period will cause hearing impairment.	• Construction site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	**Design** • Design to use construction equipment that generate low levels of noise with adoption of best available technologies to minimize noise. • Conduct a noise survey covering the identified sensitive receptors to update the existing baseline data in the Final EIA Report. • Demonstrate through predictive modeling of the proposed construction techniques and monitoring ambient noise readings prior to construction to establish pre-disturbance levels, the likely levels of noise due to construction works throughout the construction period.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Leq 1 hr • Leq 24 hrs • Lmax	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Noise level Operations of heavy construction equipment during land clearing, pipeline lowering, and backfilling, etc. would generate noise. (cont'd)			**Pre-Construction and Construction Noise** • Construction works which generate excessive levels of noise must be carried out, only during the period between 6.30 am to 6.30 pm Mondays to Saturdays. Such construction works on Sundays or public holidays will need approval from the resident engineer of the Project Proponent. • Protect the affected sensitive receptors beyond standard construction hours such as installation of acoustic walls or noise barriers. • The noise reduction at the perimeter could be achieved using an acoustic wall or a sound barrier (Steel 18 ga with 1.27 mm. thickness which transmission loss of 25 dB(A) or equivalent) at least 3 m high with adequate length to block the noise emanating to the receptor. • Provide ear plugs or ear muffs to workers operating in the excessive noise areas. • Limit speeds of vehicles in the construction site, not exceed 40 km/hr. • Include measures to achieve the construction noise targets such as: – Commence advanced notification of works and undertake on-going consultation with potentially affected property owners and occupants. – Establishing temporary noise barriers between construction worksites and sensitive receptors. – Fitting noise-reduction measures to all equipment engaged in the construction works; • Designing worksites to minimize potential noise impacts on nearby sensitive places.				
Wastewater Daily activities of the workers/employees in relation to kitchen, canteen, toilets, bath rooms, and wash water in the base camp and satellite camp will generate wastewater.	Wastewater volume will be from: • about 15.3 m^3/day from base camp • about 1.9 m^3/day from each satellite camp.	At the outlet of retention pond at the 3 worker camps	**Design Concept** The Contractor will prepare detailed design of a wastewater management system for the worker camp, consisting of a collection system and a simple treatment system. Its proposed design concepts are:	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • Total Nitrogen • Temperature • Total Suspended Solid • Oil and Grease • BOD_5 • COD • Total Phosphorus • Sulfides	Twice a year during construction

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Wastewater Daily activities of the workers/employees in relation to kitchen, canteen, toilets, bath rooms, and wash water in the base camp and satellite camp will generate wastewater. (Cont'd)			**For Domestic Wastewater** • Toilet wastes will be separated from grey water or sullage. • Toilet wastes will be discharged into a septic tank(s) with a hydraulic retention time of about 5 days. The volume of toilet wastes is estimated at about 20% of the total volume of domestic wastewater. The septic tank effluent (septage) will be discharged into the retention pond. Alternatively, toilet wastes will be treated in a package treatment plant using an aerobic process. • The temporary retention pond within worker camp site areas will be designed as an oxidation pond. **During Construction** • Water in the retention pond will be used for dust suppression on unpaved areas in the construction site, and also for watering of the green area. • The remaining volume will be discharged into the water sources.				
Construction Waste • Activities related to site clearing, excavation, concrete works, steel works, piping works, installation of equipment, and construction of buildings will generate wastes. • Daily activities of the workers will generate non-construction wastes, including wastes from canteens and offices such as paper, food and beverage containers, food wastes, and other domestic items.	An amount of waste is equivalent to: • About 237 tons of *construction waste* over the 60 km length of pipeline corridor, or about 0.2 tons/day over the period of 36 months. • About 0.8 m^3 / day of *waste from workers.* • About 0.25 tons/month of *hazardous waste*.	• Construction site • Waste disposal area	**Design and Planning before Commencing the Construction** • Design own disposal facility, preferably within the construction site. • Design the construction methods to generate the least amount of wastes. • Design methods of waste transport and disposal. • Prepare an action plan for waste management to reflect cumulative results of the previous quarters. • Consider using materials and products that have a recycled content. • Arrangements with suppliers to return any unused construction materials; • Where possible, goods to be ordered in bulk to minimize packaging waste and packaging material returned to the supplier wherever practicable; and **During Construction** **Waste Segregation** • Design and implement a waste segregation system. • Provide an appropriate number of containers with adequate volume and appropriate materials at strategic locations to support the segregation in terms of recycling, reuse and disposal sub-categories.	To be included in total solid waste management cost of 25,820 USD.	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Efficiency of the collection, • Storage, and disposal volume, and • Record keeping	• Daily site inspections, and • Detailed weekly site inspections.

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Construction Waste • Activities related to site clearing, excavation, concrete works, steel works, piping works, installation of equipment, and construction of buildings will generate wastes. • Daily activities of the workers will generate non-construction wastes, including wastes from canteens and offices such as paper, food and beverage containers, food wastes, and other domestic items. (Cont'd)			**Waste Collection and Storage** • Collection and transport each sub-category of segregated wastes on daily basis. • Provide a roofed storage area with adequate space for storing the segregated wastes waiting for the on-site or off-site reuse or recycling. • Special design the storage area for hazardous waste to prevent spills or leaks onto the soil. **Waste Reuse and Recycling** • Chipping and mulching of vegetation and reuse for landscaping purposes; • Reuse of excavated material as fill at approved fill sites; • Topsoil free of weeds to be stockpiled and stored for re-use, if possible; • Collection and return of packaging materials (e.g. pallets) to suppliers wherever practicable; • Remove any contamination inadvertently deposited in recyclable waste material containers. Provide cleanup of excessive contamination at recycling vendor locations when such contamination is not controlled at the project site. • Collection and recycling of used oils by a licensed contractor; • Collection by a licensed contractor of empty oil and fuel drums and other containers for return to recycling facilities; **Waste Disposal** • Disposal of the remaining wastes that are unable to be reused or recycled in the approved landfill site. • Prohibit haphazard disposal of construction waste in or off the construction site. • Inert wastes such as broken tiles, bricks, plastics should be used for filling the site in areas planned to be vacant space. • No burning of wastes. • Decomposable wastes such as food wastes and vegetation may be disposed of by composting. • Hazardous wastes will be handled by a licensed hazardous waste contractor, otherwise finding for appropriate arrangements for incineration, safe permanent storage, or other appropriate methods of disposal.				

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
			On-site Record Keeping Design and maintain record keeping procedures with provisions for: • Tracking collections of waste materials at the sites and deliveries to recycling, reuse, salvage, and landfill facilities. • Maintaining on-site logs that include for each load of materials removed from the site: type of material, load weight, recycling/hauling service, and date accepted by recycling service or landfill.				
Hydrostatic Test Water Hydrostatic test of all four installed pipes generate tested water.	Discharge of 9,900 m^3 tested water to natural receiving water.	Receiving water at Suai Supply Base	• Formulate and submit a hydrostatic test plan for approval. • Conduct the hydrostatic test with specific practices.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • Temperature • Suspended Solids	Once after construction, at the beginning, middle and end of the discharge of hydrostatic test water.
Water Turbidity In-river construction of pipe support columns will cause water turbidity.	A small turbidity plume would be observed in the river around the site, over a short distance before the turbidity returns to its normal level.	At 100 m and 200 m downstream of the 12 river construction sites	**Design and Planning** • Ensure the design of pipeline bridge for each river and the method of its construction will give due consideration on impacts on water quality, particularly turbidity or suspended solids. • For each river, the Contactor will: – Conduct a survey of downstream water user, river bed and embankment conditions at the proposed construction section. – Estimate the duration and magnitude of likely impacts of the in-river construction activities on river water quality. – Submit an action plan containing results of the surveys and impact assessment, and proposed methods of construction and mitigation measures to be implemented in each river. **Construction** • Undertaken in the low flow conditions, and should be completed with all temporary facilities in the river completely removed before the high flow season. • Minimize the areas that will be disturbed, including the river bed, bank, access to the construction site, and laydown area. • The on-land construction area near the river bank will have appropriate measures to minimize soil erosion during rainfalls. • The on-land construction area will be rehabilitated to its previous conditions as soon as the construction is completed.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • DO • Suspended Solids • Turbidity	2 times; before and during construction.

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Chance Finds for Archeological, Historic and Sacred Sites During site clearing and excavation of pipe trench, the Contractor may discover artifacts which potentially could have archeological, historic, religious, or cultural value.	Operational activities may possibly destroy some artifacts presented under the pipeline corridor.	Area along the condensate pipeline between KM 35+000 to KM 50+000, which are situated in Bonuc and Bobe sub-villages.	• Site supervisor/foreman shall order construction workers to stop immediately the construction activities in the area of the chance find. • Inform concerned authority, including local leaders, for proper management if historic is found. • Delineate and mark clearly the discovered site or area and prohibit physical activities in the area without prior approval of the concerned authority. • Install temporary site protection measures (warning tape and stakes, avoiding signs). • Strictly enforce any no-go area needed to protect the site. • Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the responsible Ministry takes over. • If it is necessary to relocate a cemetery and grave yard, cultural ceremony should be arranged prior to the relocation.	To be included in the total construction contract cost	• The contractor to inform the Project Proponent. • The Project Proponent to inform concerned authorities in case of chance finds archeological, historic, religious, or cultural value.	Site inspection	During land clearance and site preparation
OSH of construction workers Activities related to pre-construction and construction may harm health of construction workers	There is a possibility that the workers/employees might be injured during working. Pre-construction.	• Construction area along the pipeline route • Worker camps	Mitigation measures are identified in the worker camp management. (Under social issue)	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Accident • Record keeping	Daily and weekly inspection
Social Issues							
Land acquisition Site preparation for establishment of base camp, office, corridor with space, pipe laydown etc will occupy some forest and agricultural areas.	Reduce of forest and agricultural areas which are economic resources of villagers who collect forest products and cultivate on these areas.	• Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	Compensation and relocation for affected persons in Bobe and Bonuc sub-villages	Compensation cost will be covered by the Ministry of Public Works, Transport and Communication.	• The Ministry of Public Works, Transport and Communication. • The Project Proponent to coordinate with the Ministry of Public Works, Transport and Communication.	To be identified and managed by the Ministry of Public Works, Transport and Communication.	To be managed by the Ministry of Public Works, Transport and Communication.
Worker Camps Mismanagement of worker camps may harm workers' health and pollute surrounding environment.	• Unhygienic living conditions will affect health of workers; • Pollution of the natural environment outside the worker camp, such as fly infestation, water pollution, and odor;	Worker Camps	Ensure the design, operation, and management of the worker camp are within specific requirements as follows: • The worker camps should be made of decent materials that could withstand heavy rains and storms, with adequately ventilated and lighted.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent	• Worker Camp • Worker health and safety	Daily and weekly inspection.

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Worker Camps Mismanagement of worker camps may harm workers' health and pollute surrounding environment. (Cont'd)	• Exposure of workers on accidental risks or worker safety.		• Provide a sleeping space of at least 4 m^2 per worker, with separate rooms for professional staff. • Number of toilets and baths should be 1 unit for 20 workers. • Plan for common canteen which can accommodate at least 150 persons. • Provide common areas for cloth washing and drying with adequate water supply and drainage. • Provide recreational facilities with sufficient accessories. • Set up one shop to sell sundry goods to the workers. • Strictly control fly, insect and rodent. • Provide medical services at a small clinic served by a doctor. • Prepare fire and safety plan for the camps. • Basic camp infrastructure with facilities of power supply, telecommunication, water supply, drinking water, drainage, sanitation and solid wastes management. • Establish and enforce codes of conduct within and outside the worker camps covering camp security, fire safety, drug using, drinking, smoking, and visiting guests. • Provide security guards to be in charge of the security of camp. • Provided transport services from the project site to nearby communities. • Environmental management of the demolition and dismantling of the worker camp and associated facilities after the construction is completed.				
Influx of Worker Employment of a large number of construction workers will create both of positive and negative impacts	*Positive impact* • Creation of demand for local goods and services; *Negative impact* • Competing use of local resources; • Health risks to the communities such as communicable diseases; • Conflicts with the locals due to differences in culture, value and ways of life.	• Worker camps • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Ensure that local provision of goods and services to the workers will be orderly and clean, and will not create unsanitary conditions near the worker camp. • Avoid using local resources as much as possible, and should provide a medical clinic within the worker camp. • Provide communicable diseases control program related to the sanitation and hygiene program for the worker camp. • Provide brief information to non-local workers, to make them aware of cultural sensitivity of the locals.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent	Feedback and complaints from affected households.	Daily and weekly inspection

TABLE 12.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Community health and safety Mismanagement or improper control of pre-construction and construction works may affect health and safety including security of the communities resided the pipeline corridor.	The locals and passers-by along the pipeline route might be injured or being insecure.	• Worker camps • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Undertake a program of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto the construction corridor where the construction is ongoing. • Ensure that signs are put up around work fronts and construction sites advising people of the risks associated with trespass. • Ensure that there is adequate fencing around pipe lay down yards and other similar facilities to minimize the risk of trespass. • When work fronts are within 100 m of an inhabited building, all equipment will be parked overnight in a demarcated area • Select security personnel based on a careful background screening of the applicants and provide their training. • At the intersection of the construction corridor and local roads or trails, a diversion route must be provided during construction with warning signs to vehicles and pedestrians. • Truck drivers and operators of heavy construction equipment must receive training in public safety in their works.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent. • The EHS Manager to involve in CSR program.	CSR program and its implementation	Daily and weekly inspection

TABLE 12.5-2
ENVIRONMENTAL MANAGEMENT PLAN DURING OPERATION PHASE

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Environmental Issues							
Waste Cleaning of using pigs along the pipeline will generate waste.	Waste from pigging	• The pigging station at Suai Supply Base • The Betano Refinery's wastewater treatment system	**Pigging Waste Collection and Transportation** • The pigging wastes will be collected and transported to the waste oil treatment unit of the Betano Refinery's wastewater treatment plant. • The Operational Manager will supervise the collection, storage, and transport of the pigging wastes to the refinery's wastewater treatment plant. **On-site Record Keeping** • The ESH manager will design and maintain procedures for recording the volume of pigging wastes collected and sent for treatment at the refinery.	Including in the operational cost of Betano Pipeline System Company	The Operational Manager, the Maintenance Manager and the EHS Manager under supervision of the General Manager of the BPSC.	• Quality of oily sludge before and after the pigging waste is treated. • Volume and characteristics of pigging wastes	Every time the pigging waste is sent to the refinery for treatment, about 2 times per month.
Operational risk Defective design, installation, and operation and management of operational work may cause accidental fires and explosions of pipelines	Damage of the pipeline due to risk of oil leak and explosion	Along the pipeline route	Risk Management Program must be in place as a means to guarantee the safe start-up of the commercial operations with all risks fully under control (Details are in ***Table 9.5-1***).	Including in the operational cost of Betano Pipeline System Company	The Operational Manager, the Maintenance Manager and the EHS Manager under supervision of the General Manager of the BPSC	Monitoring emergency incidents situations such as accident, fire, oil spill, etc. including restrain and recovery the situations	Daily and weekly site inspections
Social Issues							
Community Health and Safety Mismanagement or improper control of operational work may affect health and safety including security of the adjacent communities	• Risk of explosions; and • Pipeline ruptures and oil leaks	Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Undertake stakeholder engagement regarding the pipeline operations to present and discuss safety features of the pipeline system. • Maintain the Grievance Mechanism throughout the operation of the pipeline so the communities can report their specific concerns; and • Undertake a community education program on pipeline safety to alleviate concerns.	Including in the operational cost of Betano Pipeline System Company	The General Manager of the BPSC	Feedback and complaints from affected households.	Throughout the entire operation period

TABLE 12.5-3

ENVIRONMENTAL MANAGEMENT PLAN DURING DEACTIVATION PHASE

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Demolition of structures and operation of heavy equipment and vehicles along the dirt road will generate: - *Fugitive dust* - *Loud noise* - *Solid waste* - *Hazardous wastes and oil products* from the storage tanks and pipelines - *Wastewater* from cleaning of storage tanks and pipeline	Fugitive dust will be generated and disturb health of workers and the locals adjacent to the demolition site.	• Demolition site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• During the deactivation phase, the Project Proponent prepared at the EIA stage will not be applicable and will replaced by the new deactivation environmental management plan based on the new EIA. • The environmental issues, major sources, magnitude, receptor, predicted impact and mitigation measures in this phase will be similar to those occur during the construction phase. • However, activities of this phase will be demolition only then impacts from demolition activities will be controlled by the demolition contractor. • The contractor will be required to adopt the best practice to minimize impacts from : - Dust - Gas emission - Noise from heavy machinery and from demolition activities - Hazardous wastes and oil products - Wastewater and wastes	• To be included in the demolition contract • To be included in the total solid waste management cost of 13,000 USD	The demolition contractor and to be controlled by the project proponent.	*Fugitive dust* • Quantity of dust • Wind speed and direction • Complaints from the nearest communities *Noise level* • Complaints from the nearest communities *Solid waste* • Quantity • Its disposal *Hazardous wastes and oil products* • Quantity • Disposal management *Wastewater* • Volume and • Its discharge	Regular site inspection (weekly minimum) by in-house staff.
Community Health and Safety Mismanagement or improper control of demolition work may affect health and safety including security of the workers adjacent communities	Demolition workers, the locals and passers-by along the pipeline route might be injured or being insecure.	• Demolition site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	Maintain the Grievance Mechanism throughout the operation of the pipeline so the communities can report their specific concerns.	To be included in the annual budget of the Project proponent	The Project proponent	Complaints from local communities	Regular inspection (weekly minimum) by in-house staff.

CHAPTER 13

PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

CHAPTER 13

PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

This chapter presents implementation of public consultation and information disclosure, which was performed in the study area of Condensate Pipeline Project. Details are as follows:

13.1 PURPOSES OF THE CONSULTATION DURING THE PREPARATION OF THE EIS

Public consultation conducted during the preparation of the EIS has three purposes:

(1) Informing the stakeholders about the Project, environmental and social issues related to the Project pre-construction, construction, operation, and deactivation including mitigation measures to minimize environmental and social impacts;

(2) Seeking views of the stakeholders on the Project and mitigation measures; and

(3) Participation and partnership where issues and needs are jointly discussed and assessed.

Results of the public consultation are useful to the formulation and implementation of environmental and social management plans, purposing on alleviating the adverse impacts while promoting positive impacts of the Project, including being guidance for improving the living conditions of communities around the Project site.

13.2 METHODOLOGY AND APPROACH

Public Consultation was conducted during the period from 31 March to 8 April, 2016. The methodology and approach of public consultation is presented below:

13.2.1 Identification of Stakeholders and Group Affected by the Project

Considering the Project scope and the legal and institutional framework for environmental and social impact management applicable to the Project, the Project's stakeholders could be identified and classified into three categories:

(1) Government Authorities Involved in EIA Administration and Energy Development

The Project's stakeholders in this category are key officials or representatives of the national and state who have direct responsibilities for the administration of the EIA process for environmental and social clearance and issuing operation permits for proposed development projects, including relevant agencies of the energy and social development. These comprise:

1) National Directorate for Pollution Control and Environment Impact (NDPCEI), Ministry of Commerce, Industry and Environment
2) Ministry of Agriculture, Forestry and Fisheries (MAFF)
3) Ministry of Public Works, Transport and Communications
4) Ministry of Tourism (Secretariat of State for Art and Culture)
5) Secretariat of State of Professional Training and Employment (SEFOPE)
6) Ministry of Finance
7) Ministry of Planning and Strategic Investment
8) National Petroleum of Authority and Mineral (ANPM)
9) Ministry of Justice, Department of Land and Property

(2) NGO

The Project Proponent had invited a number of NGOs to participate the consultation meeting (as listed in ***Appendix 10A***). However some were not able to take part in the consultation. Besides Lao Hamutuk NGO, few others also presented in the consultation meeting.

(3) Local Communities

The Project's stakeholders in this category are the local people in eight villages settling along the 60 km of condensate pipeline alignment, namely Betano, Foho-Ailico, Leolima, Raimea, Tashilin, Zulo, Beco and Labarai villages, located in four sub-districts of Same, Hatu-Udo, Zumalai and Suai, and three districts of Manufahi, Ainaro and Covalima (see ***Table 13.2-1*** and refer to ***Figure 4.1-1*** of ***Chapter 4***). The people are representatives of these four sub-districts, three districts, chiefs of villages and sub-villages in the study area, community leaders, representatives of sensitive areas such as school, church, graveyard etc. and individual villagers. Residents in these villages have concerns on various potential impacts of the Project, especially during construction and operations such as noise, vibration, fugitive dust, traffic safety including risk of pipeline leakage and explosion.

TABLE 13.2-1

VILLAGES AND COMMUNITIES IN THE STUDY AREA

District	Sub-District	Village
Manufahi	Same	Betano
Ainaro	Hatu-Udo	Foho-Ailico
		Leolima
Covalima	Zumalai	Raimea
		Tashilin
		Zulo
	Suai	Beco
		Labarai
Total of 3 Districts	**Total of 4 Sub-districts**	**Total of 8 villages**

Source : Information derived from Community leaders, February 2016.

13.2.2 Methods of Consultations

The main method used in consultation was public meetings. This method is generally used in EIA. It is the most effective in achieving the informing purpose, followed by the seeking views purpose, and the participation and partnership purpose.

The public meeting method was complemented by disclosure of project information through presentation in the meetings. This served the informing purpose.

In addition, the public meeting method is also complemented by the interviews with key informants in the communities in order to collect socio-economic information of communities in the study area. These two methods served the informing and seeking views purposes of the public consultation. However, this chapter reports only results of the public meetings, including the meetings with key officials of relevant government offices, interested NGO and local communities.

13.2.3 Approach to the Public Meetings

The following approach to the public meetings had been adopted:

- At the national level, the Project Proponent and the Consultants invited key officials of relevant government offices, arranged for the meeting venue and issued invitations.
- At the local level, the Project Proponent and the Consultants invited the local people to participate the public meeting. This was performed in line with social structure. Invitation letter was sent to the Administrators of Manufahi, Ainaro districts and Suai sub-district, including chiefs of eight villages to inform their communities.

- Each meeting was organized with assistance of chiefs of sub-villages and villages. They informed villagers and making arrangements for the meeting venues and issuing invitations.

- At the meeting, representatives of the Project Proponent presented the meeting agenda.

- Representatives of the Project Proponent and the Consultant were jointly conducting the meeting. The Project Proponent's representative was responsible for providing information on Project development plan and expected outcomes. The consultants were responsible for informing about details of project components and the EIA study, comprising existing situation of the project areas, potential impacts and mitigation measures addressed the impacts. The two parties had worked as a Project team.

- The meeting then provided an open forum for discussions. The participants had expressed their concerns, offer their views and suggestions, and raised questions or points that they needed response from the Project team. The Project team responded to their concerns, views and suggestions as appropriate. The consultants had clarified on technical aspects of the design, engineer, environment and social related to the Project development. The Project Proponent answered on other issues, mainly concerning about communities' benefits. The meeting was in interactive mode. The participants were engaged in constructive and relevant discussions.

Additional activities carried out at the local level are:

- Representatives of district/sub-district or village opened the meeting.

- NDPCEI representative informed the participants about objectives of the meeting and expected outcome, including necessity of EIA study.

13.3 PUBLIC PARTICIPATION ACTIVITIES

Detailed public participation activities are presented as follows:

13.3.1 Meeting Organization

The public meetings were organized at both of national and local levels. The Project proponent had invited relevant government authorities and NGO for consultation meeting on 31 March 2016 and the locals on 4 to 8 April 2016. The meeting dates, names of persons met, the agencies they represented, and venues are given in ***Table 13.3-1***. All attendances are listed for the record in ***Appendix 13B***.

Photo 13.3-1 shows some pictures of the meetings.

TABLE 13.3-1
CONSULTATION MEETING WITH STAKEHOLDERS

Meeting Dates/time	Name	Position	Organization	Venue
31 March 2016	**Government Officer (total of 10 persons)**			Conference Room, Timor Plaza
10.00-14.00 hrs.	1. Mr. Francisco Poto	Head of EIA Department	National Directorate for Pollution Control and Environment Impact (NDPCEI)	
	Mr. Sabino L.A.	Chief of Department	Ministry of Agriculture, Forestry and Fisheries (MAFF)	
	Ms. Filomena Oliveira Ms. Elsa C. Viegas	Chief Cabinet Officer	Ministry of Public Works, Transport and Communications	
	Mr. Eugenio Sarmento	Chief of the Art and Culture Department	Ministry of Tourism	
	Mr. Paul Alves Mr. Jacinto Gusmão	Director General Director	Secretariat of State of Professional Training and Employment (SEFOPE)	
	Mr. Antonio Freitas	Director General of Statistics	Ministry of Finance	
	Mr. Ismenio da Silva	Executive Secretary of Development Fund Human Capital	Ministry of Planning and Strategic Investment	
	Mrs. Juvencia da Costa	Health Safety Inspector Officer	National Petroleum of Authority and Mineral (ANPM)	
	Mr. Paulino da Cruz	Representative	Department of Land and Property, Ministry of Justice	
	NGO (total of 3 persons)			
	Mr. Charles Scheiner Mr. Paulino de Almeido Mrs. Martinha Fernandes	Representatives	Lao Hamutuk	

TABLE 13.3-1
CONSULTATION MEETING WITH STAKEHOLDERS (CONT'D)

Meeting Dates/time	Name	Position	Organization	Venue
4-8 April 2016	**Local Community Groups**			
4 April 2016 (09.30-12.00 hrs.)	**Total 93 prs.** Local people: 67 prs. NDPCEI: 2 prs. Project proponent: 17 prs. Consultant: 7 prs.	Chief of Manufahi District, chief of Betano village, Chief of Bemetan sub-village, community leaders, representative of sensitive areas		Betano village
5 April 2016 (9.30-12.00 hrs.)	**Total 73 prs.** Local people: 47 prs. NDPCEI: 2 prs. Project proponent: 17 prs. Consultant: 7 prs.	Ainaro officials, chiefs of Leolima and Foho-Ailico villages, chief of Bobe and Bonuc sub-villages, community leaders, representative of sensitive areas		Hatu-Udo sub-district
6 April 2016 (10.00-12.00 hrs.)	**Total 78 prs.** Local people: 52 prs. NDPCEI: 2 prs. Project proponent: 17 prs. Consultant: 7 prs.	Officials and residents of Ainaro, chief of Cassa village, community leaders, representative of sensitive areas		Cassa village
7 April 2016 (15.00-18.00 hrs.)	Chief of Beco and Labarai villages	Chief of Beco and Labarai villages, villagers of Labarai		Beco and Labarai villages
8 April 2016 (9.00-12.00 hrs.)	**Total 49 prs.** Local people: 23 prs. NDPCEI: 2 prs. Project proponent: 17 prs. Consultant: 7 prs.	Chief of Zumalai sub-district, chief of Raimea, Tashilin and Zulo sub-villages, community leaders, representative of sensitive areas.		Zumalai sub-district





Meeting with Government Officials and NGO



Consultation Meeting at Betano Village



Consultation Meeting at Hatu-Udo Sub-District



Consultation Meeting at Cassa Village



Consultation Meeting with Chief of Beco Village



Consultation Meeting with Chief of Labarai Village



Consultation Meeting at Zumalai Sub-District

PHOTO 13.3-1 : CONSULTATION MEETINGS WITH GOVERNMENT OFFICIALS AND THE LOCALS

13.3.2 Topic Discussed

For the consultation meeting with the government officials and NGO, the Project information was disclosed through slides in English language. Its brief information was posted at the conference room, and provided to attendance in handout form. Questions and answers were in both English and Tetum language.

At the local level of two sub-villages, the Project information was disclosed through slides in English, and translated into Tetum language. Its brief information was posted at the meeting place. Questions and answers were in both of English and Tetum Languages. Translation was made back and forth.

Appendix 13C provides the slides and poster presented in the meeting.

In each public consultation meeting, the information included:

- Project location and alignment
- Study Area of 50 m strips on both side of pipeline route
- Lowering/Tie-ins pipeline
- Significant land mark at the cross of pipeline alignment
- Existing Environmental Condition
  - Air/Noise quality
  - Surface and ground water quality
  - Terrestrial ecology
  - Socio-economic survey activities in the study area
  - Traffic
- Cultural Heritage
- Opinions of the local people toward the project development
- Potential impacts and mitigation measures during pre-construction, construction, operation and deactivation phases

Open discussion was undertaken after information disclosure.

13.3.3 Issues Raised by Stakeholders

There were comments and feedbacks from each group of stakeholders during discussion. Clarifications were made by representatives of the Project's Proponent and Consultants accordingly. All are recorded in the Minutes of Meetings, and documented for reference as shown in ***Appendix 13D***. Its summary is shown in following section.

13.4 SUMMARY OF MAIN COMMENTS RECEIVED FROM STAKEHOLDERS

Major issues and comments raised by stakeholders and clarifications from the representatives of the Project's Proponent and Consultants can be summarized by group as follows:

(1) Government Authorities

Concerns and comments from the nine government organizations were on several issues, including impacts from noise, environmental risk from oil transportation, alignment of pipeline route, land release for pipeline alignment, integration of highway and pipeline project. Suggestion was on preservation of artifacts, sacred and cemeteries found. Its summary and clarifications are shown in ***Table 13.4-1***.

TABLE 13.4-1

SUMMARY OF MAIN CONCERNS AND COMMENTS FROM GOVERNMENT AUTHORITIES AND CLARIFICATIONS

Comments from the Government Authorities	Response/Clarifications By the Project Proponent and Consultants
Concerned on implication of the financial aspect.	It would be included as part of the mitigation measures in the EMP.
Concerned on placement of the pipeline at underground, why not above.	Final design would be based on the result of detailed investigation.
Concerned on impacts of pipeline route so that asking about realignment.	Mitigation measures would be formulated to address the impacts, especially noise.
Concerned on land release.	- The land for right of way (ROW) of the highway has been reserved for the pipeline alignment. - Currently, the land has already been released for the highway route from Suai to Zumalai. Land release from Zumalai to Betano would depend on availability of the budget and resources.
Concerned on damage of underground pipeline.	- The sign of "No Go Zone" would be installed. - Fences would be built in case of sufficient budget. - Information would be disclosed to the nearby communities, warning not to bother properties of the highway and the pipeline.
• Recommended to assist not only people relocation, but also for their animals. • Recommended to integrate highway and pipeline project	Not possible to integrate highway and pipeline as they are managed by different agencies.
Suggested to preserve artifacts, sacred and cemeteries found during construction.	Would promptly inform the relevant agencies.
Suggested to give priority to the local employment.	Noted

(2) NGOs

The Lao Hamutuk NGO expressed the concerns and comments in two occasions: (i) during the consultation meeting on 31 March 2016; and (ii) later by open letter. The major issues were on noise impacts, realignment of highway and pipeline, EIA study, construction of pipeline and highway, impacts on groundwater, products transported by pipeline, risk of pipeline explosion and poor record of PTT. Summaries and clarifications were shown in ***Table 13.4-2*** and ***Table 13.4-3***.

TABLE 13.4-2

SUMMARY OF MAIN CONCERNS AND COMMENTS FROM LAO HAMUTUK NGO AND CLARIFICATIONS DURING CONSULTATION MEETING ON 31 MARCH 2016

Concerns from Lao Hamutuk NGO	Response/Clarifications By the Project Proponent and Consultants
- Concerned on impacts on education institute and settlement areas of affected communities. - Asked about realignment of highway and pipeline route.	- Mitigation measures would be formulated to address the impacts, especially from noise. - Alignment of condensate pipeline had to be beside the highway.
Asked whether the EIA study is for both of pipeline and highway.	Only for pipeline.
Asked whether pipeline construction would be after the highway.	Ideally they should be built simultaneously.
Concerned on impact of pipeline on groundwater after the project close.	The appropriate mitigation measures during deactivation phase would be recommended in the EIS report.
Concerned on impacts from using one pipeline to transport multiple products.	Products would be transported via individual pipeline.
Concerned on impacts from spills, accidents and explosions on social and environment.	Appropriate monitoring measures would be implied to control the system. In case of error, the Project would take prompt correction, and notify the people.
Concerned on poor record of PTT in the past.	TG felt comfortable to work with ATT.

TABLE 13.4-3

SUMMARY OF MAIN CONCERNS AND COMMENTS FROM LAO HAMUTUK NGO BY OPEN LETTER AND CLARIFICATIONS

Concerns from Lao Hamutuk NGO	Response/Clarifications By the Project Proponent and Consultants
Concerned on not taking seriously on the EIA and EMP licensing process for Condensate Pipeline route due to large quantity of numerous toxic and explosive materials involved.	Mitigation measures and risk management are proposed in the final EIS and EMP reports.
Concerned on less attention about the significant impact of the environment and the community.	All environmental aspects and its avoidance management for mitigation are fully addressed in the final EIS and EMP report.
Concerned on presentation of TEAM Group which was little more than a recap of the baseline information already collected by WP and others.	All existing information is extracted and used as baseline information for impact assessment and formulation of mitigation measures including risk management. These are presented in the final EIS and EMP report.
Concerned on ineffective discussion during the Public Consultation due to limitation on environmental concerns and poor attendance, and most of the Government entities asked mostly irrelevant to the EIA licensing process.	- The Project Proponent had sent out invitation to quite a number of Government entities and civil societies which are considered as more pertinent to the proposed project. Some of them did not turn up on 31 March 2016 meeting. - However a large number of people attended the consultation meetings which were organized at the local level during 4 to 8 April 2016.
Expected to have discussion with large number of group of people, particularly community leaders and affected community.	During the consultation meetings at the local level, apart from community leaders and individual villagers, officials from district and sub-district also attended the meetings. Attendees raised a number of concerns and suggestions which were all responded by the Project Proponent and consultants. The meetings were on interactive mode.
- Concerned on not complete, logical, accurate or clear ToR. - Wondered whether because of sloppiness, lack of technical expertise, inadequate information, limited HR or lack of political will.	The developed ToR is basically in accordance with the required Guidelines from Environmental Authority, enacted along with Project Document and EIS and EMP structure. The guidelines itself was established in collaboration with World Bank and was socialised to all government entities and Civil Societies prior to endorsement.
Concerned on short preparation of 3 months for the EIA and EMP report which would not be proper as per standard report.	The Project Proponent and Consultants had put an effort to prepare the EIA and EMP reports being in line with ADB standard.
Concerned on lack of clarity of the project decommissioning.	Project decommissioning is prepared and addressed in the final EIS and EMP report.

TABLE 13.4-3

SUMMARY OF MAIN CONCERNS AND COMMENTS FROM LAO HAMUTUK NGO BY OPEN LETTER AND CLARIFICATIONS (CONT'D)

Concerns from Lao Hamutuk NGO	Response/Clarifications By the Project Proponent and Consultants
Suggested to include additional assessment, planning, licensing and management which would be required for subsequent phases.	Additional assessment, planning, licensing and management are addressed in Chapter 6, 7, 8 and 9 of the final EIS report and Chapter 6-19 of the EMP report.
Concerned on almost entirely ignorance presentation on the possibility of leaks, spills, accident, fires and explosions.	Environmental management issues on possibility of leaks, spills, accident, fires and explosions are addressed in the final EIS and EMP report.
- Concerned on little capacity of Timor-Leste to provide effective Emergency Response, contain hazardous material or supply prompt and effective medical care in Betano and across the country. - Suggestion on planning, design, preparation, implementation and operation must be spelled out the potential risks and handle approach.	Emergency Response Plan is designed and planned for all phases of pre-construction, construction, operation and deactivation, including risk management. All these are addressed in the final EIS and EMP report.

(3) Local Communities Groups

Consultation meetings at five sites of the local level were conducted on 4 to 8 April 2016. Issues identified by the participating villagers are as follows:

1) Betano Village

Sixty seven villagers participated in the meeting. Besides representatives of the Project's Proponent, the Consultants, representatives of National Directorate for Pollution Control and Environment Impact (NDPCEI) and district official also joined the meeting. Concerns/suggestions from villagers in Betano were on impacts related to leakage of the pipeline and upgrading road. Its summary and clarifications are shown in ***Table 13.4-4***.

TABLE 13.4-4

SUMMARY OF MAIN CONCERNS AND COMMENTS FROM VILLAGERS IN BETANO AND CLARIFICATIONS

Comments from Villagers in Betano	Response/Clarifications By the Project Proponent and Consultants
Asked for mitigation measures and procedure for negative impacts generated from pipeline route, especially on groundwater.	Hydrostatic Test would be applied to ensure of no leakage at pipeline route. Maintenance and control system would be also applied. In case of leakage, there would be remediation and monitoring programs on concerned parameters such as test of soil and water quality.
Suggested to provide asphalt road in order to minimize the dust during construction.	Noted

2) Hatu-Udo Sub-District

Seventy three villagers participated in the meeting. They are from Ainaro district, Leolima and Foho-Ailico villages, Bobe and Bonuc sub-villages. Besides representatives of the Project's Proponent, the Consultants, representatives of National Directorate for Pollution Control and Environment Impact (NDPCEI) and district officials also joined the meeting. Concerns/suggestions from these people were on impacts on water and culture, explosion risk by the earthquake, distance to community and suggestion for consultation in Aldeia Ainaro Kiik. Its summary and clarifications are shown in ***Table 13.4-5***.

TABLE 13.4-5

SUMMARY OF MAIN CONCERNS AND COMMENTS FROM VILLAGERS IN HATU-UDO SUB-DISTRICT AND CLARIFICATIONS

Comments from Villagers in Hatu-Udo	Response/Clarifications By the Project Proponent and Consultants
Concerned on water pollution which might be caused by placing pipeline at 1 ½ meter depth in the river.	Based on the Detailed Design, the pipeline would be placed on rack in parallel with existing bridge across the river.
Concerned on project affected on cultural places.	Sacred places would be taken care.
Concerned on damage by pipeline explosive, probably caused by earthquake.	Earthquake risk was already considered for pipeline design.
Asked about the distance of pipeline route to the community.	About 50 – 60 m (buffer zone).
Suggested to conduct public consultation in Aldeia Ainaro Kiik.	Public consultation would be conducted continuingly, whenever required.

3) Cassa Village

The meeting at Cassa village was arranged by the Project proponent. Seventy eight villagers participated in the meeting. Besides representatives of the Project's Proponent, the Consultants, representatives of National Directorate for Pollution Control and Environment Impact (NDPCEI) and district officials also joined the meeting. Concerns/suggestions from these people were on risk from pipe leakage, pipe destroyed by river flow, responsible agency for pipe maintenance and suggestion on not to relocate sacred places including information disclosure about risk associated to pipe explosion. Its summary and clarifications are shown in ***Table 13.4-6***.

TABLE 13.4-6

SUMMARY OF MAIN CONCERNS AND COMMENTS FROM VILLAGERS IN CASSA SUB-DISTRICT AND CLARIFICATIONS

Comments from Villagers in Cassa	Response/Clarifications By the Project Proponent and Consultants
Asked about mitigation plan in case of pipeline leakage.	The Project proponent would install safety system, with provision of emergency plan and monitoring program. Daily inspection would be in action.
Worried about 1-1.5 m depth of the pipeline which might be destroyed by river flow.	The pipeline would be put on rack in parallel with existing bridge at the same height of the bridge. Thus, it would be safe from river flow.
Asked about responsible agency for pipe maintenance.	TG would be responsible for maintenance and monitoring.
Suggested the Project Proponent to consider on not relocating sacred places.	Culture is "the Must" to be considered prior the project commencement.
Suggested the Project proponent to disclose information about risk associated to pipe explosion.	Noted.

4) Beco and Labarai Villages

Consultation meetings for villagers in these two villages were arranged at Suai Sub-district. The Project proponent had confirmed with villages' chief a day before the meeting date. However, the meeting was not visualized. Villagers did not come because they attended the other meeting which was chaired by the Minister of Petroleum Authority on the same day. Therefore the Project proponent and consultants had the meetings with chiefs of Beco and Labarai villages instead.

They informed chiefs of these two villagers about the Project information, with provision of handouts for dissemination in the public. Contact persons were identified to be the communication channel in case more information required.

There were no feedbacks/questions from chiefs of these two villages.

5) Zumalai Sub-district

Twenty three villagers participated in the meeting. They are from Covalima district, Raimea, Tashilin and Zulo sub-villages. Besides representatives of the Project's Proponent, the Consultants, representatives of National Directorate for Pollution Control and Environment Impact (NDPCEI) also joined the meeting. Concerns / suggestions from these people were on risk from pipeline explosion, opportunity of local employment, negative impact on soil and water, and distance of pipeline. Its summary and clarifications are shown in ***Table 13.4-7***.

TABLE 13.4-7

SUMMARY OF MAIN CONCERNS AND COMMENTS FROM VILLAGERS IN ZUMALAI SUB-DISTRICT AND CLARIFICATIONS

Comments from Villagers in Zumalai	Response/Clarifications By the Project Proponent and Consultants
Concerned on damage probably caused by pipeline explosion.	SCADA system would be installed in order to detect pipeline leakage, and the emergency team would solve problem promptly.
Asked about maximum opportunity of local employment?	Would be based on Timor-Leste Local Content regulation, and people qualifications.
Asked about risk protection for negative impact on soil and water contamination?	• There would be remediation programs for soil and water after investigation. • Hydrostatic test would be applied to ensure no leakage during pipeline construction. • EIA study team would identify and quantify the potential negative impacts and positive impact from the proposed project and proposed prevention, mitigation, and monitoring measures.
Asked about the distance from pipeline to the farms and community nearby?	About 50 – 60 m (buffer zone).

13.5 PUBLIC ACCEPTANCE ON PROPOSED PROJECT

As mentioned in ***Section 13.2.2: Methods of Consultations***, key informants[1] in the communities were interviewed in order to collect socio-economic information, including their opinions toward the Project development. Findings showed that communities in these eight villages agreed with the project development. Their reasons were: the Project would offer job opportunities including capacity building and development at the local and national level of Timor-Leste.

[1] These comprise chiefs of villages, chiefs of sub-villages, mediators, teachers, elderly, and youth. They are knowledgeable about the community circumstances.

13.6 HOW THESE COMMENTS WERE TAKEN INTO ACCOUNT

All comments/issues obtained from the consultations are the basis for planning and arranging subsequent consultation meetings during the project implementation. Results of all public consultation meetings will be utilized for implementation of environmental and social management plans of the Project as well as community support development programs to be provided by the Project Proponent in the Corporate Social Responsibility (CSR) context.

13.7 OTHER RELATED MATERIALS

Before the conduct of public consultation at the local level, the Project had sent the invitation letters to inform villagers in eight villages of the study area.

By administration function, the letters were sent to Administrators of Manufahi, Ainaro districts, Suai sub-district of Covalima district and chiefs of eight villages, on 11 March 2016. Then chiefs of villages had informed communities accordingly.

The invitation letters are ready for reference in ***Appendix 13E***.

13.8 RECOMMENDATIONS FOR FUTURE CONSULTATIONS

Public consultation will be carried out during the construction and operational phases as part of environmental management of the two project phases. Public consultation during the construction would mainly concern with measures to minimize various environmental disturbances which some communities may experience. The issues discussed would vary with the progress of construction and change in the nature of construction works. Public consultation during the operational phase would be less intense as environmental and social management become predictable and routine. Community development support would be a major issue for public consultation.

CHAPTER 14

DIFFICULTIES ENCOUNTERED

CHAPTER 14

DIFFICULTIES ENCOUNTERED

Difficulties that the Consultant encountered in conducting the EIS for this Project are as follows:

1) Insufficient information on technical aspects of the Project and the absence of a comprehensive report on technical and economic analysis of the Project due to its early stage and planning. For example, there is no precise information on construction wastes, worker camp and pipe storage area locations and facilities, design alternatives for pipeline installation crossing rivers, hydrostatic testing procedures and testing program, and the number of personnel for operation and maintenance of the pipeline corridor. Therefore, the Consultant has to work out own estimates to fill the information gaps so that the impact assessment could be done. These estimates would be later revised by the contractor. However, the discrepancies between the information worked out by the Consultant and the contractor would not be too great to distort the conclusions on environmental impacts of the Project.

2) The content of the section on Social Impact Assessment is more relevant to a project social analysis for project feasibility and planning study for rural development projects. It is not applicable to the social impact context of this Project. The Consultant has to give up an attempt to prepare a social impact assessment following the prescribed guideline and content. This difficulty initially caused confusion and loss of time trying to fit the social impact assessment in an unsuitable structure.

CHAPTER 15

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 15

CONCLUSIONS AND RECOMMENDATIONS

15.1 CONCLUSIONS

The EIA investigation was based on the information provided by the Project Proponent, surveys of environmental and socio-economic settings of the Project area, consultations with stakeholders in the government sector and communities in the vicinity of the Project site, and experience of the Consultant in technical and environmental aspects of projects of similar nature. The Project has not yet progressed to the detailed design and planning stage. Consequently, some information gaps exist.

From the EIA investigation results, the following major conclusions may be drawn:

(1) Clearing the proposed pipeline corridor of existing mixed deciduous forest, and teak and palm plantation is unavoidable environmental and economic cost. However, it will not have significant impacts on the terrestrial ecosystem.

(2) The proposed pipeline corridor will need to relocate about 10 houses each in Bobe and Bonuc communities. These affected people would also need assistance in livelihood restoration in addition to relocation.

(3) During Project construction, dust, noise, and gaseous emissions will be experienced and would have impacts on communities along the construction corridor. These environmental problems are transient and their duration will be short and the construction will move along the corridor. These transient environmental disturbances must be minimized to meet requirements in occupational health and impacts of construction workers and communities especially Bemetan sub-village in Betano village which is only 20 m from the corridor.

(4) The worker camps will need to be well designed, planned, and managed to minimize environmental, social, and cultural impacts, and to comply with OHS requirements.

(5) The small volume of pigging wastes generated during the pipeline maintenance could be sent to the wastewater treatment facilities of Betano Refinery. In case the pigging station is located at Suai Supply Base, the waste need to be gathered there. They then will be taken to Betano Refinery later.

(6) The pipeline has inherent accidental fire and explosion risks triggered by leakage. This risk is assessed and considered as possible with the likelihood of occurrence of 3.94 times in 1,000 years. The risk will need to be well managed. Risk mitigation measures will have to be fully considered in the design, construction and operations of the pipeline.

(7) Areas at risk are the pipe tie–in points at Suai Supply Base and Betano Refinery, and exposed sections near river crossing. Under the worst scenarios, the accidental fire, if occur, would impact an area within 258 m radius from the fire point, and could result in 10% fatality and 50% injuries of people in the impact area.

(8) The proposed CEMP and OEMP are adequate at this stage of project planning for the EPC contractor to prepare the contract specific CEMP and OEMP based on the designs, specifications, and construction plans and methods to be developed by the EPC contractor.

(9) Decommissioning of the Project in future will require a new EIA and a new EMP. The process will be a reverse construction process but will need less workers and shorter timeframe. Its impacts will be similar to those of the construction phase.

(10) The eight communities that public consultation meetings were held did not oppose to the Project. They have high expectations of environmental and social performance of the Project, particularly local employment and community support. Those who will have to be relocated also have concern on the impacts on their livelihood.

15.2 RECOMMENDATIONS

To implement the results of this EIA investigation, the Consultant recommends that:

(1) A detailed resettlement action plan should be prepared for the relocation of 20 houses to be affected by the Project. To prepare this plan, detailed surveys of individual households to be relocated will need to be carried out. The RAP will need to include a livelihood development plan. This livelihood development support should be extended to families who lose plantation but will not be relocated.

(2) The proposed environmental mitigation measures and environmental management requirements be clearly stated and incorporated in the TOR for the procurement of EPC contract and construction supervision contract, and in the EPC contract and construction supervision contract.

(3) An environmental management function will need to be established within the Project management organization. This function will manage the management of the construction EMP. During the operational phase, an EHS function will need to be established within the organization for operational management of the refinery.

(4) A detailed risk management plan including an emergency response plan will be needed for the operation of the pipeline. A risk management and emergency response function will need to be established within the organization for operational management of the refinery.

(5) The proposed tri-partite committee in the EMP is set up as soon as possible to serve as a means for continuing public consultation and disclosure. Therefore then will be no need to conduct public consultation with a large number of locals. Some of the committees are representatives of villagers.

(6) In case TIMOR GAP, E.P. wants to maintain its international image, it may consider providing livelihood development assistance to families who require assistance.

(7) As a number of subjects in the outline of EIS as prescribed in the MREIS does not follow a logical sequence, the proponent's endorsement of the EIS should not be included in the Description of the Project.

CHAPTER 16

NON-TECHNICAL SUMMARY

CHAPTER 16

NON-TECHNICAL SUMMARY

16.1 PROJECT BACKGROUND

The Project will construct a 60-km pipeline along the highway linking the proposed Betano Refinery with Suai Supply Base and will traverse Covalima district, Ainaro district and Manufahi district. The proposed pipeline will transport condensate from Suai Supply Base to Betano Refinery, and three products diesel, light naphtha and heavy naphtha from the refinery to Suai Supply Base.

16.2 BACKGROUND ON THE ENVIRONMENTAL IMPACT ASSESSMENT

The EIA is a comprehensive planning study and its results are presented in two stand-alone documents-an Environmental Impact Statement (EIS) and an Environmental Management Plan (EMP). The EIS identifies environmental and social impact issues of the Project that need to be adequately addressed to minimize impacts during the pre-construction, construction, operation, and deactivation phases of the Project, and recommends mitigation measures for addressing each identified issue. The Environmental Management Plan (EMP) is divided into EMP for the construction phase (CEMP) and EMP for the operational phase (OEMP). The CEMP will be incorporated in the construction contract for implementation by the contractor. The OEMP will be incorporated in operational guidelines and procedures of the pipeline for implementation by pipeline personnel.

16.3 EXISTING ENVIRONMENTAL AND SOCIAL CONDITIONS

Along its 60 km length, the pipeline traverses administrative areas of 8 villages in Covalima, Ainaro, and Manufahi districts. The eight villages are: (i) Raimea, Tashilin, and Zulo villages in Covalima district; (ii) Beco village and Labarai village of Suai sub-district in Covalima district, (iii) Leolima village and Foho- Ailico village of Hatu-Udo sub-district in Ainaro district, and (iv) Betano village of Same sub-district in Manufahi district. The pipeline will cross 8 rivers; namely Raiketan River, Foura River, Loumea River, Mola River, Belulic River, Ukasa River, Buiru River and Karaulun River

The pipeline corridor will pass several types of land and geographical conditions, including coastal and flat plain, hilly or mountainous area, and river flood plain.

The land acquisition will affect about 10 houses in Bobe and also other 10 houses in Bonuc sub-villages[1] among 12 sub-villages resetting along the pipeline corridor. These 20 houses will need to be relocated because the pipeline and highway corridor will traverse these two sub-villages. The remaining 10 sub-villages are also located within 500 m from the pipeline corridor.

Overall, the field environmental surveys confirm that the proposed pipeline corridor and its adjacent areas are not ecologically sensitive or unique areas. Wildlife habitats along the proposed pipeline corridor include mixed deciduous forest, mixed deciduous forest intermingled with teak and palm plantation, and riparian forest. Wildlife would move from place to place among these forest areas, water sources and open space according to changing seasons and fertility of food sources.

16.4 KEY ENVIRONMENTAL AND SOCIAL ISSUES

Based on the nature and magnitude of Project activities and the environmental and socio-economic conditions of the Project site and its surrounding areas, the context of each issue is discussed below:

- Pre-Construction and Construction Phases

➢ Removal of vegetation and trees along the pipeline construction on the corridor will result loss of forest and plantation areas.
➢ Relocation of about 20 houses in Bobe and Bonuc communities to the resettlement area to be provided under the Government.
➢ Waste disposal and maintaining sanitation conditions of the worker camp.
➢ Environmental disturbances at the construction will include fugitive dust, noise, and gases emissions.
➢ Increasing river water turbidity.
➢ Archeological chance finds.

- Operational Phase

➢ During operation, the pipeline will be occasionally cleaned using pigs that will generate wastes
➢ During operation, accidental fire and explosion of the pipeline will be a major operational risk that has to be managed.

- Deactivation Phase

Environmental issues during demolition of the pipeline system will include, hazardous wastes, groundwater contamination, soil contamination, noise and gases emission, and occupational health and safety of demolition workers. They are similar to the corresponding issues during construction.

[1] **Source:** Interpret from aerial photograph and confirmed by ground check (Field survey by TEAM Consulting Engineering and Management Co., Ltd in February 2016)

16.5 ENVIRONMENTAL MANAGEMENT PLAN

The Management of environmental and social issues at each phase which comprises activity, potential impact, sampling location, mitigation measures, mitigation cost, mitigation responsibility, parameter to be monitoring and monitoring frequency is presented in ***Table 16.5-1*** to ***Table 16.5 -3***.

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Land requirement for establishment of base camp, office, corridor with space, pipe laydown area with materials and shed including satellite camp	Loss of about 255 ha of forest land and 205 ha of agricultural land in relation to land requirement.	• Built up area in Bobe and Bonuc sub-villages where the corridor cut through the communities. • Agricultural land and forest land which are within 90 m strip of pipeline corridor.	• Compensation for forest and agricultural land • Compensation and relocation for affected persons in Bobe and Bonuc sub-villages	Compensation cost will be covered by the Ministry of Public Works, Transport and Communication.	• The Ministry of Public Works, Transport and Communication. • The Project Proponent to coordinate with the Ministry of Public Works, Transport and Communication.	To be managed and identified by the Ministry of Public Works, Transport and Communication.	To be managed by the Ministry of Public Works, Transport and Communication.
Fugitive dust Site clearing, excavation work, move of heavy equipment and vehicles along the dirt road will generate fugitive dust	Fugitive dust includes: • TSP about 411 $\mu g/m^3$ compared to standard of exceeding 230 $\mu g/m^3$. • PM_{10} about 214 $\mu g/m^3$ compared to standard of not exceeding 150 $\mu g/m^3$	• At construction site such as stockpiles, vehicles and roads leaving the construction sites • At sensitive area of the two nearest communities to the pipeline corridor, namely Bonuc and Bobe sub-villages.	• Spray water at and around the construction areas and access roads during site preparation and grading. • Limit speed for vehicles and trucks not to exceed 40 km/hr. • Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance. • Prohibit the open burning of waste in the pre-construction area. • Dust masks should be provided (where applicable) to all workers. • For construction site including spoil placement sites: – Use watering or other effective techniques on unsealed areas; – Rehabilitate construction sites and spoil placement as soon as the land becomes available. • Take measures (e.g. rumble bars and wheel wash bays) to ensure dust-creating material (earth or similar material) is not transported from the construction sites to roads or other areas in the public domain. • Cover all trucks carrying spoil or other loose materials. • Clear and remove all loose earth and similar material spilled or deposited within the construction sites and the transport routes from trafficked areas. • Take measures to avoid impacts of dust on adjacent properties such as: – Modify construction methods; – Increase dust suppression measures; or – Cessation of work when no other reasonable or practical measure is available.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Total Suspended Particulate (TSP-24 hrs) • Particulate Matter less than 10 micron (PM10-24 hrs) Nitrogen dioxide (NO_2) • Wind speed and direction (WS/WD)	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Gaseous emissions Operations of diesel-powered heavy construction equipment, vehicles and generator sets will generate gaseous emissions during the construction.	• Gaseous emission will be mostly generated by typical pollutants such as NO_x, SO_x, CO, and particulate in the exhaust gases discharged from the engines. • Its effect would be on health of construction workers.	• Construction site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages.	• Manage the movement of construction vehicles entering and leaving the construction sites to avoid the potential for vehicle emissions impacting on adjacent properties such as avoiding or minimizing queuing on streets approaching the worksites or adjacent to other sensitive activities; • Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites; • For stationary plant and equipment powered by diesel motors, take measures to avoid or mitigate and manage the potential impacts of exhaust emissions on adjacent residential or other sensitive activities such as all equipment powered by diesel motors are fitted with emission control measures, and are regularly maintained to manufacturers' specifications. • Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. • Provide adequate training to the equipment operators in the proper use of equipment. • Use the proper size of equipment for the job. • Use the equipment fitted engines with latest low emission technologies. • Perform on-site material hauling with trucks equipped with on-road engines • Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Nitrogen dioxide (NO_2) • Sulfur oxides (SOx) • Vehicle motors idling for periods exceeding 5 minutes while in queues to access construction sites (on-going). • Inspect the position of stationary plant and equipment powered by diesel engines to ensure exhaust emissions are directed away from sensitive activities and neighboring properties (initially on establishment).	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.
Noise level Operations of heavy construction equipment during land clearing, pipeline lowering, and backfilling, etc. would generate noise.	• Loud noise will disturb and cause annoyance to hearing capacity of the people in surrounding area. • Loud noise over long period will cause hearing impairment.	• Construction site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	**Design** • Design to use construction equipment that generate low levels of noise with adoption of best available technologies to minimize noise. • Conduct a noise survey covering the identified sensitive receptors to update the existing baseline data in the Final EIA Report. • Demonstrate through predictive modeling of the proposed construction techniques and monitoring ambient noise readings prior to construction to establish pre-disturbance levels, the likely levels of noise due to construction works throughout the construction period.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Leq 1 hr • Leq 24 hrs • Lmax	• Regular inspection (weekly minimum) by in-house staff. • Twice a year monitoring over the construction period, by the third party. • Once for 3 consecutive days cover in the period that construction is passing the two nearest communities.

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Noise level Operations of heavy construction equipment during land clearing, pipeline lowering, and backfilling, etc. would generate noise. (cont'd)			**Pre-Construction and Construction Noise** • Construction works which generate excessive levels of noise must be carried out, only during the period between 6.30 am to 6.30 pm Mondays to Saturdays. Such construction works on Sundays or public holidays will need approval from the resident engineer of the Project Proponent. • Protect the affected sensitive receptors beyond standard construction hours such as installation of acoustic walls or noise barriers. • The noise reduction at the perimeter could be achieved using an acoustic wall or a sound barrier (Steel 18 ga with 1.27 mm. thickness which transmission loss of 25 dB(A) or equivalent) at least 3 m high with adequate length to block the noise emanating to the receptor. • Provide ear plugs or ear muffs to workers operating in the excessive noise areas. • Limit speeds of vehicles in the construction site, not exceed 40 km/hr. • Include measures to achieve the construction noise targets such as: – Commence advanced notification of works and undertake on-going consultation with potentially affected property owners and occupants. – Establishing temporary noise barriers between construction worksites and sensitive receptors. – Fitting noise-reduction measures to all equipment engaged in the construction works; • Designing worksites to minimize potential noise impacts on nearby sensitive places.				
Wastewater Daily activities of the workers/employees in relation to kitchen, canteen, toilets, bath rooms, and wash water in the base camp and satellite camp will generate wastewater.	Wastewater volume will be from: • about 15.3 m^3/day from base camp • about 1.9 m^3/day from each satellite camp.	At the outlet of retention pond at the 3 worker camps	**Design Concept** The Contractor will prepare detailed design of a wastewater management system for the worker camp, consisting of a collection system and a simple treatment system. Its proposed design concepts are:	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • Total Nitrogen • Temperature • Total Suspended Solid • Oil and Grease • BOD_5 • COD • Total Phosphorus • Sulfides	Twice a year during construction

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Wastewater Daily activities of the workers/employees in relation to kitchen, canteen, toilets, bath rooms, and wash water in the base camp and satellite camp will generate wastewater. (Cont'd)			**For Domestic Wastewater** • Toilet wastes will be separated from grey water or sullage. • Toilet wastes will be discharged into a septic tank(s) with a hydraulic retention time of about 5 days. The volume of toilet wastes is estimated at about 20% of the total volume of domestic wastewater. The septic tank effluent (septage) will be discharged into the retention pond. Alternatively, toilet wastes will be treated in a package treatment plant using an aerobic process. • The temporary retention pond within worker camp site areas will be designed as an oxidation pond. **During Construction** • Water in the retention pond will be used for dust suppression on unpaved areas in the construction site, and also for watering of the green area. • The remaining volume will be discharged into the water sources.				•
Construction Waste • Activities related to site clearing, excavation, concrete works, steel works, piping works, installation of equipment, and construction of buildings will generate wastes. • Daily activities of the workers will generate non-construction wastes, including wastes from canteens and offices such as paper, food and beverage containers, food wastes, and other domestic items.	An amount of waste is equivalent to: • About 237 tons of *construction waste* over the 60 km length of pipeline corridor, or about 0.2 tons/day over the period of 36 months. • About 0.8 m^3 / day of *waste from workers.* • About 0.25 tons/month of *hazardous waste*.	• Construction site • Waste disposal area	**Design and Planning before Commencing the Construction** • Design own disposal facility, preferably within the construction site. • Design the construction methods to generate the least amount of wastes. • Design methods of waste transport and disposal. • Prepare an action plan for waste management to reflect cumulative results of the previous quarters. • Consider using materials and products that have a recycled content. • Arrangements with suppliers to return any unused construction materials; • Where possible, goods to be ordered in bulk to minimize packaging waste and packaging material returned to the supplier wherever practicable; and **During Construction** **Waste Segregation** • Design and implement a waste segregation system. • Provide an appropriate number of containers with adequate volume and appropriate materials at strategic locations to support the segregation in terms of recycling, reuse and disposal sub-categories.	To be included in total solid waste management cost of 25,820 USD.	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Efficiency of the collection, • Storage, and disposal volume, and • Record keeping	• Daily site inspections, and • Detailed weekly site inspections.

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Construction Waste • Activities related to site clearing, excavation, concrete works, steel works, piping works, installation of equipment, and construction of buildings will generate wastes. • Daily activities of the workers will generate non-construction wastes, including wastes from canteens and offices such as paper, food and beverage containers, food wastes, and other domestic items. (Cont'd)			**Waste Collection and Storage** • Collection and transport each sub-category of segregated wastes on daily basis. • Provide a roofed storage area with adequate space for storing the segregated wastes waiting for the on-site or off-site reuse or recycling. • Special design the storage area for hazardous waste to prevent spills or leaks onto the soil. **Waste Reuse and Recycling** • Chipping and mulching of vegetation and reuse for landscaping purposes; • Reuse of excavated material as fill at approved fill sites; • Topsoil free of weeds to be stockpiled and stored for re-use, if possible; • Collection and return of packaging materials (e.g. pallets) to suppliers wherever practicable; • Remove any contamination inadvertently deposited in recyclable waste material containers. Provide cleanup of excessive contamination at recycling vendor locations when such contamination is not controlled at the project site. • Collection and recycling of used oils by a licensed contractor; • Collection by a licensed contractor of empty oil and fuel drums and other containers for return to recycling facilities; **Waste Disposal** • Disposal of the remaining wastes that are unable to be reused or recycled in the approved landfill site. • Prohibit haphazard disposal of construction waste in or off the construction site. • Inert wastes such as broken tiles, bricks, plastics should be used for filling the site in areas planned to be vacant space. • No burning of wastes. • Decomposable wastes such as food wastes and vegetation may be disposed of by composting. • Hazardous wastes will be handled by a licensed hazardous waste contractor, otherwise finding for appropriate arrangements for incineration, safe permanent storage, or other appropriate methods of disposal.				

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
			On-site Record Keeping Design and maintain record keeping procedures with provisions for: • Tracking collections of waste materials at the sites and deliveries to recycling, reuse, salvage, and landfill facilities. • Maintaining on-site logs that include for each load of materials removed from the site: type of material, load weight, recycling/hauling service, and date accepted by recycling service or landfill.				
Hydrostatic Test Water Hydrostatic test of all four installed pipes generate tested water.	Discharge of 9,900 m^3 tested water to natural receiving water.	Receiving water at Suai Supply Base	• Formulate and submit a hydrostatic test plan for approval. • Conduct the hydrostatic test with specific practices.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • Temperature • Suspended Solids	Once after construction, at the beginning, middle and end of the discharge of hydrostatic test water.
Water Turbidity In-river construction of pipe support columns will cause water turbidity.	A small turbidity plume would be observed in the river around the site, over a short distance before the turbidity returns to its normal level.	At 100 m and 200 m downstream of the 12 river construction sites	**Design and Planning** • Ensure the design of pipeline bridge for each river and the method of its construction will give due consideration on impacts on water quality, particularly turbidity or suspended solids. • For each river, the Contactor will: – Conduct a survey of downstream water user, river bed and embankment conditions at the proposed construction section. – Estimate the duration and magnitude of likely impacts of the in-river construction activities on river water quality. – Submit an action plan containing results of the surveys and impact assessment, and proposed methods of construction and mitigation measures to be implemented in each river. **Construction** • Undertaken in the low flow conditions, and should be completed with all temporary facilities in the river completely removed before the high flow season. • Minimize the areas that will be disturbed, including the river bed, bank, access to the construction site, and laydown area. • The on-land construction area near the river bank will have appropriate measures to minimize soil erosion during rainfalls. • The on-land construction area will be rehabilitated to its previous conditions as soon as the construction is completed.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• pH • DO • Suspended Solids • Turbidity	2 times; before and during construction.

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Chance Finds for Archeological, Historic and Sacred Sites During site clearing and excavation of pipe trench, the Contractor may discover artifacts which potentially could have archeological, historic, religious, or cultural value.	Operational activities may possibly destroy some artifacts presented under the pipeline corridor.	Area along the condensate pipeline between KM 35+000 to KM 50+000, which are situated in Bonuc and Bobe sub-villages.	• Site supervisor/foreman shall order construction workers to stop immediately the construction activities in the area of the chance find. • Inform concerned authority, including local leaders, for proper management if historic is found. • Delineate and mark clearly the discovered site or area and prohibit physical activities in the area without prior approval of the concerned authority. • Install temporary site protection measures (warning tape and stakes, avoiding signs). • Strictly enforce any no-go area needed to protect the site. • Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the responsible Ministry takes over. • If it is necessary to relocate a cemetery and grave yard, cultural ceremony should be arranged prior to the relocation.	To be included in the total construction contract cost	• The contractor to inform the Project Proponent. • The Project Proponent to inform concerned authorities in case of chance finds archeological, historic, religious, or cultural value.	Site inspection	During land clearance and site preparation
OSH of construction workers Activities related to pre-construction and construction may harm health of construction workers	There is a possibility that the workers/employees might be injured during working. Pre-construction.	• Construction area along the pipeline route • Worker camps	Mitigation measures are identified in the worker camp management. (Under social issue)	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent.	• Accident • Record keeping	Daily and weekly inspection
Social Issues							
Land acquisition Site preparation for establishment of base camp, office, corridor with space, pipe laydown etc will occupy some forest and agricultural areas.	Reduce of forest and agricultural areas which are economic resources of villagers who collect forest products and cultivate on these areas.	• Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	Compensation and relocation for affected persons in Bobe and Bonuc sub-villages	Compensation cost will be covered by the Ministry of Public Works, Transport and Communication.	• The Ministry of Public Works, Transport and Communication. • The Project Proponent to coordinate with the Ministry of Public Works, Transport and Communication.	To be identified and managed by the Ministry of Public Works, Transport and Communication.	To be managed by the Ministry of Public Works, Transport and Communication.
Worker Camps Mismanagement of worker camps may harm workers' health and pollute surrounding environment.	• Unhygienic living conditions will affect health of workers; • Pollution of the natural environment outside the worker camp, such as fly infestation, water pollution, and odor;	Worker Camps	Ensure the design, operation, and management of the worker camp are within specific requirements as follows: • The worker camps should be made of decent materials that could withstand heavy rains and storms, with adequately ventilated and lighted.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent	• Worker Camp • Worker health and safety	Daily and weekly inspection.

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Worker Camps Mismanagement of worker camps may harm workers' health and pollute surrounding environment. (Cont'd)	• Exposure of workers on accidental risks or worker safety.		• Provide a sleeping space of at least 4 m^2 per worker, with separate rooms for professional staff. • Number of toilets and baths should be 1 unit for 20 workers. • Plan for common canteen which can accommodate at least 150 persons. • Provide common areas for cloth washing and drying with adequate water supply and drainage. • Provide recreational facilities with sufficient accessories. • Set up one shop to sell sundry goods to the workers. • Strictly control fly, insect and rodent. • Provide medical services at a small clinic served by a doctor. • Prepare fire and safety plan for the camps. • Basic camp infrastructure with facilities of power supply, telecommunication, water supply, drinking water, drainage, sanitation and solid wastes management. • Establish and enforce codes of conduct within and outside the worker camps covering camp security, fire safety, drug using, drinking, smoking, and visiting guests. • Provide security guards to be in charge of the security of camp. • Provided transport services from the project site to nearby communities. • Environmental management of the demolition and dismantling of the worker camp and associated facilities after the construction is completed.				
Influx of Worker Employment of a large number of construction workers will create both of positive and negative impacts	*Positive impact* • Creation of demand for local goods and services; *Negative impact* • Competing use of local resources; • Health risks to the communities such as communicable diseases; • Conflicts with the locals due to differences in culture, value and ways of life.	• Worker camps • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Ensure that local provision of goods and services to the workers will be orderly and clean, and will not create unsanitary conditions near the worker camp. • Avoid using local resources as much as possible, and should provide a medical clinic within the worker camp. • Provide communicable diseases control program related to the sanitation and hygiene program for the worker camp. • Provide brief information to non-local workers, to make them aware of cultural sensitivity of the locals.	To be included in the total construction contract cost	The Contractor under the supervision of the EHS Manager of the Project Proponent	Feedback and complaints from affected households.	Daily and weekly inspection

TABLE 16.5-1

ENVIRONMENTAL MANAGEMENT PLAN DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES (CONT'D)

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Community health and safety Mismanagement or improper control of pre-construction and construction works may affect health and safety including security of the communities resided the pipeline corridor.	The locals and passers-by along the pipeline route might be injured or being insecure.	• Worker camps • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Undertake a program of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto the construction corridor where the construction is ongoing. • Ensure that signs are put up around work fronts and construction sites advising people of the risks associated with trespass. • Ensure that there is adequate fencing around pipe lay down yards and other similar facilities to minimize the risk of trespass. • When work fronts are within 100 m of an inhabited building, all equipment will be parked overnight in a demarcated area • Select security personnel based on a careful background screening of the applicants and provide their training. • At the intersection of the construction corridor and local roads or trails, a diversion route must be provided during construction with warning signs to vehicles and pedestrians. • Truck drivers and operators of heavy construction equipment must receive training in public safety in their works.	To be included in the total construction contract cost	• The Contractor under the supervision of the EHS Manager of the Project Proponent. • The EHS Manager to involve in CSR program.	CSR program and its implementation	Daily and weekly inspection

TABLE 16.5-2

ENVIRONMENTAL MANAGEMENT PLAN DURING OPERATION PHASE

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Environmental Issues							
Waste Cleaning of using pigs along the pipeline will generate waste.	Waste from pigging	• The pigging station at Suai Supply Base • The Betano Refinery's wastewater treatment system	**Pigging Waste Collection and Transportation** • The pigging wastes will be collected and transported to the waste oil treatment unit of the Betano Refinery's wastewater treatment plant. • The Operational Manager will supervise the collection, storage, and transport of the pigging wastes to the refinery's wastewater treatment plant. **On-site Record Keeping** • The ESH manager will design and maintain procedures for recording the volume of pigging wastes collected and sent for treatment at the refinery.	Including in the operational cost of Betano Pipeline System Company	The Operational Manager, the Maintenance Manager and the EHS Manager under supervision of the General Manager of the BPSC.	• Quality of oily sludge before and after the pigging waste is treated. • Volume and characteristics of pigging wastes	Every time the pigging waste is sent to the refinery for treatment, about 2 times per month.
Operational risk Defective design, installation, and operation and management of operational work may cause accidental fires and explosions of pipelines	Damage of the pipeline due to risk of oil leak and explosion	Along the pipeline route	Risk Management Program must be in place as a means to guarantee the safe start-up of the commercial operations with all risks fully under control (Details are in ***Table 9.5-1***).	Including in the operational cost of Betano Pipeline System Company	The Operational Manager, the Maintenance Manager and the EHS Manager under supervision of the General Manager of the BPSC	Monitoring emergency incidents situations such as accident, fire, oil spill, etc. including restrain and recovery the situations	Daily and weekly site inspections
Social Issues							
Community Health and Safety Mismanagement or improper control of operational work may affect health and safety including security of the adjacent communities	• Risk of explosions; and • Pipeline ruptures and oil leaks	Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• Undertake stakeholder engagement regarding the pipeline operations to present and discuss safety features of the pipeline system. • Maintain the Grievance Mechanism throughout the operation of the pipeline so the communities can report their specific concerns; and • Undertake a community education program on pipeline safety to alleviate concerns.	Including in the operational cost of Betano Pipeline System Company	The General Manager of the BPSC	Feedback and complaints from affected households.	Throughout the entire operation period

TABLE 16.5-3

ENVIRONMENTAL MANAGEMENT PLAN DURING DEACTIVATION PHASE

Activities/Issues	Potential Impacts	Sampling Location	Mitigation Measures	Mitigation Cost	Mitigation Responsibilities	Parameter to be Monitoring	Monitoring Frequency
Demolition of structures and operation of heavy equipment and vehicles along the dirt road will generate: - *Fugitive dust* - *Loud noise* - *Solid waste* - *Hazardous wastes and oil products* from the storage tanks and pipelines - *Wastewater* from cleaning of storage tanks and pipeline	Fugitive dust will be generated and disturb health of workers and the locals adjacent to the demolition site.	• Demolition site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	• During the deactivation phase, the Project Proponent prepared at the EIA stage will not be applicable and will replaced by the new deactivation environmental management plan based on the new EIA. • The environmental issues, major sources, magnitude, receptor, predicted impact and mitigation measures in this phase will be similar to those occur during the construction phase. • However, activities of this phase will be demolition only then impacts from demolition activities will be controlled by the demolition contractor. • The contractor will be required to adopt the best practice to minimize impacts from : - Dust - Gas emission - Noise from heavy machinery and from demolition activities - Hazardous wastes and oil products - Wastewater and wastes	• To be included in the demolition contract • To be included in the total solid waste management cost of 13,000 USD	The demolition contractor and to be controlled by the project proponent.	*Fugitive dust* • Quantity of dust • Wind speed and direction • Complaints from the nearest communities *Noise level* • Complaints from the nearest communities *Solid waste* • Quantity • Its disposal *Hazardous wastes and oil products* • Quantity • Disposal management *Wastewater* • Volume and • Its discharge	Regular site inspection (weekly minimum) by in-house staff.
Community Health and Safety Mismanagement or improper control of demolition work may affect health and safety including security of the workers adjacent communities	Demolition workers, the locals and passers-by along the pipeline route might be injured or being insecure.	• Demolition site • Two nearest communities, comprising: - Bonuc and - Bobe sub-villages	Maintain the Grievance Mechanism throughout the operation of the pipeline so the communities can report their specific concerns.	To be included in the annual budget of the Project proponent	The Project proponent	Complaints from local communities	Regular inspection (weekly minimum) by in-house staff.

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APPENDIX 3A

SUMMARY OF QUALIFICATION FOR KEY STAFFS

TABLE 1
SUMMARY OF QUALIFICATION FOR KEY STAFFS

No.	Position	Name	Age	Education	Experience
1	EIA Team Leader/Senior Environmental Expert	Dr. Sermpol Rattasuk	72	- B.Sc. (Hons.) in Chemical Engineering, Chulalongkorn University, March 1965 - M.Eng. in Environmental Engineering, Asian Institute of Technology, February 1968 - Ph.D. in Environmental Engineering, University of Newcastle upon Tyne, U.K., May 1971	Fifty years of experience in environmental, engineering and development areas. 15 years at Thailand Institute of Scientific and Technological Research responsible for environmental planning lecturer in planning and environmental law and technology. Over 15 years at ADB responsible for project planning, analyzing the feasibility study of Infrastructure project in Asia. Over 10 years of experience as advisor and expert in organization development in public, state enterprise, private enterprise especially privatization project and improvement of state enterprise's performance, project planning, project supervision, monitoring the analysis results and structural design, analysis on finance, economic, marketing and administration system and human resources management etc.
2	Environmental Expert	Dr. Sirinimit Boonyuen	56	- B.S. in Biology, 1980 - M.S. in Environmental Studies (Aquatic Ecology), 1982 - Ph.D. in Environmental Biology (Limnology), 1986	Thirty-three years of experience in environmental studies and researches. Moreover, her professional works included teaching in her field of specialization in an American University. She is responsible for Project Manager and/or Environmental Specialist for a numbers of EIA and environmental monitoring projects both for government and private sectors.
3	Project Manager/ Environmental Engineer (Air quality/Noise/Risk Assessment)	Mr. Chaloemchai Nakkhwan	35	- B.Eng. in Environmental Engineering, 2006 - M.Eng. (Environmental Engineering), 2008	Nine years of experience in project management, environmental study, field survey and data collection various project developments. The experience is also covered air quality, noise, and risk assessment.

TABLE 1
SUMMARY OF QUALIFICATION FOR KEY STAFFS (Cont'd)

No.	Position	Name	Age	Education	Experience
4	Geological Expert/ Project Coordinator (Geology/ Hydrogeology/ Hydrology)	Mr. Songsak Bhaddee	57	- B. Sc. (Geology), 1979 - Diploma on Geothermal Exploitation, Geothermal Institute, 1985	Thirty-five years of experience on geological study and geotechnical engineering for hydropower project, tunnel, road and bridge and etc. The experience is also covered geohydrological survey and development. He also has more than five years of experience in management field both for projects and for firms. He is the project manager and key-staff for the works for TIMOR GAP, E.P. for the Betano Refinery Project.
5	Geologist (Geology/Hydrogeology)	Mr. Komsan Yonchai	26	- B. Sc.(Geotechnology), 2012	Three years of experience on geology, geotechnical and hydro-geological investigation and study for power engineering and related aspects.
6	Construction Expert	Mr. Vittaya Hongyont	47	- B. Eng. In Construction Engineering, Sripatum University, 1996	Nineteen years experience in Civil/Structural analysis/ design and construction supervision of civil/structure of various projects. Responsible for detailed engineering design and analysis for complex structure, such as industrial factory, pipe support, drainage system, oil tank storage, marine structures, pier, jetty and dolphin. He is one of ATT's design team that conducted civil/structural design for the Betano Refinery Project.
7	Pipeline Expert	Mr. Surin Sungsaka	46	- B. Eng. in Mechanical Engineering, King Mongkut Institute of Technology, Thonburi, 1993	Twenty-two years of experience in the field of mechanical engineering. He has been long engaged in master plan and designing of building services for mechanical system and sanitary especially ventilation and Air condition (VAC), fire fighting and plumbing of sanitary in building and laboratory. He is very keen and familiar with codes and standards of modern equipment and technology specified in various project. He has also worked in the field as construction supervision for the installation of all kinds mechanical and sanitary equipment.

TABLE 1
SUMMARY OF QUALIFICATION FOR KEY STAFFS (Cont'd)

No.	Position	Name	Age	Education	Experience
					He is one of the Mechanical Engineer Staff who engaged in the designing of water supply system for the Betano Refinery Project.
8	Pipeline Engineer	Mr. Natthawut Khueanlom	28	- B. Eng. in Mechanical Engineering , Chiang Mai University, 2012	Three years of experience in the field of mechanical engineering. He has been long engaged in master plan and designing of building services for mechanical system and sanitary especially ventilation and Air condition (VAC), fire fighting and plumbing of sanitary in building and laboratory. He is very keen and familiar with codes and standards of modern equipment and technology specified in various project. He has also worked in the field as construction supervision for the installation of all kinds mechanical and sanitary equipment.
9	Terrestrial Ecologist (Terrestrial Ecology)	Mr. Apichai Horcharoensap	35	- B.Sc.(Agriculture), 2003	Eleven years of experience in study, survey in forestry and wild animal, natural sustainment of forest for various projects such as dam, power plant, mine and etc.
10	Senior Environmental Scientist (Freshwater/Aquaculture /Fishery/Agriculture)	Ms. Chalida Nieobubpa	49	- B.Sc. (Animal Science), 1989 - M.Sc. (Aquaculture), 1995 - B.P.H. (Occupational Health and Safety), 2013	Twenty-four years of experiences in environmental studies and researches particularly in water quality, aquatic ecology, fisheries and aquaculture. She has been responsible for project manager and/or water quality and aquatic ecology specialist in numbers of EIA, environmental monitoring of various kinds of both international (e.g., Laos PDR, Cambodia) and domestic projects i.e. power plant , oil and gas, jetty and port, natural gas pipeline, highway, transmission line etc.

TABLE 1
SUMMARY OF QUALIFICATION FOR KEY STAFFS (Cont'd)

No.	Position	Name	Age	Education	Experience
11	Marine Ecologist (Coastal/Marine Ecology)	Dr. Supichaya Woongchinawit	39	- B.S. (Horn : Fishery), 1999 - M.S. (Marine Science), University, 2002 - Ph.D. (Marine Science), 2009	Seventeen years of professional experiences in marine ecology and fish ecology. She has been responsible for technical report writer in EIA petroleum (oil & gas) development project i.e. seismic survey, petroleum exploration drilling and petroleum production projects.
12	Land Use Specialist (Land Use)	Mr. Plian Maneeya	52	- B.Sc. in Science (Agriculture), 1988 - M.Sc. in Agriculture Science, (Soil Science), 1994	Twenty-five years of experiences in rural development, agricultural development, land use planning, agriculture planning, environmental impact assessment in various projects.
13	Environmental Scientist (Land Transportation)	Mr. Yongyut Khonchantet	34	- B.Sc. (Environmental Science and Technology), Mahidol University, 2002 - M.Sc. (Technology of Environmental Management), Mahidol University, 2007	Thirteen years of experience in project coordinating environmental study, planning, for various projects. The experience is also covered land transportation.
14	Environmental Geologist (Groundwater Quality/ Land Use)	Dr. Namporn Pituchana	31	- B.Eng (Geotechnology), 2006 - Ph.D. (Geotechnology), 2014	Ten years of experience in study, survey in geology, hydrogeology, remote sensing and environmental report preparation.
15	Senior Socio-Economist and Public Consultation Specialist (Socio-Economic/ Public Consultation)	Dr. Siriluck Sirisup	63	- B. Sc. (Agriculture), 1973 - M.Sc. (Rural-Regional Development Planning), 1988 - Ph.D. (Agricultural Geography), 2001	Forty years of experiences in the region, including Cambodia, Lao PDR, Thailand, and Vietnam. She has extensive experiences in socio-economic studies, public compensation and resettlement for development project.
16	Public Consultation Specialist/Archaeological Specialist	Mrs. Budsaba Israngura Na Ayudhya	60	- B.A., 1978 - Master of Planning (Regional Planning), 1981	Thirty-eight years of experience in environmental study and project management as well as public participation works, aesthetic value, and urban planning for several kinds of EIA/EHIA projects both in Thailand and abroad.

TABLE 1
SUMMARY OF QUALIFICATION FOR KEY STAFFS (Cont'd)

No.	Position	Name	Age	Education	Experience
17	Socio-Economist (Socio-Economic)	Ms. Anshisa Chansila	29	- B.Sc. (Sociology and Anthropology), 2009 - M.Sc. (Gender and Development Studies), 2012	Ten years' experience in study and environmental assessment on socio-economic aspect, including public relation program and institution/organization study
18	Quality Safety and Occupational Health Engineer	Mr. Tawan Srisotorn	46	- B.Tech. (Construction Management) Sukhothai Thammathirat Open University ,1999 - B.P.H. (Occupational Health and Safety) Sukhothai Thammathirat Open University ,2013	Twenty-four years of experience in the quality safety and control. Document control and project planning, tracking and monitoring the implementation of the contractor to comply with the safety plan during construction.

APPENDIX 4A

DESIGN STANDARDS OF PIPELINE

APPENDIX 4A
DESIGN STANDARDS OF PIPELINE

The pipeline and associated facilities are designed in accordance with, but not limited to, the following regulations, standards and codes:

CFR – Code of Federal Regulations

Title 49, Part 192 : Transportation of Natural and Other Gas by Pipeline : Minimum Federal Safety Standards.

Title 49, Part 195 : Transportation of Hazardous Liquids by Pipeline.

API – American Petroleum Institute

API 5L : Specification for Line Pipe.

API 6D : Specifications for Pipeline Valves.

API 6FA : Fire Test for Valves.

API 1102 : Steel Pipelines Crossing Railroads and Highways.

API 1104 : Standard for Welding Pipelines and Related Facilities.

ASCE – American Society of Civil Engineers

ASCE 7 : Minimum Design Loads for Buildings and Other Structure.

ASME – American Society of Mechanical Engineers

ASME B31.4 : Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.

ASME B31.8 : Gas Transmission and Distribution Piping Systems.

ASME B16.34 : Valves-Flanged, Threaded and Welding End.

ASME B16.5 : Pipe Flanges and Flanged Fittings.

NACE – National Association of Corrosion Engineers

NACE RP-0169 : Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

NACE RP-0175 : Control of Internal Corrosion in Steel Pipelines and Piping Systems.

NACE RP-0286 : Electrical Isolation of Cathodically Protected Pipelines.

SSPC – Steel Structures Painting Council

All of regulation, standards and codes shall be conform to latest edition at the time of construction, including the latest Addenda.

The design of the pipeline shall not only conform to the preceding regulations, standards and codes, but shall also meet the requirements of any regulations, standards and codes referenced within.

SEISMICITY

The project site is required a seismic hazard zone and seismic analysis. The earthquake load is designed in accordance with the following criteria:

- Design Code ASCE 7-10.
- Load Combination shall be as per ASCE 7-10.
- Site Class "B".
- Risk Category "IV".
- Seismic Design Category "D".
- Design response spectral shall be 475-year return period.

APPENDIX 5A

THE GOVERNMENT RESOLUTION NO. 20/2014, OF 6th AUGUST 2014

Quarta-Feira, 6 de Agosto de 2014 Série I, N.° 28

JORNAL da REPÚBLICA

$ 1.00 PUBLICAÇÃO OFICIAL DA REPÚBLICA DEMOCRÁTICA DE TIMOR - LESTE

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de 6 de Agosto

ESTATUTO DA CARREIRA DE REGIME ESPECIAL DOS AUDITORES DA CÂMARA DE CONTAS DO TRIBUNAL SUPERIOR ADMINISTRATIVO, FISCAL E DE CONTAS

A Lei n.° 9/2011, de 17 de Agosto, aprovou a orgânica da Câmara de Contas do Tribunal Administrativo, Fiscal e de Contas, que tem por função fiscalizar a legalidade e regularidade das receitas e das despesas públicas, apreciar a boa gestão financeira e a efectiva responsabilidade por infracções financeiras.

Há que dar cumprimento ao disposto no artigo 24.° da Lei n.° 9/2011, de 17 de Agosto que atribui ao Governo a competência para regular por decreto-lei o estatuto do pessoal do serviço de apoio técnico da Câmara de Contas do Tribunal Superior Administrativo, Fiscal e de Contas. A carreira especial de auditor, que não existe no quadro geral da função pública, justifica-se pela necessidade de a instituição superior de controlo das contas do Estado dispor de um quadro de pessoal de alto nível e especialmente qualificado para o exercício exigente da sua função de controlo das finanças públicas na estrita observância dos valores essenciais do código de ética da Organização Internacional das Instituições Superiores de Controlo (INTOSAI), tais como a integridade, a independência, o segredo profissional e a objectividade na salvaguarda do interesse público.

A criação de carreiras de regime especial faz-se por diploma próprio (artigo 28.° do Decreto-Lei n.° 27/2008, de 11 de Agosto).

Compete ao Governo aprovar a criação e estruturação dos cargos e carreiras profissionais na função pública e aprovar o respectivo quadro de pessoal (artigo 36.° da Lei n.° 8/2004, de 16 de Junho, alterada pela Lei n.° 5/2009, de 15 de Julho).

Assim:

Ao abrigo do disposto no artigo 24.° da Lei n.° 9/2011, de 17 de Agosto, nos artigos 36.° e 38.° da Lei n.° 8/2004, de 16 de Junho, alterada pela Lei n.° 5/2009, de 15 de Julho, e no artigo 28.° do Decreto-Lei n.° 27/2008, de 11 de Agosto, e nos termos da alínea p) do n.° 1 artigo 115.° da Constituição, o Governo decreta, para valer como lei geral da República, o seguinte:

CAPÍTULO I
Disposições gerais

Artigo 1.°
Objecto

O presente Decreto-Lei estabelece o estatuto dos auditores da Câmara de Contas do Tribunal Superior Administrativo Fiscal e de Contas.

Artigo 2.°
Auditores

1 - São auditores da Câmara de Contas do Tribunal Superior Administrativo Fiscal e de Contas o auditor-coordenador geral, os auditores-chefe e os auditores.

2 - Há auditores de 1ª classe, auditores de 2ª classe e auditores de 3ª classe.

RESOLUÇÃO DO GOVERNO N.° 20/2014

de 6 de Agosto

VALORES MÁXIMOS A PAGAR PELOS TERRENOS NO PROJECTO *TASI MANE* EM SUAI

Considerando que o Projecto *Tasi Mane* prevê a criação de três pólos industriais na costa Sul do país, abrangendo o agrupamento da Plataforma de Abastecimento do Suai, o agrupamento da Refinaria e Indústria Petroquímica de Betano e o agrupamento da Instalação de Gás Natural Liquefeito (GNL) de Beaço que, depois de instalados, serão a base da indústria petrolífera de Timor-Leste;

Considerando que, em particular, a Base Logística do Suai compreende as diferentes infraestruturas a serem implementadas no terreno para efeitos da construção da base logística de apoio à indústria petrolífera, que se situam no Suco de Camenasa, na zona do actual aeroporto de Suai e terrenos circundantes e ainda os terrenos necessários à construção da auto-estrada de ligação entre os três polos de desenvolvimento;

Considerando as dificuldades na identificação dos terrenos e dos respectivos titulares, e tendo em conta as negociações entre o Estado, os particulares e as comunidades, relativamente aos termos e condições de transmissão dos direitos de propriedade e de uso da terra;

Considerando a urgência de ver resolvida a questao dos terrenos por forma a dar celeridade a implementaçao do projecto que é um projecto de interesse nacional e de utilidade publica;

Tendo em conta a necessidade de definir os montantes máximos que o Estado deverá pagar pela cedência destes direitos sobre os terrenos e de indemnização pelas respectivas árvores e culturas agrícolas existentes nos terrenos;

Assim,

O Governo resolve, nos termos da alínea d) do artigo 116.° da Constituição da República, o seguinte:

1. Aprovar o pagamento máximo de usd $ 3,00 (três dolares americanos) por metro quadrado de terreno, no âmbito do processo de aquisição de direitos de propriedade ou de uso e fruição dos terrenos abrangidos no Plano de execução da Plataforma de Abastecimento do Suai, sitos no Suco de Camenasa, aeroporto de Suai e terrenos limítrofes bem como os terrenos necessários à construção da auto-estrada do Projecto *Tasi Mane*.

2. Aprovar os montantes máximos a pagar pela perda de culturas agrícolas e de árvores, previstos na tabela anexa à presente Resolução e da qual é parte integrante.

3. A Presente Resolução entra em vigor no dia imediato ao da sua publicação no Jornal da República.

Aprovado em Conselho de Ministros em 29 de Julho de 2014.

O Primeiro-Ministro,

Kay Rala Xanana Gusmão

ANEXO

TABELA PREÇU AGRIKULTURA E PESKAS

No	No		Tipo Dadus	Unidade	Presu/Unidade
I			Floresta		
	1		**Ai-Teka**	**hun**	
		1.A	Ai-Teka ki'ik	hun	$ 5.00
		1.B	Ai-Teka <15 cmD	hun	$ 20.00
		1.C	Ai-Teka >15 cmD	hun	$ 30.00
	2		**Mahoni**		
		2.A	Mahoni ki'ik	hun	$ 3.00
		2.B	Mahoni <15 cmD	hun	$ 15.00
		2.C	Mahoni >15 cmD	hun	$ 25.00
	3		**Gamelina**	**hun**	
		3.A	Gamelina ki'ik	hun	$ 3.00
		3.B	Gamelina <15 cmD	hun	$ 15.00
		3.C	Gamelina >15 cmD	hun	$ 25.00
	4		**Ai-Kameli**	**hun**	
		4.A	Ai-Kameli ki'ik	hun	$ 10.00
		4.B	Ai-Kameli <15 cmD	hun	$ 40.00
		4.C	Ai-Kameli >15 cmD	hun	$ 60.00
II			Plantas		
	1		**Nu'u**	**hun**	
		1.A	Nu'u seidauk fuan	hun	$ 25.00
		1.B	Nu'u fuan ona	hun	$ 60.00
	2		**Kaiju**	hun	$ 15.00
	3		**Kakao**	hun	$ 15.00
	4		**Bua**	hun	$ 25.00
	5		**Malus**	hun	$ 5.00
	6		**Kami'i**	hun	$ 35.00

	7		Tohu	Klobor	$ 5.00
III			Agricultura e Holticultura		
	1		**Frutikultura**		
		1	Aidila	hun	$ 5.00
		2	Hudi	Klobor	$ 15.00
		3	Sabraka	hun	$ 10.00
		4	Derok	hun	$ 7.00
		5	Ainanas	hun	$ 1.00
		6	Guiava	hun	$ 4.00
		7	Kulu Jaka	hun	$ 15.00
		8	Kulu Modo	hun	$ 15.00
		9	Has	hun	$ 25.00
		10	Bilimbi	hun	$ 5.00
		11	Durian	hun	
		12	Jambu be'e	hun	$ 7.00
		13	Aiata	hun	$ 5.00
		14	Avocate	hun	$ 10.00
		15	Kulu tunu	hun	$ 15.00
		16	Rumao	hun	$ 4.00
		17	Jambu Biji	hun	$ 7.00
		18	Jambu Buah	hun	$ 7.00
	2		**Vegetable Crops**		
		1	Marungi	hun	$ 20.00
		2	Brinjela	hun	$ 5.00
		3	Tomate	hun	$ 5.00
		4	Kobi	hun	$ 1.00
		5	Repolho	hun	$ 2.00
		6	Mostarda	hun	$ 0.10
		7	Alfase	hun	$ 0.20
		8	Bayam	hun	$ 0.10
		9	Kankung	hun	$ 0.05

		10	Koto nurak	hun	$	0.20
		11	Fore chikote	hun	$	0.20
		12	Ai-manas	hun	$	0.50
	3		**Cerelia, Bens and tuber crops**			
		1	Batar	hun	$	0.25
		2	Hare	hun	$	0.10
		3	Fore mungu	hun	$	0.20
		4	Fore keli	hun	$	0.20
		5	Fore rai	hun	$	0.20
		6	Koto	hun	$	0.20
		7	Aifarina	hun	$	1.00
		8	Fehuk midar	hun	$	1.00
		9	Uhi/Kumbili	hun	$	2.00
		10	Talas	hun	$	1.00
		11	Fehu eropa	hun	$	2.00
	4		**Ornamentals**			
		1	Aifunan Bunga	hun	$	5.00
		2	Aifunan Suratahan	hun	$	5.00
		3	Aifunan Vasu	hun	$	5.00
		4	Aifunan seluk	hun	$	5.00
V			**Pekuaria**			
	1		**Karau**			
		1.A	Karau: <8	Luhan	$	75.00
				Subsidi Transporte ho kareta	$	75.00
		1.B	Karau: 8-30	Luhan	$	100.00
				Subsidi Transporte ho kareta	$	100.00
		1.C	Karau: 31-60	Luhan	$	125.00
				Subsidi Transporte ho kareta	$	125.00
		1.D	Karau: >61	Luhan	$	150.00

				Subsidi Transporte ho kareta	$ 150.00
	2		**Manu**	Luhan	$ 100.00
	3		**Fahi**		
		3.A	Fahi <6	Luhan	$ 50.00
		3.B	Fahi 6-10	Luhan	$ 75.00
		3.C	Fahi >10	Luhan	$ 100.00
	4		**Bibi**		
		4.A	Bibi: <6	Luhan	$ 50.00
		4.B	Bibi: 6-10	Luhan	$ 75.00
		4.C	Bibi: >10	Luhan	$ 100.00
VI			**Peskas**		
	1		**Ro'o**	Ro'o	$ 200.00
	2		**Kolam**	Kolam	$ 700.00
VII			**Masin**		
	1		**Fatin tein masin**	Fatin	$ 700.00

RESOLUÇÃO DO GOVERNO N.° 21/2014

de 6 de Agosto

RECONHECIMENTO PÚBLICO PELA ORGANIZAÇÃO E PARTICIPAÇÃO NA CIMEIRA DA CPLP

Durante a semana de 20 a 27 de Julho decorreram em Dili variadíssimas reuniões e outras actividades, relacionadas com a realização da X Cimeira de Chefes de Estado e do Governo da CPLP, que se realizou no dia 23, bem como, outros eventos paralelos.

A organização desta Cimeira mobilizou um grande esforço não apenas em termos financeiros mas, principalmente, em termos de recursos humanos da administração pública, que participaram, de uma forma ou de outra, no planeamento, preparação e logística deste empreendimento.

Salienta-se também a forma respeitadora e a responsabilidade cívica demonstrada pela população de Dili em geral e pela juventude em particular que cumpriram, escrupulosamente as instruções e indicações dadas pelas autoridades de segurança no que respeita ao trânsito e circulação na cidade, que se foi processando sem quaisquer entraves.

A Cimeira de Chefes de Estado e de Governo da CPLP e os demais eventos relacionados decorreram de forma muito satisfatória, sem falhas relevantes e os resultados desta foram dignos de louvor.

Nestes termos,

O Governo resolve, nos termos da alínea d) do artigo 116.° da Constituição da República, o seguinte:

1. Manifestar um elevado reconhecimento e admiração pela forma cívica e responsável como a sociedade civil em geral e a juventude em particular, residentes em Dili, acompanharam e responderam à realização dos eventos ligados à X Cimeira de Chefes de Estado e de Governo da CPLP.

APPENDIX 6A

SOIL CHARACTERISTIC ALONG THE CONDENSATE PIPELINE

APPENDIX 6A

TABLE 1
SUMMARY OF SOIL CHARACTERISTIC ALONG THE CONDENSATE PIPELINE

Hole	Depth (m.)	SPT	Description
BH-1	0.00-0.80	-	Dark brown GRAVELLY SAND and SILTY SAND
	0.80-3.00	7	Dark brown SILT and CLAYEY SILT
	3.00-3.70	7	Dark brown SILTY SAND
	3.70-5.00	14	Dark brown CLAYEY SILT
	5.00-7.00	9	Light and grey brown CLAY
	7.00-7.50	9	Brownish grey CLAYEY SAND
	7.50-20.00	50	Brownish grey SAND
BH-2	0.00-1.00	-	Light brown GRAVELLY SILT
	1.00-9.50	48	Whitish brown LIMESTONE
	9.50-15.50	49	Light and dark brown CLAYEY SILT
	15.50-16.00	50	Light brown SILTY CLAY
BH-3	0.00-5.50	37	Light brown SILT
	5.50-7.80	23	Light brown CLAYEY SILT
	7.80-12.00	50	Light brown SILT
BH-4A	0.00-9.80	50	Light brown GRAVELLY SAND
	9.80-12.00	50	Light brown SILTY SAND contains GRAVEL
BH-4	0.00-12.00	50	Dark brown GRAVELLY SAND
BH-42	0.00-2.00	21	Light brown GRAVELLY CLAY with SAND
	2.00-6.00	46	Light grey SILTY CLAY
	6.00-14.00	50	Dark grey SANDY CLAY
BH-43	0.00-2.00	-	Dark brown SANDY SILT with CLAY
	2.00-4.00	12	Dark brown SILTY CLAY with GRAVEL
	4.00-11.00	21	Light brown SILTY CLAY
	11.00-20.00	48	Dark grey SILTY CLAY
BH-44	0.00-1.00	-	Dark brown CLAYEY SILT
	1.00-10.00	8	Dark brown SILT CLAY
	10.00-14.00	14	Grayish brown SANDY CLAY
	14.00-20.00	43	Brownish grey SANDY CLAY
BH-45	0.00-5.00	11	Dark brown GRAVELY SILT with CLAY
	5.00-9.00	11	Dark brown SANDY SILT with CLAY
	9.00-10.00	50	Grayish white LIMESTONE
	10.00-11.00	50	Light brown SANDY SILT
	11.00-20.00	25	Dark brown SILTY CLAY
	20.00-24.00	50	Grayish brown CLAY

TABLE 1 (Cont'd)
SUMMARY OF SOIL CHARACTERISTIC ALONG THE CONDENSATE PIPELINE

Hole	Depth (m.)	SPT	Description
BH-46	0.00-1.00	-	Dark brown SILT
	1.00-5.00	50	Light brown GRAVELLY SAND
	5.00-7.00	45	Light grey SANDY GRAVEL
	7.00-12.00	50	Dark brown GRAVELLY SAND
BH-5	0.00-12.00	50	Light brown GRAVELLY SAND
BH-6	0.00-12.00	50	Light brown GRAVELLY SAND
BH-7	0.00-12.00	48	Light to dark brown GRAVELLY SAND
BH-8	0.00-12.00	50	Light brown GRAVELLY SAND
BH-9	0.00-12.00	50	Light to dark brown GRAVELLY SAND
BH-10	0.00-3.50	50	Brownish grey GRAVELLY SAND
	3.50-8.10	15	Brownish grey SANDY SILT
	8.10-11.00	50	Brownish grey GRAVELLY SAND
	11.00-12.00	50	Dark brown CLAYEY SILT
BH-47	0.00-4.00	31	Whitish brown SAND
	4.00-5.00	50	Whitish brown SANDY SILT
	5.00-12.00	50	Blackish brown SILTY SAND with GRAVEL
BH-11	0.00-2.00	46	Firm reddish brown to grayish brown SANDY SILT
	2.00-12.00	50	Grayish brown GRAVELLY SAND
BH-12	0.00-12.00	48	Grayish brown GRAVELLY SAND
BH-13	0.00-12.00	49	Grayish brown GRAVELLY SAND
BH-14	0.00-12.00	49	Grayish brown GRAVELLY SAND
BH-15	0.00-6.00	20	Grayish brown SANDY SILT
	6.00-12.00	50	Grayish brown SANDY GRAVEL
BH-16	0.00-4.00	33	Grayish brown SANDY GRAVEL
	4.00-12.00	50	Grayish brown SANDY to SILTY GRAVEL
BH-17	0.00-12.00	50	Grayish brown GRAVELLY SAND
BH-48	0.00-2.50	9	Light and dark brown CLAYEY SILT, CLAY
	2.50-7.50	6	Brownish grey CLAY
	7.50-11.50	18	Light brown CLAY
	11.50-18.80	10-14	Brownish light to grey CLAY
	18.80-40.00	6-16	Light grey CLAY with layer of SANDY CLAY at 28.00-34.00 m.
BH-49	0.00-1.00	-	Light brown SILT
	1.00-5.00	35	Dark brown CLAYEY SILT
	5.00-12.00	50	Dark brown CLAYEY SILT

TABLE 1 (Cont'd)
SUMMARY OF SOIL CHARACTERISTIC ALONG THE CONDENSATE PIPELINE

Hole	Depth (m.)	SPT	Description
BH-50	0.00-2.60	15	Dark brown SILT
	2.60-7.40	50	Brownish white LIMESTONE
	7.40-9.80	50	Brown GRAVELLY SILT
	9.80-12.00	50	Whitish brown SILTY GRAVEL
BH-18	0.00-2.00	33	Grayish brown SILTY to SANDY CLAY
	2.00-12.00	50	Grayish to blackish brown SANDY GRAVEL
BH-19	0.00-12.00	50	Light to dark brown SANDY GRAVEL
BH-20	0.00-12.00	50	Dark brown to brownish grey SANDY GRAVEL
BH-21	0.00-2.50	31	Dark brown SILTY CLAY
	2.50-12.00	50	Dark brown GRAVELLY SILT
BH-22	0.00-4.00	4	Dark brown SANDY SILT
	4.00-10.00	36	Dark brown SANDY to SILTY CLAY
	10.00-20.00	50	Light brown SANDY to SILTY GRAVEL
BH-23	0.00-1.00	-	Brownish gray SANDY GRAVEL
	1.00-14.00	22-50	Brownish and dark grey GRAVELLY to SANDY SILT with layer of GRAVELLY SAND at 5.00-8.00 m.
BH-24	0.00-6.50	27	Brownish grey SILTY to SANDY GRAVEL
	6.50-14.00	50	Brownish grey GRAVELLY SAND
BH-25	0.00-10.00	14	Grayish brown SILTY SAND
	10.00-14.00	50	Brownish grey GRAVELLY SAND

APPENDIX 6B

SPECIES LIST OF WILDLIFE

APPENDIX 6B

THE SPECIES LIST OF WILDLIFE FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Class, Order, Family, Species (Scientific Name)	Common Name	Information		Status of Conservation Concern			Migration		Pipeline			50 m. Strip Pipeline		
			Database	Record	Endemic	CITES	IUCN	R	M	Vc	Co	Un	Vc	Co	Un
	MAMMALIA														
	CHIROPTERA														
	PTEROPODIDAE														
1	*Pteropus vampyrus*	Greater flying fox	x	x		App II	NT	x				x			x
2	*Macroglossus minimus*	Dagger-toothed long-nosed fruit bat		x			LC	x				x			x
	ARTIODACTYLA														
	SUIDAE														
3	*Sus scrofa*	Wild Pig	x	x			LC	x			x			x	
	CERVIDAE														
4	*Rusa timorensis*	Javan Rusa	x	x	x		VU	x			x			x	
	BOVIDAE														
5	*Bos javanicus*	Bali Cattle/Banteng	x	x			EN	x		x			x		
6	*Bubalus bubalis*	Domestic Buffalo		x			-	x				x			x
7	*Capra hircus*	Domestic Goat	x	x			-	x				x			x
	PERISSODACTYLA														
	EQUIDAE														
8	*Equus caballus*	Domestic Horse		x			-	x				x			x
	CARNIVORA														
	VIVERRIDAE														
9	*Paradoxurus hermaphroditus*	Common Palm Civet	x	x			LC	x				x			x
	CANIDAE														
10	*Canis familiaris*	Domestic Dog	x	x			-	x				x		x	
	RODENTIA														
	MURIDAE														
11	*Rattus rattus*	Roof Rat		x			LC	x			x			x	
12	*Rattus norvegicus*	Brown Rat	x	x			LC	x				x		x	
13	*Mus musculus*	House Mouse	x	x			LC	x			x			x	
	Total (13 Species)		**9**	**13**	**1**	**1**	**9**	**13**		**1**	**4**	**8**	**1**	**6**	**6**
	Percentage (%)		**69.23**	**100.00**	**7.69**	**7.69**	**69.23**	**100.00**	**0.00**	**7.69**	**30.77**	**61.54**	**7.69**	**46.15**	**46.15**

APPENDIX 6B (Cont'd)

THE SPECIES LIST OF WILDLIFE FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Class, Order, Family, Species (Scientific Name)	Common Name	Information		Status of Conservation Concern			Migration		Pipeline			50 m. Strip Pipeline		
			Database	Record	Endemic	CITES	IUCN	R	M	Vc	Co	Un	Vc	Co	Un
	AVES														
	Ciconiiformes														
	Ardeidae														
1	*Egretta garzetta*	Little Egret		x			LC	x	x			x			x
2	*Bubulcus ibis*	Cattle Egret		x			LC	x				x		x	
3	*Egretta sacra*	Pacific Reef Heron	x	x			LC	x							x
4	*Butorides striata*	Striated Heron	x	x			LC	x	x			x			x
	Falconiformes														
	Accipitridae														
5	*Pernis ptilorhyncus*	Oriental Honey-buzzard		x		App II	LC		x			x			x
6	*Haliastur indus*	Brahminy Kite	x	x		App II	LC	x			x			x	
	Galliformes														
	Phasianidae														
7	*Synoicus ypsilophorus*	Brown Quail	x	x			LC	x				x			x
	Gruiformes														
	Rallidae														
8	*Amaurornis phoenicurus*	White-breasted Waterhen		x			LC	x				x		x	
	Charadriiformes														
	Scolopacidae														
9	*Actitis hypoleucos*	Common Sandpiper	x	x			LC		x			x		x	
	Charadriidae														
10	*Charadrius mongolus*	Lesser Sand Plover	x	x			LC		x						x
	Columbiformes														
	Columbidae														
11	*Columba livia*	Rock Pigeon	x	x			LC	x				x			x
12	*Streptopelia chinensis*	Spotted Dove	x	x			LC	x		x			x		
13	*Streptopelia bitorquata*	Island Collared-dove		x			LC	x							x
14	*Geopelia maugei*	Barred Dove	x	x			LC	x		x			x		
15	*Chalcophaps indica*	Emerald Dove	x	x			LC	x			x			x	
16	*Turacoena modesta*	Slaty Cuckoo Dove	x				NT	x				x			x
	Psittaciformes														
	Psittacidae														
17	*Aprosmictus jonquillaceus*	Olive-shouldered Parrot	x	x	x		NT	x				x			x

APPENDIX 6B (Cont'd)

THE SPECIES LIST OF WILDLIFE FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Class, Order, Family, Species (Scientific Name)	Common Name	Information		Status of Conservation Concern			Migration		Pipeline			50 m. Strip Pipeline		
			Database	Record	Endemic	CITES	IUCN	R	M	Vc	Co	Un	Vc	Co	Un
	Cuculiformes														
	Cuculidae														
18	*Eudynamys cyanocephalus*	Australian Koel		x			LC	x				x			x
19	*Centropus bengalensis*	Lesser Coucal	x	x			LC	x			x			x	
20	*Cacomantis pallidus*	Pallid Cuckoo	x	x			LC		x			x			x
21	*Cuculus saturatus*	Himalayan Cuckoo	x	x			LC		x			x			x
	Caprimulgiformes														
	Caprimulgidae														
22	*Caprimulgus macrurus*	Large-tailed Nightjar	x	x			LC	x				x			x
	Apodiformes														
	Apodidae														
23	*Collocalia fuciphaga*	Edible-nest Swiftlet		x			LC		x			x		x	
	Coraciiformes														
	Alcedinidae														
24	*Alcedo atthis*	Common Kingfisher		x			LC		x			x			x
25	*Todiramphus Chloris*	Collared Kingfisher	x	x			LC	x		x			x		
	Meropidae														
26	*Merops ornatus*	Green Bee-eater	x	x			LC		x			x			x
27	*Merops leschenaulti*	Chestnut headed Bee-eater		x			LC		x			x			x
	Coraciidae														
28	*Eurystomus orientalis*	Dollarbird	x	x			LC	x				x		x	
	Passeriformes														
	Acanthizidae														
29	*Gerygone inornata*	Plain Gerygone	x	x			LC	x			x			x	
	Pachycephalidae														
	Motacillidae														
30	*Anthus gustavi*	Pechora Pipit		x			LC	x			x			x	
31	*Anthus novaeseelandiae*	Richard' s Pipit	x	x			LC		x		x			x	
	Meliphagidae														
32	*Meliphaga reticulata*	Streaky-breasted Honeyeater	x	x	x		LC	x		x			x		
33	*Philemon inornatus*	Timor Friarbird	x	x	x		LC	x				x			x
34	*Philemon buceroides*	Helmeted Friarbird	x	x			LC	x			x			x	
	Corvidae														
35	*Corvus macrorhynchos*	Large-billed Crow	x	x			LC	x				x			x

APPENDIX 6B (Cont'd)

THE SPECIES LIST OF WILDLIFE FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Class, Order, Family, Species (Scientific Name)	Common Name	Information		Status of Conservation Concern			Migration		Pipeline			50 m. Strip Pipeline		
			Database	Record	Endemic	CITES	IUCN	R	M	Vc	Co	Un	Vc	Co	Un
	Muscicapidae														
36	*Cyornis tickelliae*	Tickell's Blue Flycatcher		x			LC	x				x			x
37	*Saxicola caprata*	Pied Bushchat	x	x			LC	x		x			x		
	Rhipiduridae														
38	*Rhipidura rufiventris*	Northern Fantail	x	x			LC	x			x			x	
39	*Rhipidura rufifrons*	Rufous Fantail	x	x			LC	x				x			x
	Laniidae														
40	*Lanius schach*	Long-tailed Shrike	x	x			LC	x				x			x
	Locustellidae														
41	*Megalurus timoriensis*	Tawny Grassbird	x	x			LC	x		x			x		
	Artamidae														
42	*Artamus leucorhynchus*	White-breasted Wood-swallow	x	x			LC		x		x			x	
43	*Artamus cinereus*	Black-faced Woodswallow	x	x			LC		x						x
	Cisticolidae														
44	*Cisticola exilis*	Golden-headed Cisticola	x	x			LC	x			x			x	
	Dicaeidae														
45	*Dicaeum agile*	Thick-billed Flowerpecker	x	x			LC	x				x			x
	Nectariniidae														
46	*Cinnyris solaris*	Flame-breasted Sunbird	x	x			LC	x				x			x
	Passeridae														
47	*Passer montanus*	Eurasian Tree Spallow	x	x			LC	x		x			x		
	Estrildidae														
48	*Lonchura punctulata*	Scaly-breasted Munia	x	x			LC	x		x			x		
	Total (48 Species)		**37.00**	**47**	**3**	**2**	**48**	**36**	**14**	**8**	**10**	**26**	**8**	**15**	**25**
	Percentage (%)		**77.08**	**97.92**	**6.25**	**4.17**	**100.00**	**75.00**	**29.17**	**16.67**	**20.83**	**54.17**	**16.67**	**31.25**	**52.08**
	REPTILIA														
	Squamata - Suborder Sauria (Lacertilia)														
	Gekkonidae														
1	*Hemidactylus garnotii*	Indo-Pacific Gecko		x			LC	x			x			x	
2	*Hemidactylus platyurus*	Flat-tailed House Gecko	x	x			LC	x			x			x	
3	*Hemidactylus frenatus*	Common House Gecko	x	x			LC	x			x			x	
4	*Gekko gecko*	Tokay	x	x			LC	x				x			x
	Agamidae														
5	*Draco timoriensis*	Timor Flying Lizard		x	x		LC	x			x			x	
	Scincidae														
6	*Mabuya multifasciata*	Common sun skink		x			LC	x				x			x

APPENDIX 6B (Cont'd)

THE SPECIES LIST OF WILDLIFE FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Class, Order, Family, Species (Scientific Name)	Common Name	Information		Status of Conservation Concern			Migration		Pipeline			50 m. Strip Pipeline		
			Database	Record	Endemic	CITES	IUCN	R	M	Vc	Co	Un	Vc	Co	Un
	Squamata - Suborder Serpentes (Ophidia)														
	Pythonidae														
7	*Liasis mackloti*	Indonesian Water Python	x	x			LC	x							x
	Colubridae														
8	*Lycodon capucinus*	Indian Wolf Snake	x	x			LC	x				x			x
	Total (8 Species)		5	8	1	0	8	8	0	0	4	3	0	4	4
	Percentage (%)		62.5	100	12.5	0	100	100	0	0	50	37.5	0	50	50
	Amphibia														
	Anura														
	Bufonidae														
1	*Duttaphrynus melanostictus*	Black-spined Toad	x	x			LC	x			x			x	
	Dicroglossidae														
2	*Fejervarya limnocharis*	Asian Grass Frog		x			LC	x		x			x		
	Rhacophoridae														
3	*Polypedates leucomystax*	Common Tree Frog	x	x			LC	x				x			x
	Total (3 Species)		2	3	0	0	3	3	0	1	1	1	1	1	1
	Percentage (%)		66.67	100.00	0.00	0.00	100.00	100.00	0.00	33.33	33.33	33.33	33.33	33.33	33.33
	Grand Total (72 Species)		53	71	5	3	68	60	14	10	19	38	10	26	36
	Total Percentage (%)		73.61	98.61	6.94	4.17	94.44	83.33	19.44	13.89	26.39	52.78	13.89	36.11	50.00

Remark :

IUCN Red List (2015)
CR : Critically Endangered Species
EN : Endangered Species
VU : Vulnerable Species
NT : Near Threatened Species

Data Source
Record : Data by Direct Searching Method
Database : Data by inquiring Searching Method and Secondary Data

CITES
Appendix I
Appendix II
Appendix III

Endemic Species of Timor-leste

Endemic Species of Timor-leste
Flora
Fauna

Abundance
Vc : Very common
Co : Common
Uc : Un common

Migration Animals
R : Resident Species
M : Migration Species

Source : Team Consulting Engineering and Management Co., Ltd., February 2016.

APPENDIX 6C

PLANT SPECIES LIST

APPENDIX 6C

THE PLANT SPECIES LIST FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Scientific Name	Family Name	Phenology	IUCN Red List (IUCN,2015)	Project Area Pipeline	Study Area 50 m. Strip of Pipeline
1	*Corypha utan* Lam.	ARECACEAE	P	-	x	x
2	*Polyalthia lateriflora* (Blume) King	ANNONACEAE	ST	-	x	-
3	*Trias intermedia* Seidenf. & Smitinand	ORCHIDACEAE	EO	-	-	x
4	*Drynaria quercifolia* (L.) Sm.	POLYPODIACEAE	EF	-	x	x
5	*Acacia tomentosa* Willd.	LEGUMINOSAE-MIMOSOIDEAE	T	-	x	x
6	*Leucaena leucocephala* (Lam.) de Wit	LEGUMINOSAE-MIMOSOIDEAE	S/ST	-	x	x
7	*Acacia nilotica* (L.)	LEGUMINOSAE-MIMOSOIDEAE	S/ST	-	x	x
8	*Passiflora foetida* L.	PASSIFLORACEAE	HC	-	x	x
9	*Ficus bengalensis* L.	MORACEAE	T	-	-	x
10	*Musa sapientum* L.	MUSACEAE	H	-	x	x
11	*Eclipta prostrata* (L.)	ASTERACEAE	H	-	x	x
12	*Cassia javanica* L. nodosa (Buch.-Ham. e1 Ro1b.) K. & S.S. Larsen var.	LEGUMINOSAE-CAESALPINIOIDEAE	T	-	x	x
13	*Albizia lebbeckoides* (DC.) Benth.	LEGUMINOSAE-MIMOSOIDEAE	T	-	x	x
14	*Breynia retusa* (Dennst.) Alston	EUPHORBIACEAE	S	-	x	x
15	*Coffea* sp.	RUBIACEAE	ExS	-	x	x
16	*Pluchea indica* (L.) Less.	ASTERACEAE	S	-	x	x
17	*Zea mays* L.	POACEAE	ExG	-	x	x
18	*Senna siamea* (Lam.) Irwin & Barneby	LEGUMINOSAE-CAESALPINIOIDEAE	T	-	x	x
19	*Cassia timoriensis* DC.	LEGUMINOSAE-CAESALPINIOIDEAE	ST	-	x	x
20	*Gliricidia sepium* (Jacq.) Walp.	LEGUMINOSAE-PAPILIONOIDEAE	ExST	-	x	x
21	*Tribulus terrestris* L.	ZYGOPHYLLACEAE	H	-	x	x
22	*Cardiospermum halicacabum* L.	SAPINDACEAE	HC	-	x	x
23	*Bombax ceiba* L.	BOMBACACEAE	T	-	x	x
24	*Samanea saman* (Jacq.) Merr.	LEGUMINOSAE-MIMOSOIDEAE	T	-	x	x
25	*Capparis micracantha* DC.	CAPPARIDACEAE	S/ST	-	x	x
26	*Senna alata* (L.) Rozb.	LEGUMINOSAE-CAESALPINIOIDEAE	ExS	-	x	x
27	*Senna occidentalis* (L.) Link	LEGUMINOSAE-CAESALPINIOIDEAE	ExUS	-	-	x
28	*Sumbaviopsis albicans* (Blume) J.J. Sm.	EUPHORBIACEAE	T	-	x	x
29	*Ruellia tuberosa* L.	ACANTHACEAE	ExH	-	x	x
30	*Muntingia calabura* L.	TILIACEAE	ExST	-	x	x
31	*Schleichera oleosa* (Lour.) Oken	SAPINDACEAE	T	-	x	x
32	*Garuga pinnata* Roxb.	BURSERACEAE	T	-	x	x

APPENDIX 6C (Cont'd)

THE PLANT SPECIES LIST FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Scientific Name	Family Name	Phenology	IUCN Red List (IUCN,2015)	Project Area Pipeline	Study Area 50 m. Strip of Pipeline
33	*Anthocephalus chinensis* (Lam.) A. Rich. ex Walp.	RUBIACEAE	T	-	x	x
34	*Coccinia grandis* (L.) Voigt	CUCURBITACEAE	HC	-	x	x
35	*Alstonia angustiloba* Miq.	APOCYNACEAE	T	-	x	x
36	*Pandanus odoratissimus* L.f.	PANDANACEAE	ST	-	x	x
37	*Vigna radiata* (L.) R.Wilczek	LEGUMINOSAE-PAPILIONOIDEAE	HC	-	x	x
38	*Canavalia rosea* (Sw.) DC.	LEGUMINOSAE-PAPILIONOIDEAE	HC	-	x	x
39	*Alysicarpus vaginalis* (L.) DC.	LEGUMINOSAE-PAPILIONOIDEAE	S	-	x	x
40	*Cayratia trifolia* (L.) Domin	VITACEAE	C	-	x	x
41	*Dalbergia suthepensis* Niyomdham	LEGUMINOSAE-PAPILIONOIDEAE	C	-	x	x
42	*Annona muricata* L.	ANNONACEAE	ExST	-	-	x
43	*Alstonia macrophylla* Wall. ex G.Don	APOCYNACEAE	T	-	x	x
44	*Ficus geniculata* Kurz	MORACEAE	T	-	-	x
45	*Typha angustifolia* L.	TYPHACEAE	H	-	x	x
46	*Annona squamosa* L.	ANNONACEAE	ExS/ST	-	-	x
47	*Euphorbia hirta* L.	EUPHORBIACEAE	H	-	x	x
48	*Ceiba pentandra* (L.) Gayerth.	BOMBACACEAE	ExT	-	x	x
49	*Acrostichum aureum* L.	PTERIDACEAE	AqF	-	x	x
50	*Pterocarpus indicus* Willd.	LEGUMINOSAE-PAPILIONOIDEAE	T	VU	x	x
51	*Helicteres isora* L.	MALVACEAE	ST	-	x	x
52	*Broussonetia papyrifera* (L.) Vent.	MORACEAE	ST	-	x	x
53	*Hibiscus tiliaceus* L.	MALVACEAE	S/ST	-	x	x
54	*Grewia eriocarpa* Juss.	TILIACEAE	ST	-	x	x
55	*Croton hirtus* L.Her.	EUPHORBIACEAE	H	-	x	x
56	*Lantana camara* L.	LABIATAE	ExC	-	x	x
57	*Diplazium esculentum.* (Retz.) Sw.	ATHYRIACEAE	TerF	-	x	x
58	*Spilanthes paniculata* Wall. ex DC.	ASTERACEAE	H	-	x	x
59	*Trianthema portulacastrum* Linn.	AIZOACEAE	H	-	x	x
60	*Portulaca quadrifida* L.	PORTULACACEAE	H	-	x	x
61	*Portulaca oleracea* L.	PORTULACACEAE	H	-	x	x
62	*Murdannia nudiflora* (L.) Brenan	COMMELINACEAE	H	-	x	x

APPENDIX 6C (Cont'd)

THE PLANT SPECIES LIST FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Scientific Name	Family Name	Phenology	IUCN Red List (IUCN,2015)	Project Area Pipeline	Study Area 50 m. Strip of Pipeline
63	*Cleome viscosa* L.	CAPPARACEAE	H	-	x	x
64	*Cleome gynandra L .*	CAPPARACEAE	H	-	x	x
65	*Bambusa blumeana* J.H.Schultes	POACEAE	B	-	x	x
66	*Strychnos lucida* R. Br	STRYCHNACEAE	S/ST	-	x	x
67	*Albizia lebbeck* (L.) Benth.	LEGUMINOSAE-MIMOSOIDEAE	T	-	x	x
68	*Trema orientalis* (L.) Blume	ULMACEAE	T	-	x	x
69	*Achyranthes aspera* Linn.	AMARANTHACEAE	H	-	x	x
70	*Kopsia larutensis* King ex Gamble	APOCYNACEAE	S	-	x	x
71	*Ziziphus jujuba* Mill.	RHAMNACEAE	S	-	x	x
72	*Bougainvillea spectabilis* Willd.	NYCTAGINACEAE	ExC	-	x	x
73	*Spondias pinnata* (L.f.) Kurz	ANACARDIACEAE	T	-	x	x
74	*Mallotus philippensis* Mull. Arg.	EUPHORBIACEAE	ST	-	x	x
75	*Tamarindus indica* L.	LEGUMINOSAE-CAESALPINIOIDEAE	T	-	x	x
76	*Ficus carica* L.	MORACEAE	ExST	-	x	x
77	*Cathormion umbellatum* (Vahl) Kosterm.	LEGUMINOSAE-MIMOSOIDEAE	T	-	x	x
78	*Ficus hispida* L. f.	MORACEAE	ST/T	-	x	x
79	*Ficus racemosa* L.	MORACEAE	T	-	x	x
80	*Aegle marmelos* (L.) Correa ex Roxb.	RUTACEAE	T	-	x	x
81	*Cocos nucifera* L.	ARECACEAE	ExP	-	x	x
82	*Mangifera indica* L.	ANACARDIACEAE	T	-	x	x
83	*Phyllanthus acidus* (L.) Skeels	EUPHORBIACEAE	ExST	-	x	x
84	*Moringa oleifera* Lam.	MORINGACEAE	ST	-	x	x
85	*Lepisanthes rubiginosa* (Ro1b.) Leenh.	SAPINDACEAE	T	-	x	x
86	*Swietenia macrophylla* King	MELIACEAE	T	-	-	x
87	*Glochidion sphaerogynum* (Mull.Arg.) Kurz	EUPHORBIACEAE	T	-	x	x
88	*Manihot esculenta* Crantz	EUPHORBIACEAE	ExS/ST	-	x	x
89	*Hyptis suaveolens* (L.) Poit	LABIATAE	S	-	x	x
90	*Wrightia religiosa* Benth. ex Kurz	APOCYNACEAE	S	-	x	x
91	*Mimosa pigra* L.	LEGUMINOSAE-MIMOSOIDEAE	ExS	-	x	x
92	*Mimosa diplotricha* C.Wright ex Sauvalle	LEGUMINOSAE-MIMOSOIDEAE	ExH	-	x	x

APPENDIX 6C (Cont'd)

THE PLANT SPECIES LIST FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Scientific Name	Family Name	Phenology	IUCN Red List (IUCN,2015)	Project Area Pipeline	Study Area 50 m. Strip of Pipeline
93	*Morinda coreia* Buch.-Ham.	RUBIACEAE	T	-	x	x
94	*Calotropis gigantea* (L.) Dryander e1 W. T. Aiton	ASCLEPIADACEAE	ExS/ST	-	x	x
95	*Cassia fistula* L	LEGUMINOSAE-CAESALPINIOIDEAE	T	-	x	x
96	*Phyllanthus amarus* Schum. & Thonn.	EUPHORBIACEAE	H	-	x	x
97	*Melia azedarach* L.	MELIACEAE	T	-	x	x
98	*Casuarina equisetifolia* J.R. & G. Forst.	CASUARINACEAE	T	-	x	x
99	*Jatropha curcas* L.	EUPHORBIACEAE	ST	-	x	x
100	*Azadirachta indica* A. Juss. var. siamensis Valeton	MELIACEAE	T	-	x	x
101	*Tectona grandis* L. f.	LABIATAE	T	-	x	x
102	*Ottelia alismoides* (L.) Pers.	HYDROCHARITACEAE	AqH	-	x	x
103	*Artocarpus altilis* (Parkinson) Fosberg	MORACEAE	ExT	-	x	x
104	*Gmelina arborea* Roxb.	LABIATAE	T	-	x	x
105	*Blumea aurita* (L.f.) DC.	ASTERACEAE	H	-	x	x
106	*Chromolaena odoratum* (L.) R.M. King & H.Rob.	ASTERACEAE	H	-	x	x
107	*Sterculia foetida* L.	STERCULIACEAE	T	-	x	x
108	*Corchorus capsularis* L.	TILIACEAE	H	-	x	x
109	*Aeschynomene aspera* L.	LEGUMINOSAE-PAPILIONOIDEAE	US	-	x	x
110	*Sida acuta Burm* . f.	MALVACEAE	US	-	x	x
111	*Eragrostis ciliata* (Ro1b.) Nees	POACEAE	G	-	x	x
112	*Imperata cylindrica* (L.) P. Beauv.	POACEAE	G	-	x	x
113	*Kyllinga brevifolia* Rottb.	CYPERACEAE	H	-	x	x
114	*Eleusine indica* (L.) Gayertn.	POACEAE	G	-	x	x
115	*Dactyloctenium aegyptium* (L.) P. Beauv.	POACEAE	G	-	x	x
116	*Cynodon dactylon* (L.) Pers.	POACEAE	G	-	x	x
117	*Euphorbia heterophylla* L.	EUPHORBIACEAE	ExH	-	x	x
118	*Ziziphus oenoplia* (L.) Mill.	RHAMNACEAE	C	-	x	x
119	*Micromelum minutum* (G.Forst.) Wight & Arn.	RUTACEAE	S/ST	-	x	x
120	*Delonil regia* (Bojer e1 Hook.) Raf.	LEGUMINOSAE-CAESALPINIOIDEAE	ExT	-	x	x
121	*Terminalia catappa* L.	COMBRETACEAE	T	-	x	x
122	*Cyperus rotundus L* .	CYPERACEAE	H	-	x	x

APPENDIX 6C (Cont'd)

THE PLANT SPECIES LIST FOUND WITHIN CONDENSATE PIPELINE ALIGNMENT AND ALONG 50 METERS STRIPS ON BOTH SIDES OF THE CONDENSATE PIPELINE

No.	Scientific Name	Family Name	Phenology	IUCN Red List (IUCN,2015)	Project Area Pipeline	Study Area 50 m. Strip of Pipeline
123	*Arundo donax* L.	POACEAE	ExG	-	x	x
124	*Lannea coromandelica* (Houtt.) Merr.	ANACARDIACEAE	T	-	x	x
125	*Peltophorum pterocarpum* (DC.)Backer ex K.Heyne.	LEGUMINOSAE-CAESALPINIOIDEAE	T	-	x	x
126	*Vanda brunnea* Rchb. f.	ORCHIDACEAE	EO	-	-	x
127	*Bridelia tomentosa* Blume	EUPHORBIACEAE	S	-	x	x
	Total 127 Species			**1**	**110**	**126**

Remark : **Phenology**

AqF : Aquatic Fern
B : Bamboo
C : Climber
CF : Climbing Fern
CP : Climbing Palm
ExC : Exotic Climber
ExH : Exotic Herb
ExS : Exotic Shrub
P : Palm
S : Shrub
T : Tree
ST : Shrubbby Tree
S/ST : Shrub/Shrubby Tree
TerF : Terrestrial Ferm
TerO : Terrestrial Orchid
ScanS : Scandent Shrub
ExST : Exotic Shrubby Tree
ExT : Exotic Tree
EF : Epiphyte Fern
EO : Epiphyte Orchid
F : Fern
G : Grass
H : Herb
US : Undershrub
HC : Herbaceous Climber
CrUS : Creeping Herb Undershrub
PaHC : Parasitic Herbaceous Climber
ExUS : Exotic Undershrub
ExS/ST : Exotic Shrub/Shrubby Tree
AqH : Aquatic Herb

IUCN Red Data List (IUCN,2015)

CR : Critically Endangered Species
EN : Endangered Species
VU : Vulnerable Species
NT : Near Threatened Species

Source : Team Consulting Engineering and Management Co., Ltd., February 2016.

APPENDIX 6D

TRAFFIC COUNTING

TABLE 6D-1

RESULT OF TRAFFIC COUNTING AT TC1A (Friday, 12 February) (Direction: Same ----> Betano)

Vehicle of Type	6.00 - 7.00 a.m.	7.00 - 8.00 a.m.	8.00 - 9.00 a.m.	9.00 - 10.00 a.m.	10.00 - 11.00 a.m.	11.00 - 12.00 a.m.	12.00 a.m. - 1.00 p.m.	1.00 - 2.00 p.m.	2.00 - 3.00 p.m.	3.00 - 4.00 p.m.	4.00 - 5.00 p.m.	5.00 - 6.00 p.m.	Total (vehicle/day)
Bicycle	3	18	1	6	12	1	6	1	0	5	0	8	**61**
Motercycle	22	59	61	21	36	22	30	8	17	15	2	5	**298**
Car/Taxi	1	4	4	4	1	11	1	6	1	4	5	2	**44**
Ligth Truck	2	1	4	4	1	4	1	2	1	2	1	3	**26**
Medium Truck	4	3	4	5	2	5	5	0	1	1	5	2	**37**
10 Wheels, Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Bus	1	1	0	1	1	0	0	0	0	0	0	0	**4**
Medium Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total (No. of vehicle/hour)	**33**	**86**	**74**	**41**	**53**	**43**	**43**	**17**	**20**	**27**	**13**	**20**	**470**

TABLE 6D-2

RESULT OF TRAFFIC COUNTING AT TC1B (Friday, 12 February) (Direction: Betano ----> Selihasan)

Vehicle of Type	6.00 - 7.00 a.m.	7.00 - 8.00 a.m.	8.00 - 9.00 a.m.	9.00 - 10.00 a.m.	10.00 - 11.00 a.m.	11.00 - 12.00 a.m.	12.00 a.m. - 1.00 p.m.	1.00 - 2.00 p.m.	2.00 - 3.00 p.m.	3.00 - 4.00 p.m.	4.00 - 5.00 p.m.	5.00 - 6.00 p.m.	Total (vehicle/day)
Bicycle	4	16	3	9	5	8	7	19	0	4	0	0	**75**
Motercycle	23	51	54	43	37	21	36	25	30	19	11	26	**376**
Car/Taxi	1	4	4	2	0	9	1	3	0	2	3	0	**29**
Ligth Truck	0	1	4	8	1	3	3	6	2	6	2	1	**37**
Medium Truck	2	0	1	4	1	4	2	1	0	2	0	0	**17**
10 Wheels, Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Bus	0	2	0	1	1	0	1	0	1	0	1	0	**7**
Medium Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total (No. of vehicle/hour)	**30**	**74**	**66**	**67**	**45**	**45**	**50**	**54**	**33**	**33**	**17**	**27**	**541**

TABLE 6D-3

RESULT OF TRAFFIC COUNTING AT TC1A (Saturday, 13 February) (Direction: Same ----> Betano)

Vehicle of Type	6.00 - 7.00 a.m.	7.00 - 8.00 a.m.	8.00 - 9.00 a.m.	9.00 - 10.00 a.m.	10.00 - 11.00 a.m.	11.00 - 12.00 a.m.	12.00 a.m. - 1.00 p.m.	1.00 - 2.00 p.m.	2.00 - 3.00 p.m.	3.00 - 4.00 p.m.	4.00 - 5.00 p.m.	5.00 - 6.00 p.m.	Total (vehicle/day)
Bicycle	0	1	2	1	0	1	2	2	0	0	0	1	**10**
Motercycle	10	9	6	5	6	7	27	8	3	6	12	17	**116**
Car/Taxi	2	4	4	2	3	1	3	0	2	2	2	0	**25**
Ligth Truck	0	2	2	1	2	1	2	1	2	1	2	0	**16**
Medium Truck	7	2	2	2	1	0	0	0	1	0	3	7	**25**
10 Wheels, Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Medium Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total (No. of vehicle/hour)	**19**	**18**	**16**	**11**	**12**	**10**	**34**	**11**	**8**	**9**	**19**	**25**	**192**

TABLE 6D-4

RESULT OF TRAFFIC COUNTING AT TC1B (Saturday, 13 February) (Direction: Betano ----> Selihasan)

Vehicle of Type	6.00 - 7.00 a.m.	7.00 - 8.00 a.m.	8.00 - 9.00 a.m.	9.00 - 10.00 a.m.	10.00 - 11.00 a.m.	11.00 - 12.00 a.m.	12.00 a.m. - 1.00 p.m.	1.00 - 2.00 p.m.	2.00 - 3.00 p.m.	3.00 - 4.00 p.m.	4.00 - 5.00 p.m.	5.00 - 6.00 p.m.	Total (vehicle/day)
Bicycle	2	13	0	5	0	4	7	8	3	11	3	2	**58**
Motercycle	21	52	40	38	35	23	46	45	16	21	27	32	**396**
Car/Taxi	2	6	3	2	3	2	5	2	2	3	1	0	**31**
Ligth Truck	1	2	11	9	6	3	7	5	2	6	2	7	**61**
Medium Truck	4	1	0	1	5	0	2	4	2	0	1	2	**22**
10 Wheels, Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Bus	0	2	0	1	0	1	0	2	0	0	1	0	**7**
Medium Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total (No. of vehicle/hour)	**30**	**76**	**54**	**56**	**49**	**33**	**67**	**66**	**25**	**41**	**35**	**43**	**575**

TABLE 6D-5

RESULT OF TRAFFIC COUNTING AT TC2A (Friday, 12 February) (Direction: Zumalai ----> Ainaro)

Vehicle of Type	6.00 - 7.00 a.m.	7.00 - 8.00 a.m.	8.00 - 9.00 a.m.	9.00 - 10.00 a.m.	10.00 - 11.00 a.m.	11.00 - 12.00 a.m.	12.00 a.m. - 1.00 p.m.	1.00 - 2.00 p.m.	2.00 - 3.00 p.m.	3.00 - 4.00 p.m.	4.00 - 5.00 p.m.	5.00 - 6.00 p.m.	Total (vehicle/day)
Bicycle	5	8	7	2	2	1	2	2	0	5	6	16	**56**
Motercycle	7	26	51	29	28	32	33	27	35	22	32	30	**352**
Car/Taxi	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Truck	1	1	1	2	1	3	1	2	3	4	1	3	**23**
Medium Truck	0	1	4	5	0	0	4	2	3	1	1	0	**21**
10 Wheels, Truck	0	1	0	0	0	0	0	0	0	0	0	0	**1**
Heavy Truck	0	0	0	0	0	0	1	0	0	0	0	0	**1**
Ligth Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Medium Bus	0	0	0	1	0	0	1	2	0	0	1	0	**5**
Heavy Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total (No. of vehicle/hour)	**13**	**37**	**63**	**39**	**31**	**36**	**42**	**35**	**41**	**32**	**41**	**49**	**459**

TABLE 6D-6

RESULT OF TRAFFIC COUNTING AT TC2B (Friday, 12 February) (Direction: Ainaro ----> Suai)

Vehicle of Type	6.00 - 7.00 a.m.	7.00 - 8.00 a.m.	8.00 - 9.00 a.m.	9.00 - 10.00 a.m.	10.00 - 11.00 a.m.	11.00 - 12.00 a.m.	12.00 a.m. - 1.00 p.m.	1.00 - 2.00 p.m.	2.00 - 3.00 p.m.	3.00 - 4.00 p.m.	4.00 - 5.00 p.m.	5.00 - 6.00 p.m.	Total (vehicle/day)
Bicycle	3	8	9	1	1	2	3	1	3	4	11	23	**69**
Motercycle	12	37	41	25	20	25	26	33	30	20	31	22	**322**
Car/Taxi	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Truck	3	1	1	7	1	3	5	3	2	7	2	2	**37**
Medium Truck	0	2	4	7	1	1	4	4	3	3	0	0	**29**
10 Wheels, Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Truck	0	0	0	0	0	0	1	0	0	0	0	0	**1**
Ligth Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Medium Bus	0	0	0	0	1	0	1	2	0	0	1	0	**5**
Heavy Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total (No. of vehicle/hour)	**18**	**48**	**55**	**40**	**24**	**31**	**40**	**43**	**38**	**34**	**45**	**47**	**463**

TABLE 6D-7

RESULT OF TRAFFIC COUNTING AT TC2A (Saturday, 13 February) (Direction: Zumalai ----> Ainaro)

Vehicle of Type	6.00 - 7.00 a.m.	7.00 - 8.00 a.m.	8.00 - 9.00 a.m.	9.00 - 10.00 a.m.	10.00 - 11.00 a.m.	11.00 - 12.00 a.m.	12.00 a.m. - 1.00 p.m.	1.00 - 2.00 p.m.	2.00 - 3.00 p.m.	3.00 - 4.00 p.m.	4.00 - 5.00 p.m.	5.00 - 6.00 p.m.	Total (vehicle/day)
Bicycle	4	7	17	9	24	4	13	14	4	7	10	12	**125**
Motercycle	10	37	57	19	26	34	36	33	25	45	43	30	**395**
Car/Taxi	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Truck	0	2	0	4	7	7	3	4	2	1	3	3	**36**
Medium Truck	7	1	4	8	6	8	12	3	2	7	7	3	**68**
10 Wheels. Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Medium Bus	0	3	0	1	1	0	1	1	0	0	0	0	**7**
Heavy Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total (No. of vehicle/hour)	**21**	**50**	**78**	**41**	**64**	**53**	**65**	**55**	**33**	**60**	**63**	**48**	**631**

TABLE 6D-8

RESULT OF TRAFFIC COUNTING AT TC2B (Saturday, 13 February) (Direction: Ainaro ----> Suai)

Vehicle of Type	6.00 - 7.00 a.m.	7.00 - 8.00 a.m.	8.00 - 9.00 a.m.	9.00 - 10.00 a.m.	10.00 - 11.00 a.m.	11.00 - 12.00 a.m.	12.00 a.m. - 1.00 p.m.	1.00 - 2.00 p.m.	2.00 - 3.00 p.m.	3.00 - 4.00 p.m.	4.00 - 5.00 p.m.	5.00 - 6.00 p.m.	Total (vehicle/day)
Bicycle	4	2	12	8	16	6	10	5	4	2	0	11	**80**
Motercycle	4	41	42	26	21	30	28	37	24	39	35	23	**350**
Car/Taxi	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Truck	0	2	0	3	8	5	3	3	1	1	4	5	**35**
Medium Truck	7	3	0	1	2	4	5	1	2	4	3	1	**33**
10 Wheels, Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Heavy Truck	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Ligth Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Medium Bus	0	2	0	1	1	0	1	1	0	0	0	2	**8**
Heavy Bus	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total (No. of vehicle/hour)	**15**	**50**	**54**	**39**	**48**	**45**	**47**	**47**	**31**	**46**	**42**	**42**	**506**

APPENDIX 6E

KEY QUESTIONS USED FOR INTERVIEWING THE KEY INFORMANTS AND PHOTOS

KEY QUESTIONS FOR VILLAGE PROFILE SURVEY

Place .....

Date...../...../.....

PART 1 : PARTICIPANTS (Person in Charge : .....)

Participant	Position in Communities
1.	
2.	
3.	
4.	
5.	
6.	

Note : People to be interviewed:

- Community Leader and Key Informants
- 4-5 persons/community, comprising headman, teacher, public health, woman representative

Administrative Organization and Limits

Structure of Community Administration

.....

.....

.....

Family Structure

.....

.....

.....

PART 2 : SOCIAL PROFILE

1. Number of household at present and Population in 2014 (or latest) (Approximately)

Number of	Year 2014
Population	
Households	

2. Classification of population

Description	Number of persons	%
1. Sex		
- Male		
- Female		
2. Age *		
- 0-14 years		
- 15-59 years		
- 60 years and over		
Note :		

* Age group can be adjusted following existing information.

3. Population change during 2014

Description	Number of Persons	Comparison to the past (% of increase or decrease)	Causes
1. Birth			
2. Death			
3. Morbidity			
3. In-migration			
4. Out-migration			
Note : Reason of in-migration:			
Reason of out-migration:			

Source: Secondary Information (census? Should be after 2010 census)

4. Communities

1) Settlement pattern of village (line type along the road, cluster type and others) (Specify).....

2) Age of the community .....

3) Previous location that the residents came from .....

4) Reasons of moving to this village.....

5. Education

Level of education	%
1. Education level	
- Children before school	
- Never attended school	
- Primary school	
- Secondary and high school	
- University	
2. Others	

6. Vulnerable groups in the village

How to define vulnerable?

Vulnerable Group	%	How are they taken care?
1. Disabled in family.		
2. Head of households over 60 years old.		
3. Women who are head of household.		
4. Only one person live alone in a household.		
5. Homeless		
6. Others (specified) – orphan		

Source: Secondary Information (at the district level, vulnerable gr. must be cross-checked at communities' level)

7. Ethnic minorities/Religion (if can be inquired)

Ethnic group/Indigenous	%	Religion	Language	Norm/belief
1.				
2.				
3.				

Source: Secondary Information (at the district level)

8. Gender Situation : Roles of male and female in families or community

Who make decision in these activities?	Male	Female
Children's education		
Cooking		
Political		
Communicate/Negotiation		
Participation in activities of community		
Participation in activity of religion		
Purchase of house		

9. Are there any political and social organizations in the Communities?

Group name	No. of group member (identified household or person)	Functions
Political Group		
1. Group		
2. Group		
3. Group		
Social Group		
4. Group		
5. Group		
6. Group		
7. Group		

Source: Interview at the community level (or district, if available)

PART 3 : ECONOMIC PROFILE

10. Main Occupations

Main Occupations	Number of Household	%
Agriculture		
Trade		
Fishery		
Government officer		
General wage labour		
Employee		
Unemployed persons (adult after school or 18-60 year old)		

11. Land Holding and Land Use

1. Average Land Holding per family .....acres /hh

2. Land Rights Document

1) .....

2) .....

3) .....

12. Cropping pattern, both in rainy and dry seasons (i.e., rice, maize, cassava, fruit, vegetables, etc.)

Types of Crop	Starting Month	Harvest Period (month)	Water Sources	Purpose (Consumption / Sale or Both)
Rice ???				
Maize				
Cassava				
Fruit				
Vegetables				

Source: Secondary Information (at the district level)

13. Livestock

Types of livestock	No. of household raised (%)	Average head / household (if applicable)	Purpose of raising (consumption/sale)
Pig			
Pouty			
Cattle			
Fish			

14. Household income

Main sources of income

1) .....

2) .....

3) .....

15. Cost of Living

Main sources of expenditure

1) .....

2) .....

3) .....

16. Are there any industries development in the nearby area (Yes, No) .....

If yes, pls specify

Type of Business	Developer	Location	No. of employee	Remark
1.				
2.				
3.				
4.				
5.				

17. Is there any mineral development in the nearby area (Yes, No) .....

If yes, pls specify

Type of mineral development	Developer?	Location	No. of employee	Remark
1.				
2.				
3.				

PART 3 : HEALTH PROFILE

18. Access to health service

Please identify the access to health service by type (Prioritize from high to low preference)

Type of service	Distance (km)	Degree of Accessibility (specify)*	Preference **
Hospital			
Health care center			
Private clinic			
Others (specified)			

Note : * 1= convenient 2 = Inconvenient

** 1 = Most preference 2 = Intermediate 3= Least preference

19. Nutrition levels

% of malnutrition person .....

Cause .....

20. Pls identify communicable diseases in this village (Priority from high to low)?

Name of disease	No. of persons affected	Causes	How to treat
1.			
2.			
3.			
4.			
5.			

21. Pls identify the major types of toilet in the communities (rank from high to low)?

1) .....

2) .....

3) .....

22. How the communities dispose the garbage (rank from high to low)?

1) .....

2) .....

3) .....

23. How the communities dispose the wastewater?

1) .....

2) .....

3) .....

Source: Secondary information from Public Health at the District Level

PART 5 : INFRASTRUCTURE FACILITIES

24. Water Use and Water Supply

(1) Drinking water source (specified):.....

Quantity/Sufficiency/Quality:.....

(2) Water use sources: .....

Quantity/ Sufficiency/Quality:.....

25. Community facilities

(1) No. of service places

Types of service	Yes/No	Number of service place	Remarks
1. Market			
2. Factory			
3. Pre-school/Nursery			
4. Primary School			
5. Secondary School			

Types of service	Yes/No	Number of service place	Remarks
6. Well (specified)			
7. Church			
8. Mosque			
9. Grave			
10. Hospital			
11. Health Center			
12. Pharmacy			
13. Village Meeting Hall			

(2) Nursing facilities

Types of nursing place	No. of doctor	No. of nurse	No. of bed
1. Hospital			
2. Health Center			

(3) School facilities

Types of school	No. of class	No. of teacher	No. of pupils
1. Pre-school/Nursery			
2. Primary School			
3. Secondary School			

26. Road transportation

1) Please rank common mode of road transport from village to district: (Rank from most likely to the least use)

1 .....

2 .....

3 .....

2) Characteristic/type of road in village .....

Problem: .....

27. Electricity

Is there availability of electricity (Yes/No) .....

If yeas, pls specify source of electricity .....

If no, what are sources of lighting .....

Payment rate .....

28. Energy sources

What fuel are common used for cooking .....

Sources .....

29. What are major amenities of the local peoples (mobile phone, bicycle, TV, etc.)?

1 .....

2 .....

3 .....

PART 7 : SOCIAL PROBLEMS AND CRIME

30. Pls identify serious problem in the communities

1). .....

2). .....

3). .....

31. Pls identify crime in the communities

1). .....

2). .....

3). .....

PART 8 : COMMUNITY RESOURCES

32. Community area

Total community area approximately ..... acres

1) Residential area ..... %
2) Orchard land ..... %
3) Pasture area ..... %
4) Public area ..... %
5) Idle area ..... %
6) Forest area ..... %
7) Other (Specified) ..... %
(Specified) ..... %
(Specified) ..... %

33. Natural resources uses

Types	Harvested Period (month-month)	Sufficiency*
33.1 Food		
1)		
2)		
3)		
4)		
5)		
3.3.2 Medicine		
1)		
2)		
3)		
4)		
5)		
3.3.3 Household Use/ Building Materials/ Handicrafts/Fire wood		
1)		
2)		
3)		
4)		
5)		

Note:* 1) Abundance 2) Sufficient 3) Insufficient 4) Rare

PART 9 : CULTURE COMPONENTS

34. Culture and aesthetics

(1) Important historic places (specified).....

(2) Archeological place (specified) .....

(3) Antiquities (specified).....

(4) Building with aesthetic value/building to be conserved (specified) .....

(5) Sacred place (specified) .....

(6) Religions places (specified) .....

PART 10 : VISUAL COMPONENTS

Pls specified

1) Natural scenic area (specified).....

2) Landscape .....

3) Tourism site (specified) .....

PART 11 : OPINIONS TOWARD PROJECT DEVELOPMENT

35. What are the Project effects in the communities (Rank from high to low)?

1) .....

2) .....

3) .....

36. What are opinions of the local about the project development?

.....1) Agree, Reasons: .....

.....2) No Opinion, Reasons: .....

.....3) Disagree, Reasons:.....

.....4) Other .....

37. In your opinion, what the Project should do for the local?

1) .....

2) .....

3) .....

Interviewer .....
Time .....

	
Ainaro District	Ainaro Sub-district
	
Covalima District	Suai Sub-district
	
Hato-Udo Sub-district	Zumalai Sub-district

PHOTO 1 : INTERVIEW OF KEY INFORMANTS IN THE STUDY AREA

	
Leo Lima Village	Raimea, Tashilin , Zulo Villages
	
Foho Ailico Village	Bobe and Bonuc Sub-villages
	
Beco Village	Labarai Village

PHOTO 1 : INTERVIEW OF KEY INFORMANTS IN THE STUDY AREA (Cont'd)

APPENDIX 7A

CLIMATE AND METEOROLOGICAL IMPACT ASSESSMENT

APPENDIX 7A

CLIMATE AND METEOROLOGICAL IMPACT ASSESSMENT

7.1 Pre-Construction and Construction Phases

A. Source

The main source of GHGs during these phases is the operation of diesel-engined equipment such as backhoes, bulldozers, and trucks, etc. Emissions from the operations are air pollutants classified as greenhouse gases (GHG) including carbon dioxide (CO_2) and methane (CH_4).

B. Magnitudes of GHGs Emission at Sources

The quantities of GHGs emissions could be estimated from information on the number, type of diesel engine equipment, their hours of operation (see ***Table 1***), and GHGs Emission factor. Based on the preliminary construction plan, type of diesel engine equipment, and hours of operation are summarized in ***Table 2***.

TABLE 1

SUMMARY OF EQUIPMENT DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES

No.	Construction Activities	Duration (Month)	Number of Equipment							
			Scraper	Bulldozer	Truck	Backhoe	Wedding machine	Crane	Pump	Truck (Watering)
1.	Site Preparation (Site clearing and transportation of biomass waste to the disposal site)	12.0	2	2	4	2	-	-	-	2
2.	Excavation work	21.0	-	-	-	2	-	-	-	2
3.	Pipeline Installation (Pipe stringing, bending, welding, coating, and lowering)	21.0	-	-	-	-	2	4	1	1
4.	Earth backfilling work	21.0	-	-	-	2	-	-	-	1
5.	Inspection and Testing	24 hours	-	-	-	-	-	-	1	-
6.	Commissioning	6.0	-	-	-	-	-	-	-	-

TABLE 2

TYPE OF DIESEL ENGINE EQUIPMENT AND HOURS OF OPERATION

No.	Equipment	Total Working Period (Hrs.)
1	Scraper	4,224
2	Bulldozer	4,224
3	Truck	8,448
4	Backhoe	7,392
5	Wedding machine	7,392
6	Crane	14,784
7	Pump	24[2/]
8	Truck (Watering)	12,672

Remark: 1/ = Assumed working period is 8 hours per day and 22 days per month.
2/ = Assumed working period is 24 hours per day

According to the Emission Factors for off-road mobile source emissions from various equipment such as loaders, tractors, dozers, graders, etc. (South Coast Air Quality Management District; SCAQMD, 2016), the emission factors related to the Project construction equipment are summarized in ***Table 3***.

TABLE 3

EMISSION FACTORS

Fuel Type	GHGs Emission Factor (lb./hr.)	
	CO_2	CH_4
Scraper	262	0.0215
Bulldozer	239	0.0234
Truck	260	0.0164
Backhoe	67	0.0055
Wedding machine	129	0.0103
Crane	26	0.0044
Pump	50	0.0051
Truck (Watering)	260	0.0164

Source: Off-Road - Model Mobile Source Emission Factors (SCAQMD, 2016)

C. Predicted GHG Emissions

The following equation is used for calculating the quantities of GHG generated by the combustion of diesel engine equipment:

GHG Emissions (kg) = Emission factor (lb./hr.) × Operation hour (hr.) × 0.454 (Conversion factor from lb. to kg.)

The predicted GHGs Emission will be reported as CO_2 equivalent (CO_2e). For CH_4, its quantities are converted to CO_2e by multiplying with the global warming potential (GWP). The Global Warming Potential (GWP) was developed to allow comparison of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of 1 tonne of a gas will absorb over a given period of time, relative to the emissions of 1 tonne of carbon dioxide (CO_2). The larger the GWP, the more that a given gas warms the earth compared to CO_2 over that same period. The time period usually used for GWPs is 100 years. The GWP values are shown in ***Table 4***.

TABLE 4

GLOBAL WORMING POTENTIAL VALUES

GHGs Emission	100-year Global Warming Potential (GWP)
CO_2	1
CH_4	25
N_2O	298

The quantity of GHG emitted from the Project construction can be readily calculated to be 4,294.7 tonnes of CO_2e or 0.0043 Mt of CO_2e through-out 3 years of pre-construction and construction phases. This quantity is about 0.29 % of the total GHG emissions of Timor-Leste in 2010 (1,482.61 Gg of CO_2e or 1.48 Mt of CO_2e/year, total GHG emissions excluding land use change and forestry[1]). The details are shown in ***Table 5***.

[1] http://unfccc.int/ghg_data/,United Nations Framework Convention on Climate Change.

TABLE 5

GHGs EMISSION

Fuel	GHGs Emission (tonne of CO_2e)		
	CO_2	CH_4	Total
Scraper	502.4	1.0	503.5
Bulldozer	458.3	1.1	459.5
Truck	997.2	1.6	998.8
Backhoe	224.8	0.5	225.3
Wedding machine	432.9	0.9	433.8
Crane	174.5	0.7	175.2
Pump	0.5	0.0	0.5
Truck (Watering)	1495.8	2.4	1498.2
Total	***4,286.6***	***8.1***	***4,294.7***

F. Evaluation of the Significance of Impacts

In the context of Timor-Leste, this quantity of GHGs Emissions could be considered as insignificant impact.

Impact category	Indirect impacts
Impact duration	Long
Impact extent	Regional
Impact magnitude	Insignificant
Impact severity	Insignificant
Control priority	Low

7.2 Operation Phase

The main source of GHGs during this phase is the electricity consumed for the equipment the pumping operation. However, the main equipment is only the pumping system, the quantities of GHGs emission during these phase is very small and can be negligible.

7.3 Deactivation Phase

A. Sources

The main source of GHGs Emission during the deactivation phase is the operation of diesel engine equipment such as truck, backhoes, and bulldozers, etc. Emissions from the operations are air pollutants classified as greenhouse gases (GHG) including carbon dioxide (CO_2) and methane (CH_4).

B. Magnitudes of GHGs Emission at Sources

The quantities of GHGs emissions could be estimated from information on the number, type of diesel engine equipment, their hours of operation, and GHGs Emission factors. However, the timing and activities undertaken during the decommissioning phase will not be planned until closer to the end of economic life of the refinery. A detailed decommissioning plan will be prepared and submitted to the relevant authorities prior to commencement of the deactivation activities. This plan should be prepared at least 12 months before the decommissioning. The decommissioning phase would take from 1-2 years to complete.

Typically, the heavy equipment to be used during this phase would be similar to those used during the pre-construction and construction phases, but the number and working period of each equipment would be less. Therefore, the GHG Emission during this phase would be less than the emission in the pre-construction and construction phases.

C. Predicted GHG Emissions

Assuming, the number of equipment and the working period of each equipment are half of those in the pre-construction and construction phases, the quantity of GHG emission can be readily calculated to be 1,073.7 tonnes of CO_2e or 0.0011 Mt of CO_2e, or about 0.07 % of the total GHG emissions of Timor-Leste in 2010 (1,482.61 Gg of CO_2e or 1.48 Mt of CO_2e/year, total GHG emissions excluding land use change and forestry[2]).

D. Evaluation of the Significance of Impacts

In the context of Timor-Leste, this quantity of GHGs Emissions could be considered as insignificant impact.

Impact category	Indirect impacts
Impact duration	Long
Impact extent	Regional
Impact magnitude	Insignificant
Impact severity	Insignificant
Control priority	Low

[2] http://unfccc.int/ghg_data/,United Nations Framework Convention on Climate Change.

APPENDIX 9A

THE ESTIMATES OF CAMP AREAS

APPENDIX 9A
THE ESTIMATES OF CAMP AREAS

"Workers" accommodation: processes and standards: A guidance note by IFC and the EBRD", IFC, August 2009 provides the principles and standards applicable to the location and construction of worker's accommodation, including the general living facilities, rooms/dormitories facilities, sanitary facilities, and canteen and cooking facilities. The estimates of camp areas based on the standards are shown in ***Table 1***.

TABLE 1
THE ESTIMATES OF CAMP AREAS

No.	Detailed	Sq.m. required per unit	Area (m^2)	Remark
1	**Base camp**			
	-Accomodation for 120 workers	4 m^2 per worker	480.00	15 workers per 1 unit
	-Number of toilet	10 units, 2 m^2 each	20.00	15 workers per 1 unit
	-Number of bathrooms	10 units, 2 m^2 each	20.00	
	-Canteen	1 m^2 per worker	120.00	
	Subtotal 1		**640.00**	
	Offices for 10 engineers and tech.			
	Manager	9 m^2 per worker	9.00	
	Open space workstations	7.5 m^2 per worker	67.50	
	Document storage room	9 m^2 per worker	9.00	
	Toilet and bath	1 m^2 per worker	6.00	15 workers per 1 unit
	Meeting room	1.5 m^2 per worker	15.00	
	Kitchen and lunch room	1.5 m^2 per worker	15.00	
	Reception or waiting room	20	20.00	
	Subtotal 2		**141.50**	
	Subtotal 1+2		**781.50**	
	Allow 20% for corridors witin space		156.30	
	Total		**937.80**	
	Pipe laydown area+materials+shed		32,000.00	
	Grand Total		**32,937.80**	approx. 35,000 m^2
2	**Satellite camp**			
	-Accomodation for 15 workers	4 m^2 per worker	60.00	
	-Number of toilet	1 units, 2 m^2 each	2.00	
	-Number of bathrooms	1 units, 2 m^2 each	2.00	
	-Canteen	1 m^2 per worker	15.00	
	Office	1	20.00	
	- Lay down area		**3,200.00**	2 camps = 6,400 m^2

APPENDIX 9B

ASSESSMENT OF PIPELINE FIRE RISK

APPENDIX 9B
ASSESSMENT OF PIPELINE FIRE RISK

According to Eaton (2003) a risk can be defined as a potential event, either internal or external to a project that, if it occurs, may cause the project to fail to meet one or more of its objectives.

The Condensate and Products Pipeline Route Project is identified as a project to support the Betano Refinery Project, one of the three strategic projects for the development of oil and gas sector of the country. The Project will transport condensate from storage tanks at Suai Supply Base to Betano Refinery, and will transport light naphtha, heavy naphtha, and diesel fuel from storage tanks at the refinery to storage tanks at Suai Supply Base.

Therefore, the risk of the project is the potential event, which may cause condensate or refinery products transportation interrupted, if it occurs.

The Risk Assessment (RA) is both a design and valuable tool for evaluation of the potential risks. It can be used to assist decision-making on the risk management to minimize, monitor, and control the potential risk. The RA has been undertaken to identify the potential risks associated with the project using the methodology and guidelines established by relevant agencies as the following documents:

- Techniques for Assessing Industrial Hazards a Manual, World Bank (1989)
- Handbook of Chemical Hazard Analysis Procedures, US.EPA.(1990)
- Base Resource Document, API (2000)
- Pipeline Risk Management Manual, W. Kent Muhlbauer (2003)
- A Tool for Risk Assessment, Dejan Ristić (2013)

1. RISK ASSESSMENT METHODOLOGY

The Qualitative Risk Analysis assessment has been applied to identify the risks using the likelihood of occurrence and the level of consequent impact. The Risk Analysis Matrix has been used for assessment process, where the x-axis represents likelihood of occurrences and y-axis is the level of severity or consequent impact ***(Figure 1)***.

Risk Definitions

E - Extreme risk - Detailed action plan required
H - High risk - Needs seniors management attention
M - Medium risk - Specify management responsibility
L - Low risk - Manage by routine procedures

				Potential Consequence				
			People	Injures and diseases that do not require medical treatment	Minor injuries that require first-aid only	Severe injuries that require hospitalization or multiple medical treatment	Life-threatening injuries or multiple medical treatment	Deaths or multiple medical treatment
			Reputation	Internal control	Observation by internal controls to prevent escalation	Observation by external executors or investigation	Intense public or political significance	Publicity
			Business Process and System	Minor errors within the system or process that requires corrective action	Failure to procedures in the process	The requirements for one or more responsibilities are not met	Strategic are not in accordance with the national plan	Critical system failure, bad policy advisor
			Finance	1% of budget	2.5% of budget	> 5% of budget	>10 % of budget	> 25 % of budget
				Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
	Probability	**Historical**		**1**	**2**	**3**	**4**	**5**
Likelihood	> 1 in 10 years	Is expected to occur in most circumstance	**1** **Almost Certain**	M	H	H	E	E
	1 in 10-100 years	Will probably occur	**2** **Likely**	M	M	H	H	E
	1 in 100-1,000 years	Might occur at some time in the future	**3** **Possible**	L	M	M	H	E
	1 in 1,000-10,000 years	Could occur at some time	**4** **Unlikely**	L	M	M	H	H
	1 in 10,000-100,000 years	May occur but only in exceptional circumstances	**5** **Rare**	L	L	M	H	H

Source: A Tool for Risk Assessment, Dejan Ristić, 2013

FIGURE 1: RISK ASSESSMENT MATRIX ACCORDING TO AUSTRALIAN AND NEW ZEALAND RISK MANAGEMENT STANDARDS AS/NZS 4360: 2004

2. BRIEF PROJECT DESCRIPTION

A. Pipe Material, Diameters and Capacities

The Condensate and Products Pipeline Route Project will be 60 km long along alignment of the highway currently under construction. The Project will transport condensate from storage tanks at Suai Supply Base to Betano Refinery, and will transport the refinery products comprising Light Naphtha, Heavy Naphtha, and Diesel fuel from storage tanks at the Betano refinery to storage tanks at Suai Supply Base. There are 4 pipelines as shown in ***Table 1.***

TABLE 1
KEY DESIGN AND OPERATING DATA OF THE PIPELINES

No.	Material/Product	Density (kg/m^3)[1/]	Diameter (Inch)	Flow rate (m^3/hr)[2/]	Velocity (m/s)	Operating Pressure (kg/cm^2)[3/]	Design Pressure (kg/cm^2)[4/]
1	Condensate	711	12	417	1.6	55	83
2	Light Naphtha	625	8	156	1.3	62	93
3	Heavy Naphtha	730	8	106	0.9	41	62
4	Diesel	800	8	128	1.1	62	92

Remark: 1/ Density is referred to UOP Heat and Mass Balance @ 40 °C

2/ Based on 45 hours transferring time, which design based on 10% margin

3/ 50% Safety factor was added for pressure lose to represent pipe fitting and auxiliary

4/ 50% Margin was added for pipe design pressure

Source: TIMOR GAP, E.P., 2016

B. Design Standards

The pipelines and associated facilities are designed in accordance with recognized international standards of the American Society of Mechanical Engineers (ASME) and American National Standards Institute (ANSI); ASME/ANSI B31.1, B31.4. The pipelines are designed to be durable in various conditions and tolerate different factors during installation, testing and operation. The pipeline material conforms to API 5L specification.

3. CONSTRUCTION METHOD

Most of pipeline will be laid at least 1.0-1.5 m below ground measured from its crown to the ground surface by using the open-cut method for the typical area, and pipe jacking while cross the local road. Pipe bridges will be used for river crossing.

4. INSTRUMENTATION SYSTEM

The pipeline will be equipped with appropriate instruments for monitoring and control of pressure, temperature and flow at both ends. The gathered information will be assessed and analyzed using a SCADA system to efficiently and effectively monitor and control the pipeline operation. In addition, the pipeline will be equipped with safety equipment as specified in the design standards, such as pressure reducing valves.

5. OPERATIONS AND MAINTENANCE

Pigging will be used for pipeline inspection to perform various maintenance operations without stopping the flow in pipelines. A pigging launching station will be installed closed to the starting point of the pipeline to push a pig down the pipe until it reaches the receiving station.

In addition, regular patrol driving along the pipeline right of way will be carried out in order to detect any abnormal activities or damages.

6. LIKELIHOOD OF OCCURANCES

According to the secondary review of Significant Incidents of the Onshore-Transmission Refinery petroleum products Pipeline from various source; i.e., Pipeline and Hazardous Materials Safety Administration (PHMSA), Base Resource Documents of API Publication 581. The potential event, which may cause transportation interrupted, if it occurs is shown in ***Figure 2***.

Furthermore, considered the generic equipment failures frequencies as specified in the Base Resource Documents of API Publication 581, the failures frequencies associated with 12 and 8 inches diameter pipe ***(Table 2)***.

The likelihood of project pipeline leak at 1 inches is most likely to occur about 3×10^{-7} times/ft./year or 9.84×10^{-7} times/km./year. Therefore, the likelihood of incident occurrence for each pipeline with 60 km in length is 5.91×10^{-2} times/km./year or 5.9 times in 100 year, and can be defined as ***"Likely"*** as classified in ***Figure 1***.

Moreover, the likelihood of project pipeline rupture, the worst case scenario is about 2×10^{-8} times/ft./year or 6.56×10^{-7} times/km./year. Therefore, the likelihood of incident occurrence for each pipeline with 60 km in length is 3.94×10^{-3} times/km./year or 3.94 times in 1,000 year. These can be defined as ***"Possible***" as classified in ***Figure 1.***

However, the likelihood of the potential event occurrences and level of its impacts can be minimized with the appropriate mitigation and prevention measures as shown in ***Table 3.***

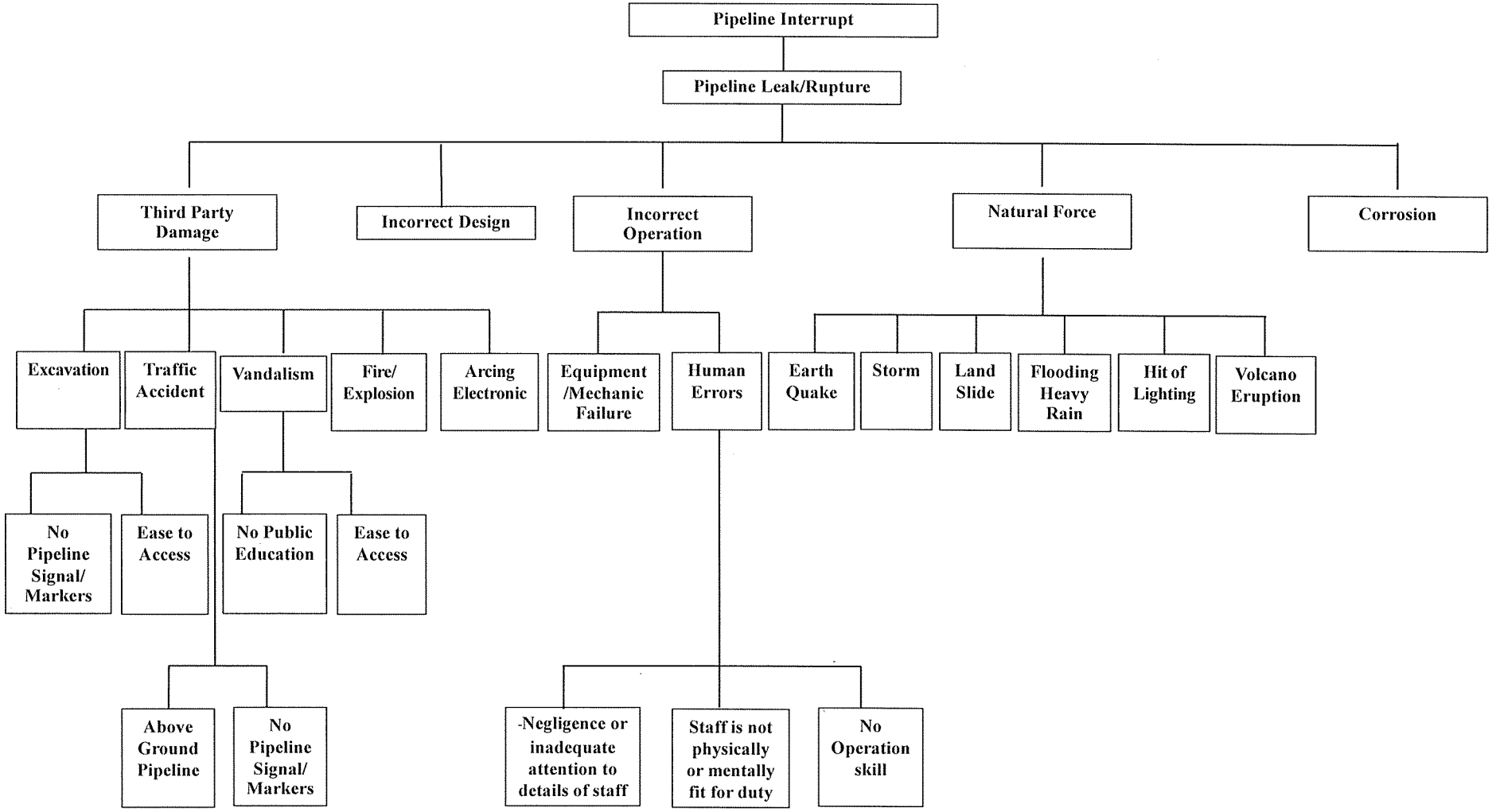


FIGURE 2 : PIPELINE INTERRUPTION

TABLE 2
THE GENERIC EQUIPMENT FAILURES FREQUENCIES

Type of Equipment	Generic Failures Frequencies (times/year)			
	1/4-inch	1-inch	4-inch	Rupture
Piping, 1.905 cm. (0.75 inch) diameter, per ft	1×10^{-5}	-	-	3×10^{-7}
Piping, 2.54 cm. (1 inch) diameter, per ft	5×10^{-6}	-	-	5×10^{-7}
Piping, 5.08 cm. (2 inch) diameter, per ft	3×10^{-6}	-	-	6×10^{-7}
Piping, 10.16 cm. (4 inch) diameter, per ft	9×10^{-7}	6×10^{-7}	-	7×10^{-8}
Piping, 15.24 cm. (6 inch) diameter, per ft	4×10^{-7}	4×10^{-7}	-	8×10^{-8}
Piping, 20.32 cm. (8 inch) diameter, per ft	3×10^{-7}	3×10^{-7}	8×10^{-8}	2×10^{-8}
Piping, 25.40 cm. (10 inch) diameter, per ft	2×10^{-7}	3×10^{-7}	8×10^{-8}	2×10^{-8}
Piping, 30.48 cm. (12 inch) diameter, per ft	1×10^{-7}	3×10^{-7}	3×10^{-8}	2×10^{-8}
Piping, 40.64 cm. (16 inch) diameter, per ft	1×10^{-7}	3×10^{-7}	2×10^{-8}	2×10^{-8}
Piping, >40.64 cm. (16 inch) diameter, per ft	6×10^{-8}	2×10^{-7}	2×10^{-8}	1×10^{-8}
Pressure Vessels	4×10^{-5}	1×10^{-6}	1×10^{-5}	6×10^{-6}
Reactor	1×10^{-4}	3×10^{-4}	3×10^{-5}	2×10^{-5}
Reciprocating Pumps	0.7	0.01	0.001	0.001
Atmospheric Storage Tank	4×10^{-5}	1×10^{-4}	1×10^{-5}	2×10^{-5}

Source: API Publication 581, 1st edition, May 2000

TABLE 3
POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK

Potential Event	Mitigation/Prevention Measures
1. Third Party Damage	
1.1 Excavation - Ease to access by third party - No pipeline signal or marker	- The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. - The pipeline signal or marker will be installed along the pipeline route. - Regular survey patrol driving along the pipeline right of way. - The minimum cover of buried pipeline shall be accordance with ASME/ANSI B31.4 standards.
1.2 Traffic Accident - No pipeline signal or marker	- The pipeline signal or marker will be installed along the pipeline route. - The traffic signal shall be installed while pipeline laid above ground.
1.3 Vandalism	- The project shall be educated the people who living in the vicinity area, in order to make the community understand and participate in the process of project development. - The project shall be built-up the relationship with the local communities.
1.4 Other damage, i.e., Fire/Explosion, arcing of Electronic from the other etc.	- The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. - The pipeline signal or marker will be installed along the pipeline route. - Regular survey patrol driving along the pipeline right of way.
2. Incorrect Design	- The pipeline designed in accordance with the international standards (ASME/ANSI B31.4, ASME/ANSI B31.1, API RP 1102, etc.) - The pipeline material conforming to API 5L Specification.

TABLE 3
POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK (Cont'd)

Potential Event	Mitigation/Prevention Measures
3. Incorrect Operation	
3.1 Mechanical/Equipment Failure	– The pipeline operation shall be done in accordance with the international standards (ASME/ANSI B31.4, ASME/ANSI B31.1, etc.) – Regular maintenance and inspection the equipment, machines to be in good conditions.
3.2 Incorrect Installation	– Installation of machinery and equipment shall be in accordance with codes applicable to the specific type and their installation manual or guidelines. – After installation, machinery or equipment shall be tested under conditions approximating actual operations to assure their proper functioning.
3.3 Human Errors – No operation skill – Staff is not physically or mentally fit for duty – Negligence or inadequate attention to details of staff	– Staff training to be provided on a regular and continuing basis. – Physical check up programs for staff relevant to their tasks as required by regulations or safety standards – Random checks of drug use. – Instilling work safety discipline into staff
4. Natural Forced	
4.1 Earthquake	– The pipeline is designed in accordance with the following criteria: • Design Code ASCE: 7-10 • Load Combination shall be as per ASCE 7-10 • Site Class: B • Risk Category: IV • Seismic Design Category: D • Design return period: 475-year

TABLE 3
POTENTIAL RISK EVENTS AND MITIGATION/PREVENTION MEASURES TO MINIMIZE THE RISK (Cont'd)

Potential Event	Mitigation/Prevention Measures
4.2 Storm	– The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route. – The pipeline signal or marker will be installed along the pipeline route. – Regular survey patrol driving along the pipeline right of way.
4.3 Hit of Lightning	– The pipeline shall be provided the lightning or fault currents prevention systems in accordance with NACE RP-O1-77 Guidelines.
4.4 Flood/Heavy Rain	– The pipeline will be laid in the right of way of the highway and the fences will be installed along the highway and pipeline route.
4.5 Volcano Eruption	– According to TIMOR LESTE: Natural Hazard Risks map provided by United Nation Office for the Coordination of Humanitarian Affairs (OCHA), there are no actives volcano within the project area and vicinity.
5. Corrosion	– The pipeline shall be used 3LPE for External Coating, that consist of a three layers coating system comprising: • First layer (inner): Fusion Bonded Epoxy (FBE). • Second layer (intermediate): Chemically Modified Polyethylene Copolymer • Third layer (outer): High-density high molecular weight UV stabilized Polyethylene (HDPE) – Three layers shall be used for Painting (External Coating for A/G) – The Cathodic Protection (CP) shall be provide to prevention the corrosion. – Pre-cast concrete sleeper shall be used for above-ground pipeline instead of steel structure in order to avoid corrosion problem.

7. THE SEVERITY OF CONSEQUENCE

The severity of consequence of condensate and products pipeline leakage are estimated by the consequence analysis techniques according to the Techniques for Assessing Industrial Hazards a Manual, World Bank (1990) and the Base Resource Documents of API Publication 581 (API, 2000) as steps below:

A. Representative Material

The transmission products of project consist of Diesel, Heavy Naphtha, Light Naphtha, and condensate. The characteristic of each products such as molecular weight, boiling point, flash point, explosive limits, auto ignition temperature, and etc., depends on its composition. The representative materials of used to define the types of release, final phase, and dispersion/consequence, are shown in ***Table 4.***

B. Hole Sizes

The hole sizes of pipe leakage suggestion used the standard four whole sizes; 0.25-inch, 1-inch, 4-inch, and rupture, represented the small, medium, large, and rupture (API Publication 581, API 2000). The small, medium and large hole sizes for the condensate and products pipelines with 8-inches and 12-inches diameter are 0.25-inch, 1-inch, 4-inch, and for the rupture are 8-inches and 12 inches as its diameter.

TABLE 4
THE REPRESENTATIVE MATERIALS OF TRANSMISSION PRODUCTS

Transmission Products	Representative Materials
Diesel	C_9-C_{12}
Light Naphtha	C_6-C_8
Heavy Naphtha	C_9- C_{12}
Condensate	C_{25+}

Source: API Publication 581, 1st edition, May 2000

C. Release Duration

The release duration suggestion used the Leak Durations based on Detection and Isolation Systems (API Publication 581, API 2000). The Project would use SCADA system for monitoring and control of pressure, temperature and flow at both ends. In case of leakage, the SCADA systems can detect then, isolation or shutdown systems would be activated by operators in the control room or other suitable locations remote from the leak. The Detection and Isolation System of the Project can be considered as class A and B, according to the Detection and Isolation System Rating Guide (API Publication 581, API 2000). Therefore, the release duration of the hole size of 4-inch, 1-inch, and 1/4-inch should be 10 minutes, 20 minutes, and 30 minutes, respectively. For the pipe rupture, the release duration of 5 minute will be applied.

D. The Potential Release Rate

According to the set of standards four whole sizes; 0.25 inch, 1 inch, 4 inches, and pipe rupture (8 and 12 inches) as recommended by API Publication 581, API (2000). The potential release rate can be calculated by its flowrate and cross-section area of hole. The results are shown in ***Table 5.***

TABLE 5
POTENTIAL RELEASE RATE

Hole Size (Inch)	Potential Release Rate (kg/sec)			
	Condensate (12 inches)	Heavy Naphtha (8 inches)	Light Naphtha (8 inches)	Diesel (8 inches)
1/4 inch	0.04	0.03	0.02	0.03
1 inch	0.57	0.42	0.34	0.44
4 inches	9.14	6.76	5.37	7.10
Rupture	82.36	27.08	21.49	28.44

Source: API Publication 581, 1st edition, May 2000

E. Types of Release

According to API Publication 581 (API, 2000), there are 2 types of release as below:

- **Instantaneous Release:** Caused by the leakage through a medium size to rupture, the release rate more than 10,000 pounds within 3 minutes.
- **Continuous Release:** Caused by the leakage through a small size, the release rate less than 10,000 pounds within 3 minutes.

According to the types of release as above, the potential release rate of the Project on varied hole size are shown in ***Table 6***. The release rates for 0.25 inch, 1 inch, and 4 inches are less than 10,000 pounds within 3 minutes. Therefore, it can be categorized as Continuous release. In case of pipeline rupture, the release rates are greater than 10,000 pounds within 3 minutes. Therefore, it can be categorized as Instantaneous release.

F. The Final Phase of Material

The dispersion of the condensate and products after release are strongly dependent on their phase in the environment. Considered the boiling point of condensate and products according to the Guidelines for Determining the Phase of Fluid (API Publication 581, API 2000), if boiling point is less than 80 °F, the final phase is gas, and if boiling point is greater than 80 °F, the final phase is liquid. Therefore, the final phase of the condensate and products which have the boiling point in the range of 230-690 °F is liquid.

G. The Consequence of Release

According to API Publication 581 (API, 2000), the consequence of release varies by the representative material, types of release, final phase after release, and the operation condition of the Project. The consequences of release can be described as ***Table 6***.

H. Determining the Area Potentially Affected by Incidents.

According to the secondary data review of Significant Incidents of the Onshore-Transmission Refinery petroleum products Pipeline from various source; i.e., Pipeline and Hazardous Materials Safety Administration (PHMSA), Base Resource Documents of API Publication 581. The potential area related with the pipe leakage are those areas around connection points, areas where third party can easily get access to, and those aboveground surface areas. These areas are as follows:

- Tie-in point at Suai Supply Base and Betano Refinery
- River crossing where pipeline will be laid on Pipe Bridge or Pipe Rack

The mathematical model used in the study is BREEZE HAZ, developed by Trinity Consultants Inc., based on Quantitative Risk Assessment (QRA) as suggested by the United States of America Environmental Protection Agency (U.S.EPA), with following characteristics.

(1) BREEZE HAZ is a collection of mathematical model. It is used to assess impact caused by chemical leakage.

(2) Sub-models in BREEZE HAZ comprise:

- EXPERT is a model of chemical leakage in various conditions used to assess dispersion, ignition, fire and explosion.

- BREEZE HAZ DISPERSION is collection of models. It is used for assessment of dispersion, consisting of DEGADIS, SLAB, AFTOX and INPUFF in relation to toxic hazard.

- BREEZE HAZ FIRE/EXPLOSION is a model used to assess ignition and explosion which can present radius Confined Pool Fires, Unconfined Pool Fires, Jet Flames, Boiling Liquid Expanding Vapor Explosions (BLEVEs) and Unconfined Vapor Cloud Explosions (UVCEs).

This study is consideration on impacts from Jet Fire and Pool Fire ignition for all hole sizes of leakage. The assumption is under calm wind situation, as it is the worst case. Its impact caused by heat transfer is more than the windy situation.

Heat energy within the range of 4.0-37.5 kW/m^2 is used for calculation to find distance of heat transfer. This is compared with criteria set for a) impact on human and equipment at various energy levels (***Table 7***).

TABLE 6
CONSEQUENCES OF RELEASE

Pipeline/Hole size	Representative Material	Quantity of Release in 3 minute, lbs.	Release Type	Final Phase	Operation Condition	Ignition		Types of Ignition				
						YES	NO	VCE	Fire ball	Flash Fire	Jet Fire	Pool Fire
1.Condensate- 12 inches												
- 0.25 inch		14.18	Continuous		Auto Ignition	0.02	0.98	-	-	-	-	0.02
- 1 inch	C_{25+}	226.96	Continuous	Liquid		0.02	0.98	-	-	-	-	0.02
- 4 inch		3,625.63	Continuous		Not Likely[1/]	0.02	0.98	-	-	-	-	0.02
- Rupture		32,682.10	Instantaneous			0.02	0.98	-	-	-	0.005	0.015
2.Diesel- 8 inches												
- 0.25 inch		11.02	Continuous		Auto Ignition	0.05	0.95	-	-	-	-	0.05
- 1 inch	C_9- C_{12}	176.37	Continuous	Liquid		0.05	0.95	-	-	-	-	0.05
- 4 inch		2,817.48	Continuous		Not Likely[1/]	0.05	0.95	-	-	-	-	0.05
- Rupture		11,287.67	Instantaneous			0.05	0.95	-	-	-	0.01	0.04
3.Light Naphtha- 8 inches												
- 0.25 inch		10.50	Continuous		Auto Ignition	0.10	0.90	-	-	-	-	0.10
- 1 inch	C_6-C_8	167.93	Continuous	Liquid		0.10	0.90	-	-	-	-	0.10
- 4 inch		2,682.66	Continuous		Not Likely[1/]	0.10	0.90	-	-	-	-	0.10
- Rupture		10,747.54	Instantaneous			0.10	0.90	-	-	-	0.02	0.08
4.Heavy Naphtha- 8 inches												
- 0.25 inch		8.33	Continuous		Auto Ignition	0.05	0.95	-	-	-	-	0.05
- 1 inch	C_9-C_{12}	133.28	Continuous	Liquid		0.05	0.95	-	-	-	-	0.05
- 4 inch		2,129.07	Continuous		Not Likely[1/]	0.05	0.95	-	-	-	-	0.05
- Rupture		8,529.68	Continuous			0.05	0.95	-	-	-	-	0.05

Remark: 1/ Process temperature is less than auto ignition temperature plus 80 °F

TABLE 7
DAMAGE CAUSED AT DIFFERENT INCIDENT LEVEL OF THERMAL RADIATION

Incident Flux (kW/m^2)	Type of Damage Caused	
	Damage to Equipment	**Damage to People**
37.5	Damage to process equipment	- 100% lethality in 1 minute. - 1% lethality in 10 seconds
25.0	Minimum energy to ignite wood at indefinitely long exposure without a flame	- 100% lethality in 1 minute. - Significant injury in 10 seconds
12.5	Minimum energy to ignite wood with a flame; melts plastic tubing	- 1% lethality in 1 minute. - 1st degree burns (skin burning) in 10 seconds
4.0	-	- Causes pain if duration is longer than 20 seconds but blistering is unlikely

Source: World Bank Technical Paper No.55, 1989.

The results of the study are summarized in ***Table 8***, the worst case scenario is Condensate pipeline rupture and ignited as Jet Fire. Considering the area with the thermal radiation at the level of 12.5 kW/m^2, which causes 1% lethality if stay in the potential area for 1 minute, covering about 258 m. radius from the center of leakage point. The affected area for each potential point can be described as below:

- ***Tie-in Point at Suai Supply Base:*** Most of affected area is Suai Supply Base area, and undeveloping area, there is no residential area within the affected area. Therefore, the affected people is the Suai Supply Base Staff (about 200 staff), the number of fatalities might less than 2 (Assume = 1% of Total), and the potential human injuries requiring medical treatment of observation due to skin burns is also less than 100 people (Assume = 50% of Total), and the level of incident is Catastrophic, due to the affected people is potential to deaths and multiple of affected people is required the medical treatment.

- ***Tie-in Point at Betano Refinery:*** Most of affected area is Betano Refinery and Power Plant area, agricultural area, and undeveloping area, there is no residential area within the affected area. Therefore, the affected people is the Betano Refinery and Power Plant Staff (about 200 staff), the number of fatalities might less than 2 (Assume = 1% of Total), and the potential human injuries requiring medical treatment of observation due to skin burns is also less than 100 people (Assume = 50% of Total), and the level of incident is Catastrophic, due to the affected people is potential to deaths and multiple of affected people is required the medical treatment.

TABLE 8
AFFECTED RADIUS AT SPECIFIED THERMAL RADIATION

Pipeline/Hole size	Affected Radius at Specified Thermal Radiation (m.)							
	Jet Fire (kw/m^2)				Pool Fire (kw/m^2)			
	37.5	25	12.5	4	37.5	25	12.5	4
1) Condensate -12 inches Diameter								
- 0.25 inch	-				N/A[1/]	2	2	3
- 1 inch	-				2	4	6	9
- 4 inch	-				15	18	22	30
- Rupture	229	239	258	300	16	22	36	66
2) Heavy Naphtha-8 inches Diameter								
- 0.25 inch	-				N/A[1/]	2	2	3
- 1 inch	-				4	5	6	8
- 4 inch	-				13	17	21	28
- Rupture	-				23	29	37	51
3) Light Naphtha-8 inches Diameter								
- 0.25 inch	-				N/A[1/]	1	2	2
- 1 inch	-				4	5	6	8
- 4 inch	-				13	16	19	26
- Rupture	80	84	93	114	24	27	34	48
4) Diesel-8 inches Diameter								
- 0.25 inch	-				1	2	2	3
- 1 inch	-				5	6	6	8
- 4 inch	-				15	17	20	27
- Rupture	145	152	164	190	27	32	39	54

Rematrk: 1/ = Unable to Calculated distance to this flux.

- ***River Crossing Point***: The river crossing point, comprise of Karaulan River, Ukasa River, Buiru River, Belulic River, Mola River, Loumea River, Foura River, and Raiketan River. Most of affected area is undeveloping area, and agricultural area, there is a few of residential area with about 20-30 households for each point, and affected people for each point is 100-180 people (Assumed 1 household = 5-6 people), approximately. The number of fatalities might less than 2 (Assume = 1% of Total people in the residential area), and the potential human injuries requiring medical treatment of observation due to skin burns is also less than 90 people (Assume = 50 % of Total people in the residential area), and the level of incident is Catastrophic, due to the affected people is potential to deaths and multiple of affected people is required the medical treatment.

8. RESULT OF RISK ASSESSMENT

Considering the likelihood of incident occurrence and the severity of incidents according to the Risk Analysis Matrix (***Figure 1***). The likelihood of incident of the project for each pipeline in case of pipe rupture is 3.94×10^{-3} times/km./year or 3.94 times in 1,000 year, and can be defined as ***Possible***, and the severity level of incident is ***Catastrophic***. The Risk Analysis Matrix suggest as Extreme risk and detailed of action plan is required.

According to the above analysis, it can be concluded that the comprehensive planning is optional to minimize the likelihood of accident occurrences and the level of severity. Therefore, the project has established the operating procedure according to the standard of international standards of the American Society of Mechanical Engineers (ASME) and American National Standards Institute (ANSI); ASME/ANSI B31.1, B31.4, in design, construction, implementation, and maintenance. In addition, Project has provided the emergency plan together with the application of SCADA (Supervisory Control and Data Acquisition System) that can shut down systems immediately to minimize the potential impacts.

APPENDIX 10A

FULL RESETTLEMENT PLAN : A RECOMMENDED OUTLINE

APPENDIX 10A

FULL RESETTLEMENT PLAN: A RECOMMENDED OUTLINE

Topic	Contents
Scope of land acquisition and resettlement	• Describe, with the aid of maps, scope of land acquisition and why it is necessary for main investment project. • Describe alternative options, if any, considered to minimize land acquisition and its effects, and why remaining effects are unavoidable. • Summarize key effects in terms of land acquired, assets lost, and people displaced from homes or livelihoods. • Specify primary responsibilities for land acquisition and resettlement.
Socioeconomic information	• Define, identify and enumerate people to be affected. • Describe likely impact of land acquisition on people affected, taking into account social, cultural, and economic parameters. • Identify all losses for people affected by land acquisition. • Provide details of any common property resources. • Specify how project will impact on the poor, indigenous people, ethnic minorities, and other vulnerable groups, including women, and any special measures needed to restore fully, or enhance, their economic and social base.
Objectives, policy framework, and entitlements	• Describe purpose and objectives of land acquisition and resettlement. • Describe key national and local land, compensation and resettlement policies, laws, and guidelines that apply to project. • Explain how Bank Policy on Involuntary Resettlement will be achieved. • State principles, legal and policy commitments from borrower executing agency for different categories of project impacts. • Prepare an eligibility policy and entitlement matrix for all categories of loss, including compensation rates.
Consultation, and grievance redress participation	• Identify project stakeholders. • Describe mechanisms for stakeholder participation in planning, management, monitoring, and evaluation. • Identify local institutions or organizations to support people affected. • Review potential role of nongovernment organizations (NGOs) and community-based organizations (CBOs). • Establish procedures for redress of grievances by people affected.

APPENDIX 10A

FULL RESETTLEMENT PLAN: A RECOMMENDED OUTLINE (CONT'D)

Topic	Contents
Relocation of housing and settlements	• Identify options for relocation of housing and other structures, including replacement housing, replacement cash compensation, and self selection. • Specify measures to assist with transfer and establishment at new sites. • Review options for developing relocation sites, if required, in terms of location, quality of site, and development needs. • Provide a plan for layout, design, and social infrastructure for each site. • Specify means for safeguarding income and livelihoods. • Specify measures for planned integration with host communities. • Identify special measures for addressing gender issues and those related to vulnerable groups. • Identify any environmental risks and show how these will be managed and monitored.
Income restoration strategy	• Identify livelihoods at risk. • Develop an income restoration strategy with options to restore all types of livelihoods. • Specify job opportunities in a job creation plan, including provisions for income substitution, retraining, self-employment and pensions, where required. • Prepare a plan to relocate and restore businesses, including income substitution, where required. • Identify any environmental risks and show how these will be managed and monitored.
Institutional framework	• Identify main tasks and responsibilities in planning, negotiating, consulting, approving, coordinating, implementing, financing, monitoring and evaluating land acquisition and resettlement. • Review the mandate of the land acquisition and resettlement agencies and their capacity to plan and manage these tasks. • Provide for capacity building, including technical assistance, if required. • Specify role of NGOs, if involved, and organizations of affected persons in resettlement planning and management.
Resettlement budget and financing	• Identify land acquisition and resettlement costs. • Prepare an annual budget and specify timing for release of funds. • Specify sources of funding for all land acquisition and resettlement activities.

APPENDIX 10A

FULL RESETTLEMENT PLAN: A RECOMMENDED OUTLINE (CONT'D)

Topic	Contents
Implementation schedule	• Provide a time schedule showing start and finish dates for major resettlement tasks. • Show how people affected will be provided for before demolition begins.
Monitoring and evaluation	• Prepare a plan for internal monitoring of resettlement targets, specifying key indicators of progress, mechanisms for reporting, and resource requirements. • Prepare an evaluation plan, with provision for external, independent evaluation of extent to which policy objectives have been achieved. • Specify participation for people affected in M&E.

Reference : Handbook on Resettlement: A Guide to Good Practice

APPENDIX 13A

LIST OF INVITED NGO

Data: 17 Mar. 2016

Karta Saída

Asuntu: Konvite Sorumutuk ho Ministerio Relevante no NGO Local kona ba Resultado Estudu Avaliasaun Impaktu Ambientál ba Projetu Betano Refinaria

No.	Naran	Instituisaun	No. Kontaktu	Asinatura
1	Maria Celeste. B	DAF	3331209	
2	Francisco Pinto	DNCPIA	77327064	
3	Lic H. Barreto	HASLTIC	77287929	
4	Ivone	H F	3310103	
5	Maria Joana da c Mendonça	Downstream Office	7720824	
6	Alda Fernandes	SEAC	78478604	
7	Guigmar Oliveira	DNFCRL	3310052	
8	Augusto D.C. Soares	SEPTOPE - DNAF	76903655	

9	Jeffa Ranggel	MDS	3311341	Jeff 3089.	
10	Nicolau T.	Fangtil	77286061		
11	Elsa Camila Viegas		3339356		
12	Celia C. Boavida	G-DGSC	3331337		
13	KEISTA SANTOS	DGE	3311348		
14	Dyna	G.DG-DA	76692632.		
15	Martinha A. Fernandes	La'o Hamutuk	3321040		
16	Jaulino G. Amaral	Luta Hamutuk	77569599		
17	Eufracia Castro	FDCH	3310289		
18	Sabino L. A	Pescas	73705861		
19	Lucia Diac	MAP			
20					

APPENDIX 13B

LIST OF STAKEHOLDERS ATTENDED CONSULTATION MEETING ON BETWEEN 31 MARCH - 8 APRIL 2016

Stakeholders & NGOs @TIMOR GAP, E.P.

31 March 2016: 10.00 a.m. - 2.00 p.m.

Total 26 People

-Project owner: 6

-Consultant: 7

-Stakeholders & NGOs: 13

PUBLIC CONSULTATION MEETING REGISTRATION FORM

ENVIRONMENTAL IMPACT STATEMENT (EIS) STUDY FOR BETANO REFINERY PROJECT

Date 31 **Month** March **2016 Time** 10.00 a.m- 2 p.m **at** Conference Room, TIMOR GAP, E.P.

Sub-Village ..... **Village** ..... **Sub-District** ..... **District** DILI

No.	Name	Position	Sex	Age	Address (Village / Sub-village)	Telephone Number	Signature
1	Paulo Alves	DG	M	44	Taicoli	7730470	
2	Charles Scheiner	Researcher	M	65	Dili / Bebonk	7734 0965	
3	Ismenio M. da Silva	Secretário Executivo do FDCH-MPIE			Matadouro - Dili	77863745	
4	Jacinto Gusmão	DGGP	M	44	Comoro	77326637	
5	Eugenio Fernandes	Cultura	M	54	Becora	77012059	
6	Jurenca M DD Costa	H&E Insp. Officer	F	30	ANPM	77505064	
7	Paulino Da Cruz	Rep. Oweo. Dairy Co	M	47	Bebora / Dili	77305733	
8	Sabino L. A	MAP - DESCAS	M	37	Fatu metan	73705861	
9	Paulino de Almeida	Lao Hamutuk	M	26	Surik mas	77156951	
10	Martinha A. Fernandes	Lao Hamutuk	F	27	Taibessi	77240906	

PUBLIC CONSULTATION MEETING REGISTRATION FORM

ENVIRONMENTAL IMPACT STATEMENT (EIS) STUDY FOR BETANO REFINERY PROJECT

Date 31 **Month** March **2016 Time** 10.00 a.m - 2 p.m **at** Conference Room, TIMOR GAP, E.P.

Sub-Village..... **Village**..... **Sub-District**..... **District** Dili

No.	Name	Position	Sex	Age	Address (Village / Sub-village)	Telephone Number	Signature
1	Francisco Pinto	Head of EIA Dep	M	40	Motael / Dom Aleixo	7732-7064	
2	Roberto Belo	P.E (TG)	M	32	Comoro / Dili	77518661	
3	Quirinado Pinto	Env. Eng. (TG)	M	26	Beiro - Pite	77091166	
4	CHALIDA NAROGUDDA	Env Scientist	F	49	TEAM	089-0195099	CHALIDAN.
5	Anghisa Chansila	Socio-Economist & public consultation	F	29	TEAM	088-003-8822	Anghisa C.
6	Budsaba Israngura Na Ayudhya	Public Consultation Specialist	F.	59	TEAM	+66 81 907652e	Budsaba Israngura Na Ayudhya
7	Supichaya Nagchiranut	Environmental Scientist	F.	38	TEAM	+66 89 4765619	Supichaya N.
8	Chaloemchai Nakkhwan	Project Manager	M	36	TEAM	+66 828891199	Chaloemchai
9	SONGSAK BHADDEE	Project Co-ord	M	59	ATT	+66 818251921	SK B
10	Vicente Pinto	TG - Dire	M	45	TG	-	

PUBLIC CONSULTATION MEETING REGISTRATION FORM
ENVIRONMENTAL IMPACT STATEMENT (EIS) STUDY FOR BETANO REFINERY PROJECT

Date..31.....**Month**..March..... **2016** **Time**.10.00a.m.-2.p.m..**at**.Conference..Room,..T.I.M.O.R..G.A.P.,..E.P.....

Sub-Village.....**Village**.....**Sub-District**.....**District**..Dili.....

No.	Name	Position	Sex	Age	Address (Village / Sub-village)	Telephone Number	Signature
1	Filomena Oliveira	Chefe GAB.DGTC	F	43	Rai-na-B-Pite	73393381	
2	Elsa C Viegas	Sof GAB.DGTC	F			7731287	
3	Joao dos Reis	Project. Controller	M		TIMORGAP	7738607	
4	Nolkia Pereira	Env. Engineer	F	–	Timor GAP	78445186	
5	Elvira da silva	Process Eng.	F	–	— a —	77520316	
6	Komsan Vonchai	Geotechnical Eng.	M	26	ATT	+66824908763	
7							
8							
9							
10							

Betano village

4 April 2016: 9.30-12.00 a.m.

Total 93 People

-Local people: 67

-NDE: 2

-Project owner: 17

-Consultant: 7

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data..09.....**Fulan**..Abril..... **2016** **Oras**..9.30-12.00 a.m..**iha**..Sede Suco.....

Aldeia..Bemetan.....**Suku**..Betano.....**Sub-Distritu**...Same.....**Distritu**..Manufahi.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Tomas Cabral	Agricultur	M	60	Bemetan	—	
2	Raimundu T.	A — " —	— " —	35	— " —	—	
3	Domingos Vasconcelos	— " —	— " —	34	— " —	77310351	
4	Henrique Pereira	Chefe Aldeia	m	34	— " —	7771523	
5	Francisco Sarmento	Agricultor	m	63	— " —	—	
6	Joaquim de Jesus	Motorista	M	52	Same / Mi	77262653	
7	Moises Alves	Agricultura	m	1922	— " —	75279917	
8	Francisco magno	Agricultura	m		—		
9	Tito GONZAGA	AGRICULTURA	m	37	— " —	75401173	
10	Domingos Vasconcelos	Agricultor	m	10	Bemetan	— " —	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data..04.....**Fulan**..Abril..... **2016 Oras**..9:30-12.00 AM **iha**...Seak suco.....

Aldeia..Beneteo.....**Suku**..Betano.....**Sub-Distritu**..same.....**Distritu**...Manufahi.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Marcal Bx. Da	Staf Ambiental	M	31	Same Vila	77377134	
2	Fransisco de A.	Agricultor	M	40	Same vila	-	
3	Alegria da Costa J.	Agricultor	M	60	Same vila	75187169	
4	Lourenso	-"-	M	89	Same vila	-	
5	Henrique da S.	-"-	M	40	Same vila	-	
6	Hipolito J.	62 Tahun	M	53	BENETAN	-	
7	Bisanti Timoteo	Liurai	M	62	BENETAN	-	
8	IZOR. A. Miranda	Agricultor	M	61	-"-	-	
9	Joni Pereira	-"-	M	60	-"-	-	
10	Acilolvo Timoteo	-"-	M	52	-"-	-	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data..09.....**Fulan**..Abril..... **2016** **Oras**9:30-12.00 A.M**iha**..Sede...Suco.....

Aldeia..Bemetan.....**Suku**...Betano.....**Sub-Distritu**....Same.....**Distritu**...Manufahi.....

No.	Naran	Pozisaun	Sexu	Timan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Mario Pires	Agricultura	M.	60.	Betano	-11-	
2	Domingos C. Hornai	Agricultura	M	67	Betano	-	
3	Francisco da Costa	Agricultura	M	68	Betano	-	
4	Elias Timau	Veg Veteranu	M	58	Betano	76475899	
5	Mario Noronha	-1-	M	52	Betano		
6	Tiago Pereira	-11-	M	42	Betano		
7	Luis de Araujo	-11-	M	40	-11-	-11-	
8	Ucai Lau Leal	-11-	M	62	-11-		
9	Jose Pereira	Jovem	M	20	-11-	77306383	
10	Joaquim Noronha	Agricultor	M	62	-11-	-11-	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data..09.....**Fulan**..Abril..... **2016 Oras**9.30-12.00 a.m..**iha**..Sede..Suco.....

Aldeia...Bemetan.....**Suku**..Betano.....**Sub-Distritu**..Same.....**Distritu**....Manufahi.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Tomas Da Costa.	Agrikultura	m.	35.	Betano/Raumutu	— " —	
2	Florindo de vicente	Delegado Suku	m	41	Betano / Bemetan	78258652	
3	Armando de Fatima	Comunidade	M	42	Betano / Belitutaci	77266936.	
4	Bdarmino T. Neves	Comunidade	M	43	Bemetan / Betano	77664645	
5	Marcelino J.C.	Comunidade	M	36	Bemetan / Betano	75899301	
6	Florinda Pereira	Comunidade	M	54	BEMETAN	-	
7	Francisco Amoral	Comunidade	M	55	— " —	-	
8	BERO	Comunidade	M	31	— " —	-	
9	PEDRO DE ARAUJO	— " —	M	60	— " —	-	
10	Jose M. Dias	Pdt.	M.	50	Bemetan		

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 09 **Fulan** Abril **2016 Oras** 9:30 - 12.00 a.m **iha** sede suco

Aldeia Bemetan **Suku** Betano **Sub-Distritu** Same **Distritu** Manufahi

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Jacao Selino X d	Agricultor	M	65	Betano / Bemetan	-	
2	Julian d. C.	Agricultor	M	45	Betano / Bemetan	-	
3	Rogerio d.	Agricoltor	M	31	Betano	-	
4	Julião Pereira	agricultura	M	35	Betano	-	
5	Rogerio DC	Agricultura	M	60	Betano	-	
6	~~Agão~~ amigos	Ap. Same	M	50	Same		
7	Daniel Da Costa		M	30	Betano/Bemeta		
8	Moser Pereira		M	50	Betano/Bemeta		
9	~~Pedro da Cruz~~						
10	Evangelino da Costa	Juventude	M	27	Betano / Loro	-	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 04 **Fulan** Abril **2016** **Oras** 9.30-12.00 A.M **iha** Sede Suco

Aldeia Bemetan **Suku** Betano **Sub-Distritu** Same **Distritu** Manufahi

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Mateus Miranda	Agricultur	m.	50	Betano/Bemetan	—	
2	Juliao M. Da Costa	Sekretaris Kpk	m.	26	Betano/Manufahi	75765299	
3	MOISES Pereira			53	Betano Bemetan		
4	Andre Tilman	Agricultor	M.	34	— " —		
5	Silvino Pereira	— " —	M	40	— " —		
6	ENGKI	— " —	M	35	— " —		
7	MARTINHO LOUREIRO	— " —	M	32	— " —		
8	FELIPE Nascimento	Grupo Apetade	M	50	Betano - Soliheosan	77331693	
9	Caniglo de Cort	Funsionariu	M.	50	Betano - Soliheosan	70141401	
10	JUCITO Da Costa	— " —		35	BETANO, BEMETAN	76041281	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 4 **Fulan** Abril **2016** **Oras** 9:30-12:00 a.m. **iha** sede suco

Aldeia Bemetan **Suku** Betano **Sub-Distritu** Same **Distritu** Manufahi

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Benedito Omai	Studante, Arch.	M	28	Betano, Bemetan	77053252	
2	Bosco P. Noronha	Agricultor, And	M	25	Betano Bemetan	76860603	Bosco.
3	Domingos de jesus	— " —	— " —	46	Betano / LURO	—	
4	NASIMENTU DOS REIS	— " —	— " —	28	— " — RAITUSA	—	
5	IDELFONSO "M	— " —		27	—	— " —	
6	Marciano	— " —	M	29	Betano / Bemetan	7733320	
7	Martinho	— " —	M.	49	Betano / Bemeta		
8	João baptista	— " —	M	39	Betano bemetan		
9							
10							

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data....4.....**Fulan** April ..... **2016 Oras** 9.30-12.00a.m. **iha** Sede suco .....

Aldeia Bemetan .....**Suku**.....Betano .....**Sub-Distritu**....Same .....**Distritu**..Manufahi.....

NDE

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	FRANCISCO POTO	HEAD OF EIA DEP	M	40	ANCPA - AGIA	77377069	
2	FRANCISCO CARDOSO	STAFF	M	44	— / —	73525582	
3							
4							
5							
6							
7							
8							
9							
10							

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data..4.....**Fulan**..April..... **2016 Oras**..9.30-12.00a.m..**iha**..Sede suco.....

Aldeia..Bemetan.....**Suku**..Betano.....**Sub-Distritu**..Same.....**Distritu**..Manufahi.....

Project owner

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Vicente Pinto	TG - DIR	M	45	Dili	77147086	
2	Romy Jose B.P	— 11 —	M	32	— 11 —	77985019	
3	Joao Jose Reis	TG - Project Controller	M	33	Dili	77386507	
4	Carmelita Baptista	TG -	F	31	DILI	77963525	
5	Magdalena Viana	Env. Engineer	F	26	DILI	77995210	
6	Quimado Pinto	Env. Engr.	F	26	Dili	77041166	
7	Domingos Elisio	Proc.	M	33	Dili	7723-2694	
8	TITO FRAGA	land Surveyor	M	30	DILI	77235850	
9	ADILIO XIMENES	CIVIL ENGINEER	M	31	DILI	7771367	
10	Manuel Boavida	-	M		Bobai		

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data...4.....**Fulan**.April..... **2016** **Oras**.9.30 - 12.00 a.m.**iha**..Sede Suco.....

Aldeia...Bemetan.....**Suku**...Betano.....**Sub-Distritu**.....Same.....**Distritu**.Manufahi.....

Project owner

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Alberto Da Silva	Community Rela	M	53	Taibitin	-	
2	Manuel Madeira	Community Rela	M	32	Raimea	-	
3	José Conceição	Comm	M	50	Zulo	-	
4	Magdalena Viana	Env Engineer	F	26	Dili / Aimutin		
5	Carmelita M. Baptista	Tenente	F	51	Dili		
6	Domingos ELISIO	Proc.	M	35	Dili		
7	Faustino Corte Real	Sub Proc	M	44	Dili		
8							
9							
10							

PUBLIC CONSULTATION MEETING REGISTRATION FORM
ENVIRONMENTAL IMPACT STATEMENT (EIS) STUDY FOR BETANO REFINERY PROJECT

Date 4 **Month** April **2016 Time** 9.30-12.00 a.m. **at** Sede suco

Sub-Village Bomelau **Village** Betano **Sub-District** Same **District** Manufahi

Consultant

No.	Name	Position	Sex	Age	Address (Village / Sub-village)	Telephone Number	Signature
1	chaloemchai Nakkhwan	Project Manager	Male	39	TEAM	+66 2889 1199	Chaloemchai
2	Supichaya Hongchinsrit	Environmental Scientist	F	38	TEAM	+66 897765419	Supichaya H.
3	Budsaba Issangura Na Ayudhya	Public Participation Specialist	F	51	TEAM	+66 81 409 6522	Budsaba Issangura Na Ayudhya
4	Komsain Yonchai	Geotechnical Eng	M	26	ATT	+66 8A 910 97603	
5	SONGSAK BAADDEE	Proj. Coord	M	59	ATT	+66 81 825 1921	
6	CHALIDA NIBOBUBPA	Senia Env. Scientist	F	49	TEAM.	+66 89 019 5099	CHALIDA N.
7	Anshisa Chansila	socio-Economist & Public Consultation	F	29	TEAM	+668800388822	Anshisa C.
8							
9							
10							

Meeting at Hatu-udo, Ainaro

5 April 2016: 9.30-12.00 a.m.

Total 73 People

-Local people: 47

-NDE: 2

-Project owner: 17

-Consultant: 7

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 5 **Fulan** April **2016** **Oras** 9:30 - 12:00 a.m **iha** Hatu-udo

Aldeia bdos & bonuc **Suku** Fohoailico & Leolima **Sub-Distritu** Hatu-udo **Distritu** Ainaro

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Albertino de Araujo	Administrador	M	36	Ainaro/Natarbora	77869064	
2	FRANCISCO BARROS	ADJUNTO	M	51	Ainaro villa	77304100	
3	ELDA F. DE ARAUJO	DIRECTORA	F	30	AINARO VILLA	78443929	
4	Jeferino G.M.	Rep. Directo	M	52	Ainaro villa	77287589	
5	Lucio R. Ribeiro	Director Mgp.	M	40	Ainaro	78592723	
6	Rui vo. B. Magno	STAFF ADM	M	34	Ainaro	77441038	
7	Alcina O. J. da Cruz	Estudante	F	20	Ainaro	78527303	
8	Anabela B. Maria	Studante	F	28	Ainaro	77652541	
9	Delia da Cunha Martins	Studante	F	22	Ainaro	78080926	
10	Cegmo Jolino	OSC Hako...da M.	M	40.	Leo-Lima, Natarbora	77347945	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 5 **Fulan** April **2016 Oras** 9.30 - 12.00 a.m. **iha** Hatu - udo

Aldeia Bobe & Bonuc **Suku** Foho Ailico & Leolima **Sub-Distritu** Hatu - udo **Distritu** Ainaro

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Tomas Salvador	Xefe Aldeia	M	38	Leo-Lima / Hatu-udo	-	
2	Bartolomeu de A.	komunidade	M	37	Leo-Lima - Ainaro		
3	Delfim Maia de Araújo	Asst. Operador/MAE	M	36	Ainaro	77282432	
4	Clarimundo de Araújo	Staff MAE	M	47	Leo-Lima, Hatu-udo	77430132	
5	Domingos de Araújo	komunidade	M	29	Luro, Leo-Lima		
6	Daniel Gomes	-	M	59	Dan-Luro, Leo-Lima		
7	Zeferino de Oliveira	Off. MAP	M	46	Beikala / Foho-ailico	77416686	
8	Miguel Maia Pereira	Comunidade	M	40	Daerdas Leo-Lima	76238121	
9	Elias de Jesus	Chefe Os. Hu.	M	45	Aldeia Foho Ailico	77320995	
10	Paulo Soares	DNSOP	M	35	Ainaro	78337235	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU

EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data..5.....**Fulan**.April..... **2016 Oras**9:30-12.00 a.m.**iha**..Hatu-udo.....

Aldeia.Bobe & Bonuc...**Suku**.Foho Ailico & Leolima.....**Sub-Distritu**..Hatu-udo.....**Distritu**..Ainaro.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Fidelino Araujo	chefe Aldeia	M	44	foho Ailico	76491988	
2	EDUARDO SOARES	PNTL SIP	M	44	Foho Ailico/Ailoro	75564286	
3	Estevino J. de Araujo	Sec. Dez. Comunitario	M	30	Hato-udo, Leo-Lima	77348469	
4	Mariano de Alm.	Chefe Suco Leo-Lima	M	50	Hut-seo, Leo-Lima	78442912	
5	Almerindo Camões	Kom. Bonuke	M	62	Hut-seo	—	
6	Daniel Salvador	Xefe Aldeia	M	43	Leosa Leo-Lima	75518782	
7	Lafosa Alves	Sansur	M	67	Dansuru Leo-Lima		
8	Aniceto H. G. Alves	AIMER/EU	M	39	AIMER/EU	75481242	
9	Joaninho da C. Araujo	AP. Hato udo	M	50	Hato-udo	77304112	
10	MARTINHO B. D	Xefe OPS	M	36	Ainaro	77525965	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 5 **Fulan** April **2016** **Oras** 9.30-12.00a.m **iha** Hatu-udo

Aldeia Bobe & Bonuc **Suku** Fohe Ailico & Leolima **Sub-Distritu** Hatu-udo **Distritu** Ainaro

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Crispin Pe Loiola	Com ES7	M	37anos	Hato-udo	77367591	
2	BERNARDINO X.	M. VETERANOS	M.	41 ANOS	Hato-udo	77775965	
3	Aniceto Jaques	Motorista.	M	38 Anos	Hato-udo	77563083	
4	Silvano de [illegible]	ATTA	M	42	AINARO	77262753	
5	Valdemiro Vicente	PNTL	M	34	Hato-udo	77775635	
6	Carolino da M. Pereira	Comandante	m		Ainaro		
7	Moises da Silva magno	Jovenellen	M	24	Ainaro	77094577	
8	Mario da Costa	Staf Statistik	M	25	Hato-udo	77335565	
9	Silveiro Pereira	Seguransa sivil	M	25	Ainaro		
10	João Amaral	#Juventude	M	23	Ainaro	77356814	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 5 **Fulan** April **2016** **Oras** 9:30 - 12.00 a.m **iha** Hatu-udo

Aldeia Bobe & Bonuc **Suku** Foho Ailico & Leolima **Sub-Distritu** Hatu-udo **Distritu** Ainaro

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	TOMAS AQUINO DA S. DEO	CONDUTOR ADM	M	26	AINARO	76220143	
2	SABINO PEREIRA	COMUNIDADE	M	57	HATO-UDO		
3	FRANSISCO VICENTE	COMUNIDADE	M	60	HATO-UDO		
4	VALENTINO ALVES	COMUNIDADE	M	61	HATO-UDO		
5	Tomas Alves	Comunidade	M	32	Bobe		
6	Manuel Pereira	Comunidade	M	30	BOnuc		
7	Lucas Tilman	Comunidade	M	35	Bobe		
8							
9							
10							

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 5 **Fulan** April **2016** **Oras** 9.30 - 12.00 a.m. **iha** Hatu-udo

Aldeia Bobe & Bonuc **Suku** Fohoailico & Leolima **Sub-Distritu** Hatu-udo **Distritu** Ainaro

NDE

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Francisco POTO	Head of ea Def	M	40	ANCPA - Acis	77327064	
2	Francisco Cano	STAF	M	49	—"—	73523582	
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FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 5 **Fulan** April **2016 Oras** 9.30-12.00 a.m. **iha** Hatu-udo

Aldeia Bobe & Bonuc **Suku** Foho Ailico & **Sub-Distritu** Hatu-udo **Distritu** Ainaro

Project owner Leolima

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Vicente Pinto	TG - DIV	M	45	Dili	77147086	
2	Romy Joao BP	— 1 —	M	34	— 11	77385079	
3	Joao dos Reis	TG - Project Coordinator	M	33	Dili	7738 6507	
4	Carmelita Baptista	TG -	F	31	DILI	77763525	
5	Magdalena Viana	Env. Engineer	F	26	Dili	77395210	
6	Quimando Pinto	Env. Sup.	F	26	Dili	77411166	
7	Domingos Eligio	Proc.	M	33	Dili	7723-2694	
8	TITO FRAGA	land Surveyor	M	30	Dili	77235850	
9	ADILIO XIMENES	CIVIL ENGINEER	M	31	DILI	7771367	
10	Manuel Boavida	- 1	M	[illegible]	Dili		

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 5 **Fulan** April **2016 Oras** 9.30-12.00 a.m **iha** Hatu-udo

Aldeia Bebe & Bonuc **Suku** Foho Ailico & **Sub-Distritu** Hatu-udo **Distritu** Ainaro

Project owner Leolima

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Alberto Da Silva	Community	M	33	Tashilin	-	
2	Manuel Madeira	Community	M	37	Raimea	-	
3	Jose Conceicao	Comm	M	50	Zulo	-	
4	Magdalena Viana	Env Engineer	F	26	Dili / Manatuto		
5	Carmelita M. Baptista	Tenis	F	31	Dili		
6	Domingos ELISITO	Proc.	M	35	Dili		
7	Francisco Costa	Shipping	M	44	Dili		
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PUBLIC CONSULTATION MEETING REGISTRATION FORM
ENVIRONMENTAL IMPACT STATEMENT (EIS) STUDY FOR BETANO REFINERY PROJECT

Date 5 **Month** April **2016** **Time** 9.30-12.00 a.m. **at** Hatu-udo

Sub-Village Bobe & Benuc **Village** Foho Ailico & **Sub-District** Hatu-udo **District** Ainaro

Consultant Leolima

No.	Name	Position	Sex	Age	Address (Village / Sub-village)	Telephone Number	Signature
1	chaloemchai Nakkhwan	Project Manager	Male	35	TEAM	+66 2880 1178	Chaloemchai
2	Supichaya Hongchinsrit	Environmental Scientist	F	38	TEAM	+66 894765417	Supichaya H.
3	Budsaba Issaranura Na Ayudhya	Public Participation Specialist	F	51	TEAM	+66 81 909 65 22	Budsaba Issaranura Na Ayudhya
4	Komsan Yonchai	Geotechnical Eng	M	26	ATT	+66 84 910 9763	
5	SONGSAK BUADDEE	Proj. Coord	M	59	ATT	+66818251521	
6	CHACIDA AVIROBURA	Senior Env. Scientist	F	49	TEAM.	+66890195099	CHACIDA N.
7	Anshisa Chansila	Socio-Economist & Public Consultation	F	29	TEAM	+66880038822	Anshisa C.
8							
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Cassa village

6 April 2016: 10.00-12.00 a.m.

Total 78 People

-Local people: 52

-NDE: 2

-Project owner: 17

-Consultant: 7

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data...6.....**Fulan**..April..... **2016** **Oras**9.30 - 12.00am**iha**..sede suco cassa.....

Aldeia.Mausuka.....**Suku**..Cassa.....**Sub-Distritu**..Ainaro.....**Distritu**..Ainaro.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Cesalino do Amaral	Chefe Aldeia	M	60	Suco Cassa, Mausuka	77804761	
2	Saturnino Cosme	Comandante	M	75	— " —		
3	Aleixo de Carvalho B.	Chefe de Suco	M	45	Laylima, Cassa	77054628	
4	Ostalina da Silva	PAAS	F	32	Gussamau, Cassa	77342218	
5	Venancio Ricardo	Comunidade	M	45	Cassa, Cassa	—	
6	Antonio Bonito	Comunidade	M	55	Cassa, Laylima	—	
7	Nocius da Silva Magno	Comunidade	M	29	Suco	77099577	
8	Lourenco de Araujo	comunidade	M	60	Cassa, Mausuka	—	
9	Gilberto Lopes	— " —	M	60	Cassa, Bobonaro	—	
10	Alipio Amaral	— " —	M	42	Cassa, Laylima	—	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data...6.....**Fulan**.April..... **2016 Oras**.9.30-12.00 a.m..**iha**..Sede suco cassa.....

Aldeia.Mausuka.....**Suku**..Cassa.....**Sub-Distritu**..Ainaro.....**Distritu**...Ainaro.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Antonio Da Costa	Comunidade	M	62	cassa, Betano	—	
2	Regino Lopes	comunidade	M	60	Cassa, Ainaro	—	
3	Joao Barros	—	M	35	Cassa, Ainaro	—	
4	Marcelino Lopes	—	M	56	Cassa, Betano	—	
5	Agostinho Da Silva	—	M	47	Cassa, Ainaro	—	
6	Faustino O.	—	M	26	Cassa, Ainaro	—	
7	Filomeno X.	—	M	45	Cassa, Ainaro	—	
8	ELDA F. DE ARAUJO	DIRECTORA	F	30	AINARO VILLA	78443929	
9	Aleina C. J. da cruz	Estudante	F	20	Ainaro Villa	78527303	
10	Lélia da Cunha M	Estudante	F	25	Ainaro	78080926	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data...6.....**Fulan** Abril ..... **2016** **Oras** 9.30-12.00 a.m. **iha** Sede suco cassa

Aldeia Mausuka ..... **Suku** Cassa ..... **Sub-Distritu** Ainaro ..... **Distritu** Ainaro .....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Belina Xavier	—11—	f	24	Ainaro vila.	78080763	
2	Marcelina M.S De Araujo	—11—	f	23	Ainaro Vila	78121102	
3	Natanzel M.M. Aleixo	—11—	M	23	Ainaro Vila	78416092	
4	Sidalia M.M. de orleans	—11—	F	20	Ainaro vila	78555126	
5	Lucio R. Ribeiro	diretor	M	40	Ainaro	73727237	
6	Umardi Magno	Dc. do posto	M	27	Ainaro	78409713	
7	Joserino de Braco	komunidade	M	68	Cassa	—	
8	Miguel Ximenes	komunidade	M	60	Cassa	—	
9	Justino de Araujo	komunidade	M	69	Cassa	—	
10	Agustinho Lopes	comunidade	M	64	Cassa	—	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data....6.....**Fulan**.April..... **2016** **Oras**.9.30-12.00 a.m..**iha**..Sede suco cassa.....

Aldeia.Maubuka.....**Suku**...cassa.....**Sub-Distritu**..Aimaro.....**Distritu**.Aimaro.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Jose Corte Real	Ops. Suco	M.	45	Cassa/Faulata	77390894	
2	Filomeno	Comunidade	m	46	Cassa		
3	Rogerio Bonco	—11—	m	44	Cassa		
4	Elias Pereira		M	47	—11—	77275809	
5	EVANGELINO GOMES	Agricultura	M	50	CASSA		
6	SANCHO LOPES	—11—	M	40	—11—		
7	Americo Maria	—11—	M	50	—11—	—	
8	Lucio Tito Barros	—11—	M	38	—11—	—	
9	MAS OMEM	—11—	M	40	—11—	—11—	
10	Luis Dasilva	PNTL	M.	45.	—11—	76749861	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data...6.....**Fulan**.April..... **2016** **Oras**.9.30-12.00 a.m..**iha**.Sede suco Cassa.....

Aldeia.Mausuka.....**Suku**.Cassa.....**Sub-Distritu**.Ainaro.....**Distritu**.Ainaro.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Carlos C- do Rego	Exfuncionario	M	42	Cassa	76368400.	
2	Domingos Lopes	Agricultor	M	38	Cassa		
3	Mario Magno	Agricultor	M	36	Cassa.	77447219	
4	Sebastião Gomes	— 11 —	M	42	Cassa	78240287	
5	Abelino de Araujo	— 11 —	M	64	Cassa		
6	JOSE MAGNO PEREIRA	AGRICULTURA	M	48	CASSA	77286415	
7	MONICA LOPES.	AGRICOTOR	F	41	Casa.		
8	Luis Da Silva	PNTL	M.	45	Cassa	76749861	
9	Albino de ARAUJO	chefi Aldeia	M	68	Cassa	78254547	
10	Lino C/ Araujo	— 11 —	M	46	Cassa	75837181	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data...6.....**Fulan**...April..... **2016** **Oras**...9.30-12.00 a.m...**iha**...SEDE Suco CASSA.....

Aldeia..MAUSUKA...**Suku**...Cassa.....**Sub-Distritu**..AUBARO.....**Distritu**..Aineiro.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Alicia Caldas	comunidade	F	27	Suku cassa Vatuvou		
2	Jose Soares da Cruz	— " —	M	38	— " —		
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FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 6 **Fulan** April **2016** **Oras** 9.30-12.00 a.m. **iha** Sede suco Cassa

Aldeia Mausuka **Suku** Cassa **Sub-Distritu** Aimaro **Distritu** Aimaro

NDE

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Francisco POTU	Head of EIA Dep	M	40	ANCPA - Aileu	77327069	
2	Francelino Cardoso	Staff	M	99	— / —	73523582	
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FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 6 **Fulan** April **2016 Oras** 9.30-12.00 a.m **iha** Sede suco Cassa

Aldeia Mausuka **Suku** Cassa **Sub-Distritu** Ainaro **Distritu** Ainaro

Project owner

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Vicente Pinto	TG - DIV	M	45	Dili	77497086	
2	Rosy Jose B.P	— 11 —	F	31	— 11 —	77885029	
3	Joao Jose Reis	TG - Project Controller	M	33	Dili	7738 6507	
4	Carmelita Baptista	TG -	F	31	DILI	77963525	
5	Madalena Viana	Env. Engineer	F	26	Dili	77495210	
6	Quirmado Pinto	Env. Eng.	F	26	Dili	77491166	
7	Domingos Elisio	Proc. -	M	33	Dili	7723-2694	
8	TITO FRAGA	land Surveyor	M	30	DILI	77235850	
9	ADILIO XIMENES	CIVIL ENGINEER	M	31	DLI	7771 367	
10	Raimundo Boavida	- 1	M	45	Dili		

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data....6.....**Fulan**.April..... **2016 Oras**.9.30-12.00a.m..**iha**.Sede suco Cassa.....

Aldeia.Mausuka.....**Suku**.....Cassa.....**Sub-Distritu**..Ainaro.....**Distritu**..Ainaro.....

Project owner

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Alberto Da Silva	Community	M	53	Tashilin	-	
2	Manuel Madeira	Community	M	37	Raimea	-	
3	Jose Conceicao	Comm	M	50	Zulo	-	
4	Magdalena Viana	Env Engineer	F	26	Dili / Timorlesta		
5	Carmelita M. Baptista	Intern	F	31	Dili		
6	Domingos ELISITO	Proc.	M	35	Dili		
7	Franclino Corte-Real	Subdistrict	M	49	Dili		
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PUBLIC CONSULTATION MEETING REGISTRATION FORM
ENVIRONMENTAL IMPACT STATEMENT (EIS) STUDY FOR BETANO REFINERY PROJECT

Date 6 **Month** April **2016 Time** 9.30-12.00 a.m. **at** Sede suco cassa

Sub-Village Mausuka **Village** Cassa **Sub-District** Ainaro **District** Ainaro

Consultant

No.	Name	Position	Sex	Age	Address (Village / Sub-village)	Telephone Number	Signature
1	chaloemchai Nakkhwan	Project Manager	Male	35	TEAM	+66 2889 1198	chaloemchai
2	Supichaya Hongchinarit	Environmental Scientist	F	38	TEAM	+66 874765819	Supichaya H.
3	Budsaba Issangura Na Ayudhya	Public Participation Specialist	F	34	TEAM	166 81 904 6522	Budsaba Issangura
4	Komgain Yonchai	Geotechnical Eng.	M	26	ATT	+66 84 910 9703	
5	SONGSAK BAADDEE	Fms. Corp	M	59	ATT	+668 1825 1921	
6	CHALIDA KVIBOBURA	Senia Env. Scientist	F	49	TEAM.	+66990195099	CHALIDA N.
7	Anshisa Chansila	Socio-Economist & Public Consultation	F	29	TEAM	+66880038822	Anshisa C.
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Suai sub-district

7 April 2016: 9.30 a.m.

No attendance

Remark:

-Informed project details, impact & mitigation measures to chief of villages 3.00-5.00 p.m. at their villages

-Informed way to contact & send feedback from villagers to TIMOR GAP, E.P.

Zumalai sub-district

8 April 2016: 9.00-12.00 a.m.

Total 49 People

-Local people: 23

-NDE: 2

-Project owner: 17

-Consultant: 7

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data..8.....**Fulan**..April..... **2016 Oras**..9.30-12.00 a.m.....**iha**..SALÃO NOBEL DA PAZ.....

Aldeia..Leogol.....**Suku**..ZULO.....**Sub-Distritu**..ZUMALAI.....**Distritu**..COVALIMA.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Rosita de Jesus	membrus	F		Zulo / Obucmil	78633477	
2	Miguel dos Santos	membrus	M		Zulo / Obugimi		
3	Alipio Noronha	membrus	M		Zulo/Obugmil		
4	Jaime Barreto	— " —	M		Zulol Lale		
5	Felisiano Borges	— " —	M		Zulo L lale		
6	Estagnio Barreto	— " —	M		Zulo leogol	75552242	
7	Abrão Tilman	— " —	m		Zulo Lale		
8	Gregorio S. Kchi	— " —	m	1995	Zulo Obugmil		
9	Celia monie	— " —	F		Zulo Obugmil		
10	Kalistro Tilman	— " —	m		Zulo TPZ		

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 8 **Fulan** April **2016 Oras** 9.30-12.00 a.m **iha** Salão Nobel Da Paz

Aldeia Leogol **Suku** Zulo **Sub-Distritu** Zumalai **Distritu** Covalima

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Ficomino do santos	membros	m	68	Zulo Taz		
2	Romeo Magno	membros	m	55	Lour		
3	David do santos	membros	m	1996	Zulo Obrigmil		
4	Franciscu M	membros	F		Zulo Zuz		
5	Virgilio Ferreira	Chefe Aldeia	M	1963	Zulo Obrigmil		
6	Jerema Sumes	membros	F		Zulo leogol		
7	Jorge ferreira	Chefe Sulo	M		Raimea		
8	Alexandre Pereira	Chefe Suco	M	1964	Taz-Hilin	77344528	
9	FLAVA - S	Komunidade	F		Zulo		
10	Matias Sequeira	Membro	M	70	Zulo	— —	

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data....8.....**Fulan**..April..... **2016 Oras**..9.30-12.00am..**iha**..Salão Nobel Da Paz.....

Aldeia..Leogol.....**Suku**..Zulo.....**Sub-Distritu**..Zumalai.....**Distritu**..Covalima.....

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Clarêncio do Nascimento	Funcionário	M	40	Caleitas / Zumalai		
2	Carlos Faraina	Chefi Aldeia	M	35	Zulo		
3	Alberito D. Nascimento	Seguransa Enspp	M	35	Zulo		
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FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 8 **Fulan** Apsil **2016 Oras** 9:30 - 12.00 a.m. **iha** Salão Nobel Da Paz

Aldeia Leogol **Suku** Zulo **Sub-Distritu** Zumalai **Distritu** Covalima

NDE

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Francisco Potu	Head of EIA Dep	M	40	ANCPIA - MCIA	7737064	
2	Francelino Caldas	Staff	M	44	—— / ——	73523582	
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FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data 8 **Fulan** April **2016** **Oras** 9.30-12.00 a.m. **iha** Salão Nobel Da Paz

Aldeia Leogol **Suku** Zulo **Sub-Distritu** Zumalai **Distritu** Covalima

Project owner

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Vicente Pinto	TG - DIR	M	45	Dili	77147086	
2	Romy Jose B.P	— 1 —	M	34	— 11	77886219	
3	Joao dos Reis	TG - Project Co-ordinator	M	33	Dili	77386507	
4	Carmelita Baptista	TG	F	31	DILI	77963525	
5	Madalena Viana	Env. Engineer	F	26	Dili	77195210	
6	Quimado Pinto	Env. Sup.	F	26	Dili	77071166	
7	Domingos Elicito	Proc.	M	33	Dili	7723-2694	
8	TITO FRAGA	land Surveyor	M	30	DILI	77235850	
9	ADILIO XIMENES	CIVIL ENGINEER	M	31	DILI	7779367	
10	Emanuel Boavida	- 1	M	35	Bidau		

FORMULARIU REJISTRASAUN BA SORUMUTU KONSULTASAUN PUBLIKU
EVALUASAUN IMPAKTU AMBIENTAL BA PROJEITU REFINARIA BETANO

Data....8.....**Fulan**.April..... **2016 Oras**9.30-12.00 a.m.**iha**.Salão Nobel Da Paz.....

Aldeia.Leogol.....**Suku**.....Zulo.....**Sub-Distritu**.....Zumalai.....**Distritu**.....Covalima.....

Project owner

No.	Naran	Pozisaun	Sexu	Tinan	Hela Fatin (Suku / Aldeia)	Numeru Telefone	Asinatura
1	Alberto Da Silva	Community Rel	M	33	Tashilin	-	
2	Manuel Madeira	Community Rel	M	32	Raimea	-	
3	João Conceição	Comm	M	50	Zulo	-	
4	Magdalena Viana	Env Engineer	F	26	Dili / Aimutin		
5	Carmelita M. Baptista	Interp	F	31	Dili		
6	Domingos ELISITO	Proc.	M	35	Dili		
7	Francisco Costa	Staff Medio	M	44	Dili		
8							
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PUBLIC CONSULTATION MEETING REGISTRATION FORM
ENVIRONMENTAL IMPACT STATEMENT (EIS) STUDY FOR BETANO REFINERY PROJECT

Date 8 **Month** April **2016 Time** 9.30-12.00 a.m. **at** Salão Nobel Da Paz

Sub-Village Leogol **Village** Zulo **Sub-District** Zumalai **District** Covalima

Consultant

No.	Name	Position	Sex	Age	Address (Village / Sub-village)	Telephone Number	Signature
1	chaloemchai Nakkhwon	Project Manager	Male	35	TEAM	+66 2889 1198	chaloemchai
2	Supichaya Hongchinawit	Environmental Scientist	F	38	TEAM	+66 894765619	Supichaya H.
3	Budsaba Issangura Na Ayudhya	Public Participation Specialist	F	34	TEAM	+66 819096522	Budsaba Issangura Na Ayudhya
4	Komsain Yonchai	Geotechnical Eng.	M	26	ATT	+66 824904763	
5	SONGSAK BAADDEE	Proj. Coord	M	59	ATT	+6681825 1921	
6	CHALIDA KVIEOBUBPA	Senior Env. Scientist	F	49	TEAM.	+66890195099	CHALIDA K.
7	Anshisa Changila	Socio-Economist & Public Consultation	F	29	TEAM	+66880038822	Anshisa C.
8							
9							
10							

APPENDIX 13C

PRESENTED SLIDES AND POSTER IN THE CONSULTATION MEETINGS

Slide Presentation

For

Government Officials and NGO

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) STUDY FOR BETANO REFINERY PROJECT IN TIMOR-LESTE

31 March 2016

10:00 a.m. – 02:00 p.m.

1

OUTLINE OF PRESENTATION

- EIA Objectives
- Methodology
- Project Information
- Existing Environmental Condition
- Environmental and Social Impact Assessment, Mitigation Measure and Monitoring Program
  - Pre-Construction Phase
  - Construction Phase
  - Operation Phase
  - Deactivation Phase

2

EIA OBJECTIVES

To prepare environmental management plan (EMP) to minimize environmental impact during pre-construction, construction, operation and deactivation phase based on comprehensive environmental impact assessment covering Physical Components, Ecological Components, Economic Components, Social Components and Cultural Components

3

METHODOLOGY

- Study the existing environmental conditions around the project area
- Review the project features
- Identify and quantify the potential negative impacts and positive impact from the proposed project with respect to the environment (physical, ecological, economic, social, and cultural)
- Propose prevention, mitigation measures and monitoring program

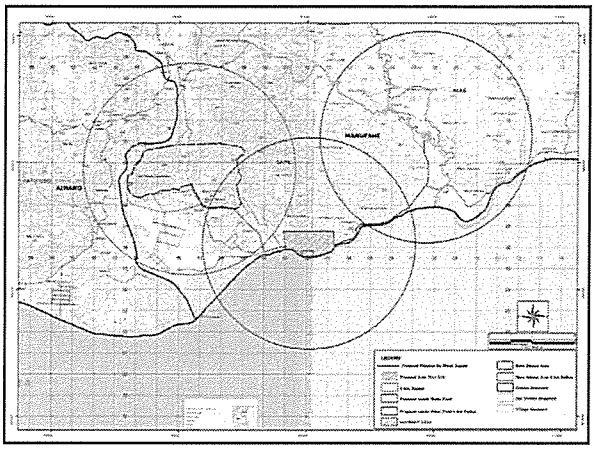
4

PROJECT BACKGROUND

The project comprises of two (2) components :

1. Component 1 for the Betano Refinery, Nova Betano and the Water Supply System, all located in Betano Area, and
2. Component 2 is the Condensate Pipeline to transport the refinery products from Betano Refinery to Suai Supply Base.

5



BETANO REFINERY

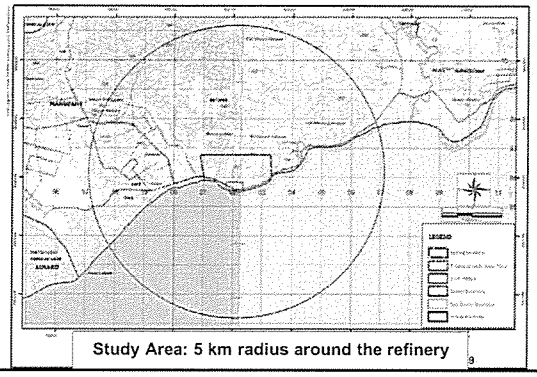
7

PROJECT INFORMATION

- **Location:** Betano Village, Same Sub-district, Manufahi District
- **Area:** 230 hectares between the new proposed highway and the southern coastal line
- **Capacity of the refinery:** 30,000 barrels of condensate per day
- **Product:** Diesel, Heavy and Light Naphtha, Gasoline & LPG
- **Project objective:** Domestic supply-demand and exportation of remaining products

8

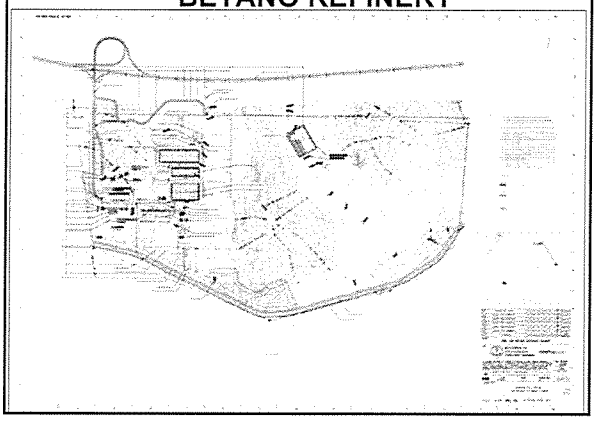
BETANO REFINERY



Study Area: 5 km radius around the refinery

9

BETANO REFINERY



REFINERY



11

OIL STORAGE TANK



12

AUXILIARY FACILITIES



13

WATER STORAGE POND



14

WASTE WATER TREATMENT SYSTEM



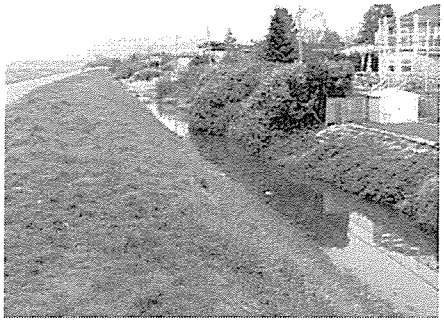
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DRAINAGE SYSTEM



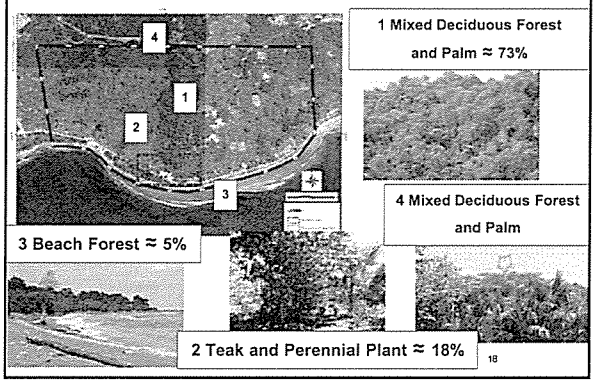
16

WAVE PROTECTION STRUCTURE



17

EXISTING LAND USE



18

NOVA BETANO

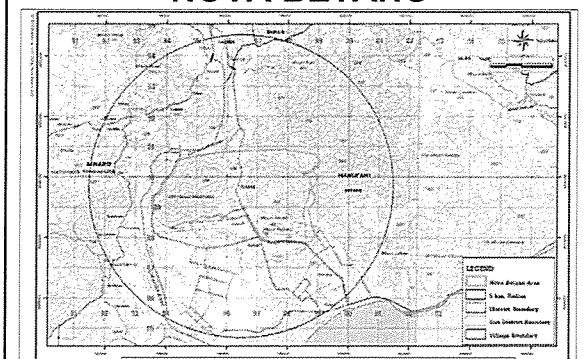
19

PROJECT INFORMATION

- **Location:** Approximately 5 km to the north of Betano village and adjacent to the Caraulun River (to the west)
- **Area:** Cover 1,190 Ha of land where Nova Betano is separated into two areas, Nova Betano West and Nova Betano East, by north-south road from Same towards the southern shoreline.
- **Project objective:** To establish Petroleum Administration City, resettlement site of relocated households from refinery construction and residence for staff of refinery

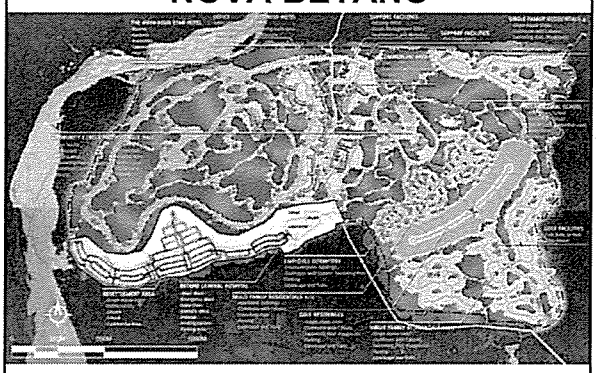
20

NOVA BETANO



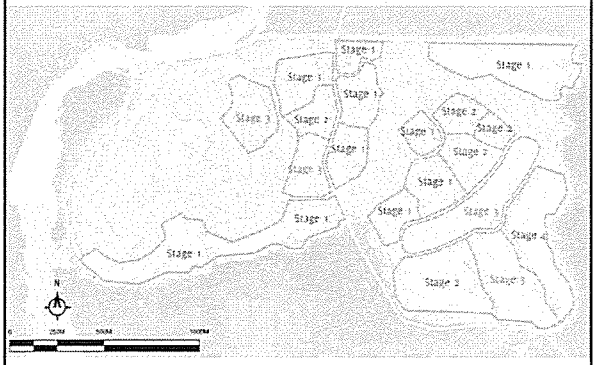
Study Area: 5 km radius around the site

NOVA BETANO



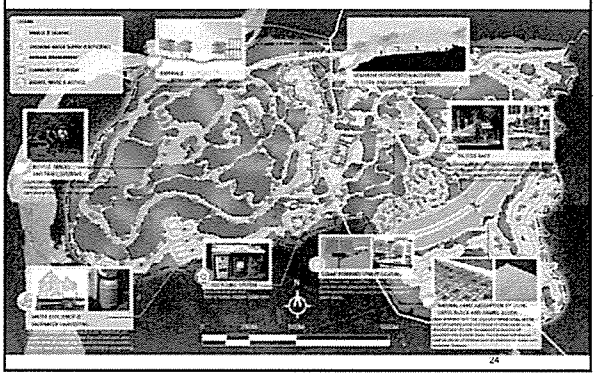
22

STAGING PLAN



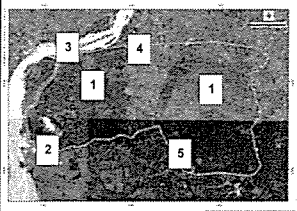
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SUSTAINABLE AND GREEN DEVELOPMENT

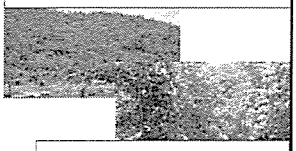


24

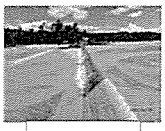
EXISTING LAND USE



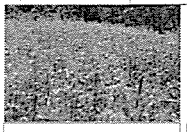
1 Mixed Deciduous Forest ≈ 70%



2 Teak and perennial plant



3 Irrigation



4 Field crop ≈ 3.6%



5 Residential area ≈ 0.5%

WATER SUPPLY SYSTEM

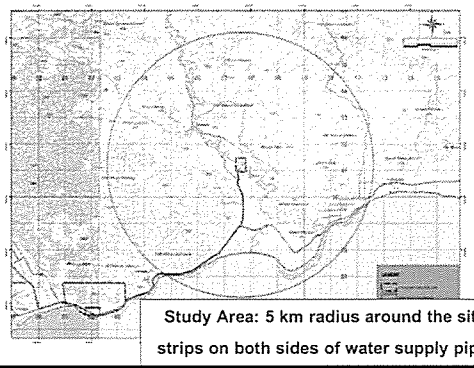
26

PROJECT INFORMATION

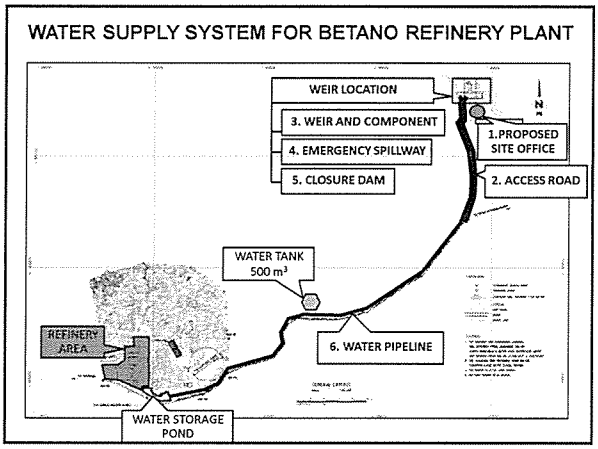
- **Location:** Weir is located about 10 km. to the northeast of the refinery
- **Length of water pipeline:** Approximately 10 km. (ϕ 250-280 mm)
- **Capacity:** 40,000 cu.m for weir
- **Project objective:** To provide the raw water feedstock which will be used to produce the reverse osmosis (RO) water for other general uses such as Boiler Feed water, Demineralized water, Potable water etc.

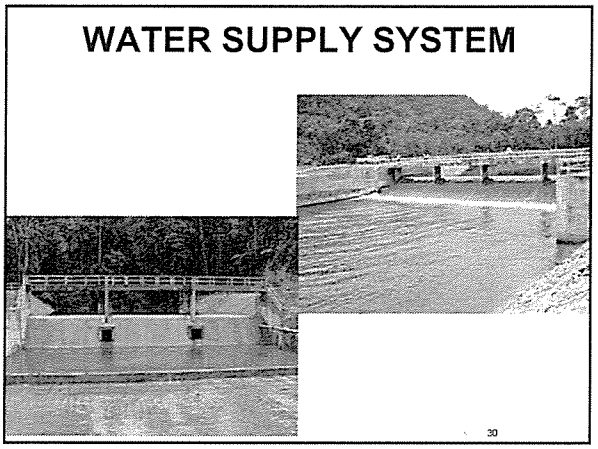
27

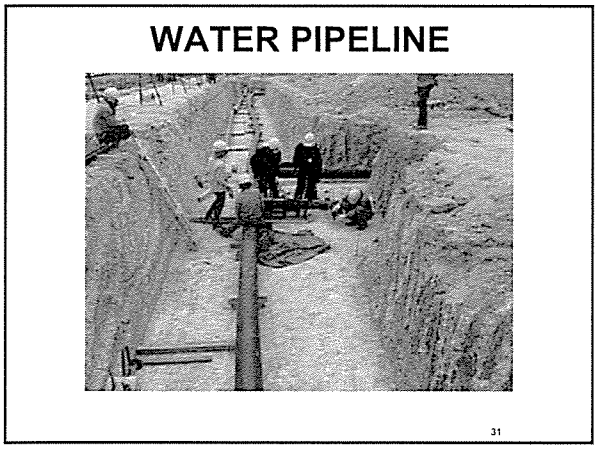
WATER SUPPLY SYSTEM

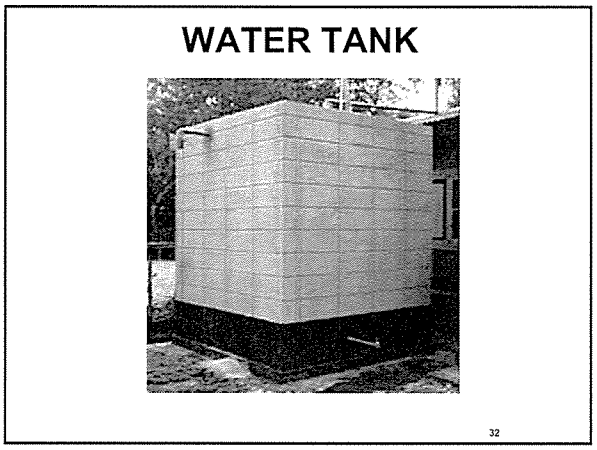


Study Area: 5 km radius around the site and 50 m strips on both sides of water supply pipeline route


WATER SUPPLY SYSTEM FOR BETANO REFINERY PLANT
WEIR LOCATION
3. WEIR AND COMPONENT
4. EMERGENCY SPILLWAY
5. CLOSURE DAM
1. PROPOSED SITE OFFICE
2. ACCESS ROAD
WATER TANK 500 m3
REFINERY AREA
6. WATER PIPELINE
WATER STORAGE POND


WATER SUPPLY SYSTEM
30


WATER PIPELINE
31

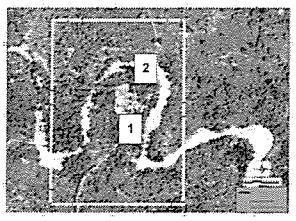

WATER TANK
32

WATER STORAGE POND



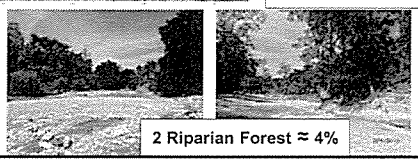
33

EXISTING LAND USE





1 Mixed Deciduous Forest, and Palm ≈ 96%



2 Riparian Forest ≈ 4%

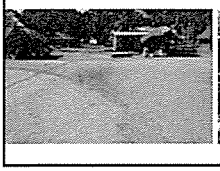
34

EXISTING ENVIRONMENTAL CONDITION

- Physical Components
- Ecological Components
- Economic Components
- Social Components
- Cultural Components









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CLIMATE & METEOROLOGICAL

- The study areas display a typical tropical monsoonal climate
- There are 2 seasons, wet season; start from December to July and dry season from August to November.
- The average temperature range of 23.8-28.1 °C.
- The relative humidity range of 73.3-85.6 %
- The average wind speed range of 0.5-1.3 m/sec.
- The average annual rainfall is 1,494 mm/year.

Source: Meteorological data during 2004-2015 of Betano Weather Station, Ministry of Agricultural, 2016.

36

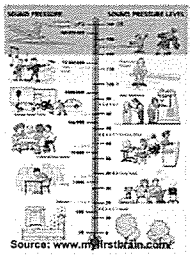
AMBIENT AIR QUALITY

- Most of Study area is residential, food crop, and un-developing area.
- The primary air pollutants is Particulate Matter (PM) or dust which cause by vehicular traffic.
- PM10 is approximately 25-27 ug/m^3 less than the 24-hr average of WHO and NEPM guidelines, and U.S. EPA. standard, which 50 and 150 ug/m^3, respectively.
- Other air pollutions, i.e. NO_x, SO_x are less than the limit of reporting.

Source: Tasi Mane Project - Betano Petroleum Refinery and Beaco LNG Plant, Strategic Environmental Impact Statement, Final Report, 2012.

37

NOISE

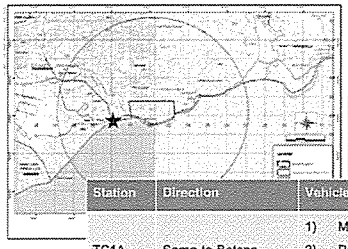


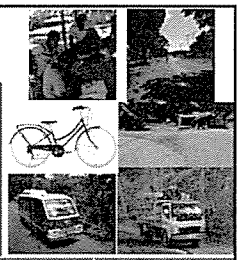
- Most of Study area is residential, food crop, and un-developing area.
- The primary source of noise is vehicular traffic.
- L_{Aeq} is range of 45.5-62.4 dB

Source: Tasi Mane Project - Betano Petroleum Refinery and Beaco LNG Plant, Strategic Environmental Impact Statement, Final Report, 2012.

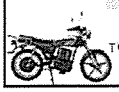
38

TRAFFIC SURVEY





Station	Direction	Vehicles	Traffic condition
TC1A	Same to Betano	1) Motorcycle 2) Passenger car 3) Light truck	Very good traffic flow
TC1B	Betano to Selihasan	1) Motorcycle 2) Bicycle 3) Light truck	Very good traffic flow



COASTAL WATER QUALITY FOR BETANO REFINERY PROJECT

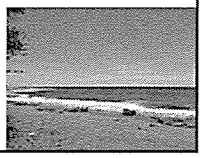
- The concentrations of dissolved oxygen (6.11-6.62 mg/L) are in range of Indonesia Marine Water Quality Standards (2004).
- pH levels (7.9-8.1) are in range of National Recommended Water Quality Criteria (US EPA, 2009).
- Heavy metal together with organic contamination are within Indonesia Marine Water Quality Standards (2004) and National Recommended Water Quality Criteria (US EPA, 2009).
- Coastal water quality is suitable for coastal ecosystem.

Source: Tasi Mane Project - Betano Petroleum Refinery and Beaco LNG Plant, Strategic Environmental Impact Statement, Final Report, 2012.



MARINE WATER QUALITY FOR BETANO REFINERY PROJECT

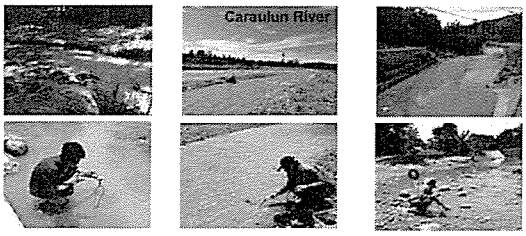
- The concentrations of dissolved oxygen (5.87-6.64 mg/L) are within Indonesia Marine Water Quality Standards (2004)
- pH levels (8.0-8.1) are in range of National Recommended Water Quality Criteria (US EPA, 2009)
- Heavy metal together with organic contamination are below Indonesia Marine Water Quality Standards (2004) and National Recommended Water Quality Criteria (US EPA, 2009)
- Marine water quality is suitable for marine ecosystem.



Source: Tasi Mane Project - Betano Petroleum Refinery and Beaco LNG Plant, Strategic Environmental Impact Statement, Final Report, 2012.

SURFACE WATER QUALITY

Betano Refinery Project **NOVA Betano Project** **Water Supply System Project**

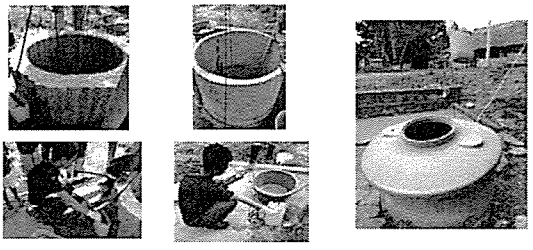


The water quality of the rivers is within the standards and can be used as freshwater preservation, livestock and irrigation.

42

GROUNDWATER QUALITY

Betano Refinery Project **NOVA Betano Project** **Water Supply System Project**



The water is suitable for domestic use and agriculture

TERRESTRIAL ECOLOGY

Class	Betano Refinery	NOVA Betano	Water Supply System
Plant	**74**	**88**	**48**
Wildlife			
Mammals	7	8	3
Birds	21	25	17
Reptiles	4	5	2
Amphibians	4	4	2
Total	**36**	**42**	**24**

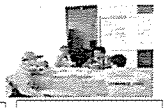


Rosewood (*Pterocarpus*

Timor Friarbird (*Philemon inornatus*)

Streaky-breasted Honeyeater (Meliphaga reticulata)

SOCIO-ECONOMIC SURVEY FOR BETANO REFINERY PROJECT



Manufahi District | Betano Village

Selihasan sub-village | Bematan sub-village

Opinion

- Agree
  - Job opportunity for local people
  - Community and country development

Suggestion

- present project affected area to local people
- Local people participation in each step of EIS study

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SOCIO-ECONOMIC SURVEY FOR NOVA BETANO PROJECT





Leo Ai sub-village | Raifusa sub-village | Lalika sub-village

Opinion	Suggestion
Agree	• Job opportunity from the project for local people
• Country development	• Not need to resettle PAPs to live together in only one area, please arrange community which has different culture separately
• Job opportunity	

SOCIO-ECONOMIC SURVEY FOR WATER SUPPLY SYSTEM PROJECT



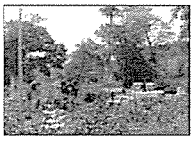


Kakeulaletek sub-village | Maha Clusin sub-village | Selihasan sub-village

Opinion	Suggestion
Agree	Availability for transportation via Dam Crest during project operation
• Job opportunity for local people	• Water supply for community
• Country development	• Job opportunity for local people

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CULTURAL COMPONENTS



Cemetery in Selihasan sub-village



Betano Name in Selihasan sub-village



Huiloco Cemetery in Maha Clusin sub-village



Portuguese Port in Betano village

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PRE-CONSTRUCTION PHASE

Potential Impacts	Mitigation Measures
• Land acquisition	• Fair compensation
• Fugitive dust from land preparation	• Spray water
• Waste from site clearance	• Reuse for communities and agricultural activities

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CONSTRUCTION PHASE

Potential Impacts	Mitigation Measures
• Fugitive dust	• Spray water • Cover truck transporting construction material with tarpaulin sheet
• Traffic Problem and risks	• Limit speed at 40 km/hr • Installation of safety signs • Avoid transportation in rush hours
• Gaseous emission from project vehicles and machinery	• Routine maintenance of vehicles



CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Increase of noise level from construction activities	• Regularly monitor ambient noise levels • Conduct routine maintenance of machinery • Set schedule for activities with high noise level only during day time

51

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Community Health, Safety and Security	• Provision of personal protective equipment for workers • Installation of warning and prohibition signs • Give priority to local employment during the construction period • Grievance Redress Mechanism



52

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Soil erosion/landslide • Increased storm water, run-off	• Limit excavated area and cut slope designed, and backfilling should be finished before opening the next section • Using less time for construction near the water source • Avoid construction during heavy rain • Prohibition of discharge of waste to water sources

53

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Agricultural area disturbance • Vegetation and wildlife disturbance • Blocking local road	• Obtain permission for cutting trees from the relevant agencies • Use efficient equipment to reduce noise level, dust and fume • Inform construction plan to landowners 3-6 months in advance • Provide temporary detour for local people

54

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Increase solid waste	• Prohibition of discharge of waste to water sources • Monitor groundwater quality at the nearest well to the project area twice a year • Provision of waste disposal site, and sewage treatment within the construction site

55

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Socio-economic	• Give priority to local employment during the construction period • Inform construction schedule to villagers • Grievance Redress Mechanism

56

OPERATION PHASE

Potential Impact	Mitigation Measures
• Increase gaseous emission from combustion of **Betano Refinery Project**	• Control the emission not to exceed the standard • Install the Continuous Emission Monitoring System (CEMS) • Properly maintain the operation of air pollution control systems • Regularly record the shutdown period and duration of flare operation • Monitor ambient air quality at sensitive receptor and emission stack twice a year

57

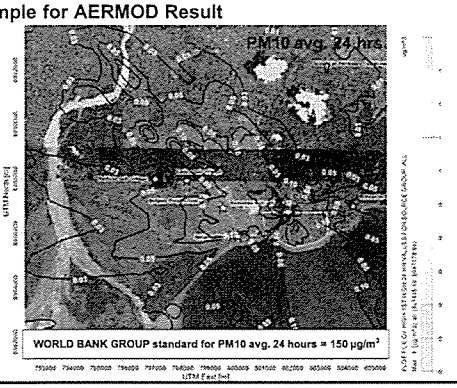
OPERATION PHASE

- **AERMOD has been used for prediction of air quality impact for refinery**
- **Study area: 10 x 10 km^2**
- **Parameters: NOx, SOx, and PM**
- **All results within applicable standard (i.e. US. EPA., WHO, IFC)**

58

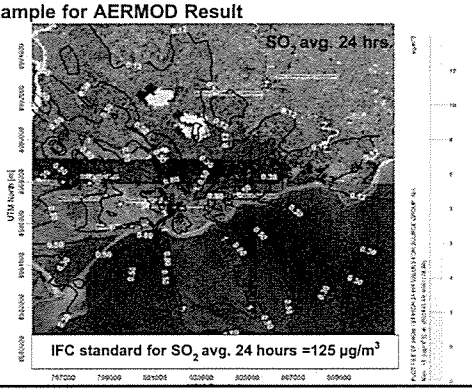
OPERATION PHASE

Example for AERMOD Result



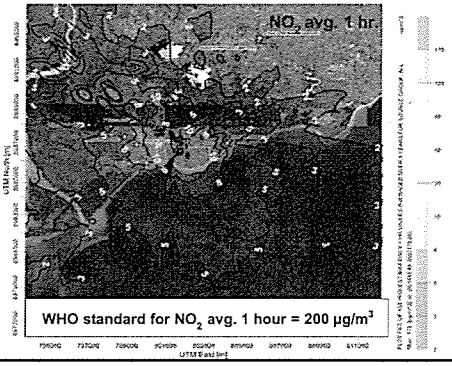
OPERATION PHASE

Example for AERMOD Result



OPERATION PHASE

Example for AERMOD Result



OPERATION PHASE

Potential Impact	Mitigation Measures
• Generation of wastewater from **Betano Refinery** Project	• Provide wastewater treatment system and control water quality to meet the standard • Regularly maintain wastewater treatment system • Monitor coastal water twice a year

62

OPERATION PHASE

Potential Impact	Mitigation Measures
• Generation of wastewater and solid waste from **NOVA Betano** Project	• All sewerage to be contained within the municipal sewer systems • Provide proper waste management system • Provision of water supply, waste disposal, and sewage treatment system within the area

63

OPERATION PHASE

Potential Impact	Mitigation Measures
• Increase of noise level in existing communities due to project operation of **Betano Refinery**	• Design the process building to reduce noise level • Personal protective equipment • Plant Operating Maintenance and Calibration Manuals, Procedures and Schedules

64

OPERATION PHASE

Potential Impact	Mitigation Measures
• Impact on occupation health and safety from excessive noise, flammable and explosive hazards of **Betano Refinery** • Public Health	• Establish the committee for occupational health/safety • Provide first aid system and fire extinguishers • Regularly inspect and maintain the pollution control system • Provide PPE • Annual health check up for workers

65

OPERATION PHASE

Potential Impact	Mitigation Measures
• The adverse impact might be generated by the **Betano Refinery** operation intense of noise and gas emission • Community Health, Safety and Security • Socio-economic	• Corporate Social Responsibilities (CSR) • Grievance Redress Mechanism

66

OPERATION PHASE

Potential Impact	Mitigation Measures
• Transport obstruction from **water supply system** project	• Provision of transportation route via weir crest (motorbike) • Provide new local road to village (small truck) • Support water to nearby communities and upgrade existing local road to weir site

67

OPERATION PHASE

Potential Impact	Mitigation Measures
• Major hazard might cause impact to community i.e. fire and explosion of **Betano Refinery**	• Propose emergency plan • Provide equipment and fire security system • Installation of gas detection system and emergency valve • Provide fire extinguishers

68

DEACTIVATION PHASE

Betano Refinery Project

- The majority activities will be demolition and removal structure including remediation.
- Impacts and mitigation measures of deactivation phase are as same as those of construction phase.

NOVA Betano and Water Supply System Project

- There would be no deactivation phase

69

CONDENSATE PIPELINE

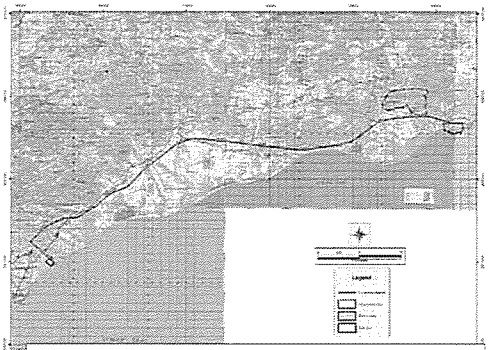
70

PROJECT INFORMATION

- **Location:** From Betano Refinery (Betano Village, Same Sub-district, Manufahi District) along southern shoreline to tank farm at Camenaãa Village, Suai Sub-district, Covalima District
- **Length of condensate pipeline:** 78 km.
  - Light Naphtha, Heavy Naphtha and Diesel ϕ 8 inches
  - Condensate ϕ 12 inches
- **Project objective:** Transportation of product and condensate

71

CONDENSATE PIPELINE



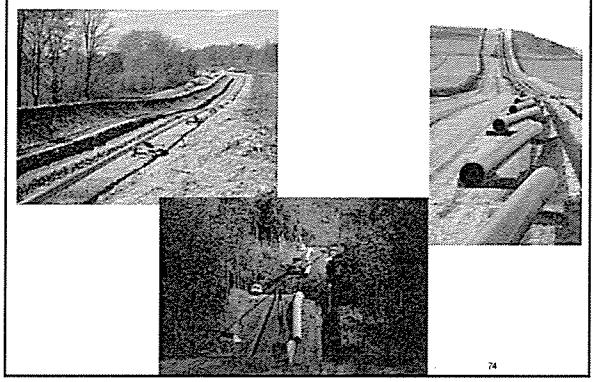
Study Area: 50 m strips on both sides of pipeline route

HIGHWAY



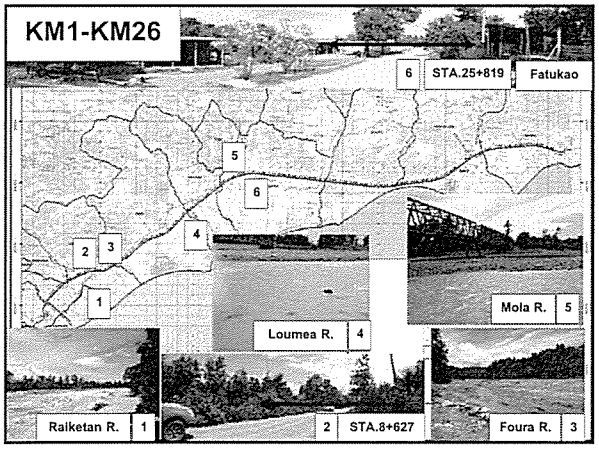
73

CONDENSATE PIPELINE

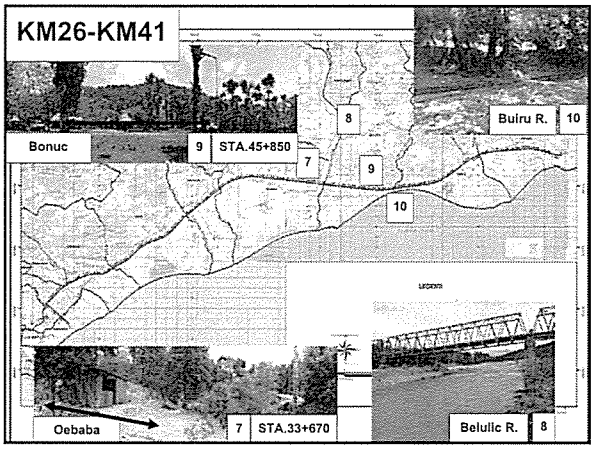


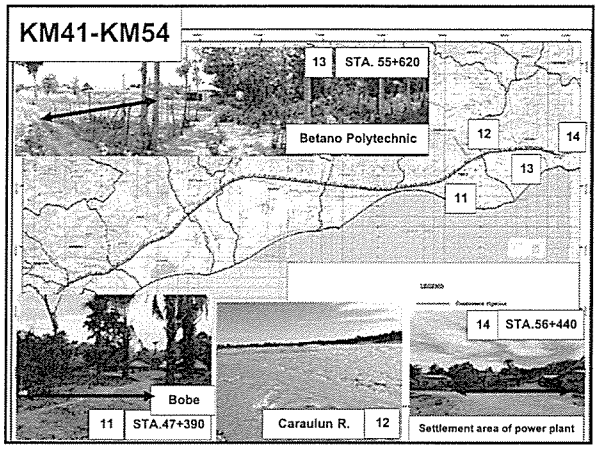
74

KM1-KM26



KM26-KM41





EXISTING ENVIRONMENTAL CONDITION

- Physical Components
- Ecological Components
- Economic Components
- Social Components
- Cultural Components






78

CLIMATE & METEOROLOGICAL

- The study areas display a typical tropical monsoonal climate.
- There are 2 seasons, wet season; start from December to July and dry season from August to November.
- The average temperature range of 23.8-28.1 °C.
- The relative humidity range of 43.9-85.6 %
- The average wind speed range of 0.3-1.3 m/sec.
- The average annual rainfall range of 1072-1494 mm/year.

Source: Meteorological data during 2004-2015 of Manufahi Weather Station and Suai Weather Station, Ministry of Agricultural, 2016.

79

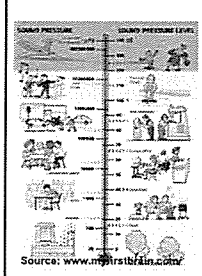
AMBIENT AIR QUALITY

- Some section is residential, food crop, and un-developing area.
- The primary air pollutants is Particulate Matter (PM) or dust which cause by vehicular traffic.
- PM10 is approximately 25-40 ug/m^3 less than the 24-hr average of WHO and NEPM guidelines, and U.S. EPA. standard, which 50 and 150 ug/m^3 ,respectively.
- Other air pollutions, i.e. NO_x, SO_x are less than the limit of reporting.

Source: Tasi Mane Project - Betano Petroleum Refinery and Beaco LNG Plant, Strategic Environmental Impact Statement, Final Report, 2012.

80

NOISE



- Most of Study area is residential, food crop, and un-developing area.
- The primary source of noise is vehicular traffic.
- L_{Aeq} is range of 45.5-64.9 dB

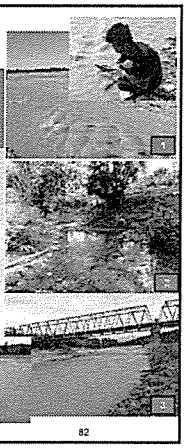
Source: Tasi Mane Project - Betano Petroleum Refinery and Beaco LNG Plant, Strategic Environmental Impact Statement, Final Report, 2012.

81

SURFACE WATER QUALITY

Parameter	1. Caraulun River	2. Ukasa River	3 Belulic River	Standard	
Temp (°C)	31.4	32.6	25.6	-	± 3
pH	8.06	7.84	8.24	6.5-9	6-9
DO (mg/L)	7.13	6.83	7.33	3.5	≥ 4

The water quality of the three rivers is within the standards and can be used as freshwater preservation, livestock and irrigation.

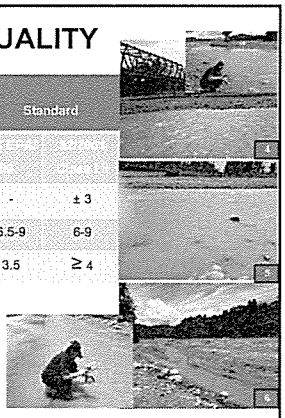


82

SURFACE WATER QUALITY

Parameter	4. Mola River	5. Loumea River	6. Foura River	Standard	
Temp (°C)	29.5	30.2	34	-	± 3
pH	8.06	8.11	8.18	6.5-9	6-9
DO (mg/L)	7.19	7.03	6.47	3.5	≥ 4

The water quality of the three rivers is within the standards and can be used as freshwater preservation, livestock and irrigation.



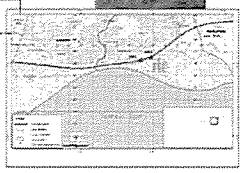
83

GROUNDWATER QUALITY

Parameter	Unit	GW2	Standard of WHO
Conductivity	µS/cm	1,452	250
pH	-	6.77	6.5-8.5
Salinity	ppt	0.7	-
Total Dissolved Solids	g/l	1.30	-



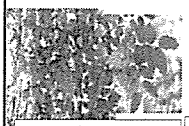




The water is suitable for domestic use and agriculture

TERRESTRIAL ECOLOGY

Class	Condensate Pipeline
Plant	92
Wildlife	
Mammals	9
Birds	28
Reptiles	5
Amphibians	5
Total	47

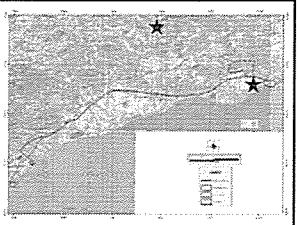

Rosewood (*Pterocarpus*


Timor Friarbird (*Philemon inornatus*)


Streaky-breasted Honeyeater (Meliphaga reticulate)

TRAFFIC SURVEY

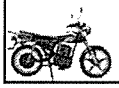








Access Road to Betano Refinery




Access Road to Condensate Pipeline

RESULT OF TRAFFIC COUNTING AT ACCESS ROAD

Station	Direction	Vehicles	Traffic condition
TC1A	Same to Betano	1) Motorcycle 2) Passenger car 3) Light truck	Very good traffic flow
TC1B	Betano to Selihasan	1) Motorcycle 2) Bicycle 3) Light truck	Very good traffic flow
TC2A	Zumalai to Ainaro	1) Motorcycle 2) Bicycle 3) Light truck	Very good traffic flow
TC2B	Ainaro to Suai	1) Motorcycle 2) Light truck 3) Bicycle	Very good traffic flow

SOCIO-ECONOMIC SURVEY

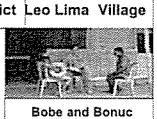

Ainaro District


Ainaro Sub-district


Hato Udo Sub-district


Leo Lima Village


Foho Ailico village


Bobe and Bonuc Community

Opinion

- Agree
- Community development (economic , benefit)
- Country development

Suggestion

- Appropriate compensation and same compensation rate
- Inform project construction plan to chief of village and local people prior to construction
- Concern sacred place
- Job opportunity for local people

SOCIO-ECONOMIC SURVEY





Cova Lima District	Suai Sub-district	Zumalai Sub-district

Opinion	Suggestion
Agree	• Spray water at construction area to mitigate dust
• Community benefit and country development	• Closely contact with chief of village during project construction period
• Job opportunity	• Project should respect to local culture
	• Appropriate mitigation measures for project impact

SOCIO-ECONOMIC SURVEY

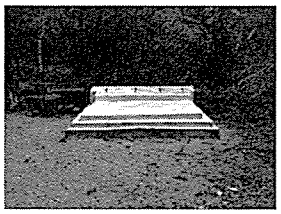




Raimea, Tashilin , Zulo village	Beco village	Labarai village

Opinion	Suggestion
Agree	• Job opportunity from the project for local people
• Community benefit and country development	• Water supply system for community from river
• Job opportunity	• Closely contact with chief of village during project construction period

CULTURAL COMPONENTS

Cemetery in Bobe sub-village (km. 35-50)

91

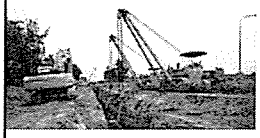
PRE-CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Fugitive dust from land preparation	• Spray water
• Land acquisition	• Pay the compensation in fair price
• Waste from site clearance	• Reuse for communities and agricultural activities

92

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Fugitive dust	• Cover truck transporting construction material with tarpaulin sheet • Limit speed 40 km/hr • Routine maintenance of vehicles • Avoid transportation in rush hours



93

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Noise pollution and annoyance • Traffic problem and risks	• Inform local communities • Limit work 06.00 a.m.-06.00 p.m. • Provide temporary by-pass • Put up indication and warning sign • Avoid transportation in rush hours

94

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Soil erosion/landslide	• Backfilling must be done immediately after pipe laying • Using less time for construction near the water source • Avoid construction during heavy rain
• Solid waste	• Prohibition of discharge of waste to water sources

95

CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Agricultural area disturbance • Vegetation and wildlife disturbance	• Obtain permission for cutting trees from the relevant agencies • Use efficient equipment to reduce noise level, dust and fume • Inform construction plan to landowners 3-6 months in advance

96

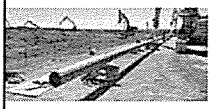
CONSTRUCTION PHASE

Potential Impact	Mitigation Measures
• Disturbance of Historic and Scared Sites	• Avoid the residential areas, historic and scared places, education institute and government offices • Consult with local leaders and relevant local agencies before construction • Stop the construction and inform concerned authority for proper management if historic object is found

97

OPERATION PHASE

Potential Impact	Mitigation Measures
• Pipeline Leakage Risk	• Have welding inspection by expert • Regularly maintain pipeline twice a year • Provide SCADA system • Organize emergency practices • Leakage inspection once a year in compliance with the ASME B31.8 standard

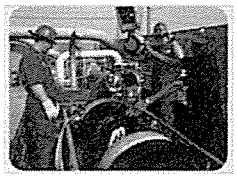




98

OPERATION PHASE

Potential Impact	Mitigation Measures
• Public health and safety for local resident	• Support and participate in communities' activities • Distribute Emergency manual to people • Build up knowledge, understanding and confidence on pipeline system • Provide first aid kits in project concerned sub-villages



99

DEACTIVATION PHASE

There would be no deactivation phase.

100

THANK YOU

For Your Attention

Slide Presentation
For
the Local Communities

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) STUDY FOR BETANO REFINERY PROJECT IN TIMOR-LESTE

08 April 2016

09:00 a.m. -12:00 a.m.

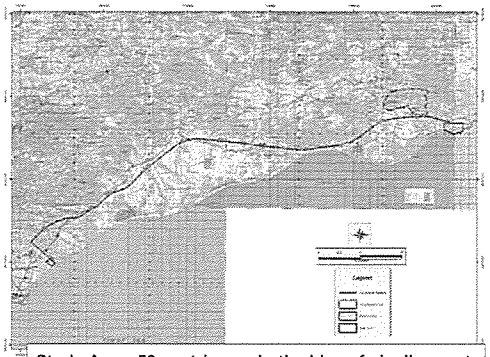
1

PROJECT INFORMATION

- **Location:** From Betano Refinery (Betano Village, Same Sub-district, Manufahi District) along southern shoreline to tank farm at Camenaãa Village, Suai Sub-district, Covalima District
- **Length of condensate pipeline:** 78 km.
  - Light Naphtha, Heavy Naphtha and Diesel ϕ 8 inches
  - Condensate ϕ 12 inches
- **Project objective:** Transportation of product and condensate

2

CONDENSATE PIPELINE

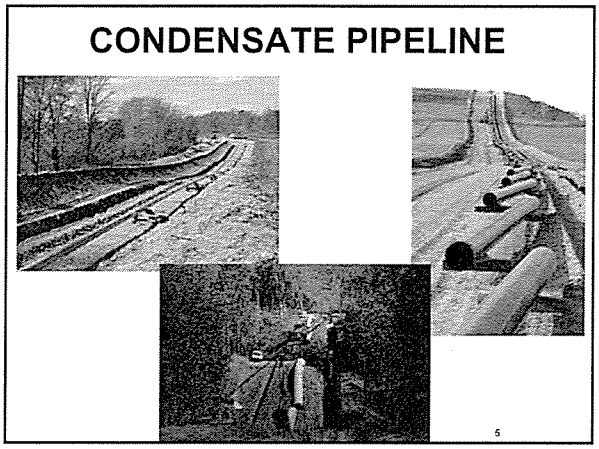


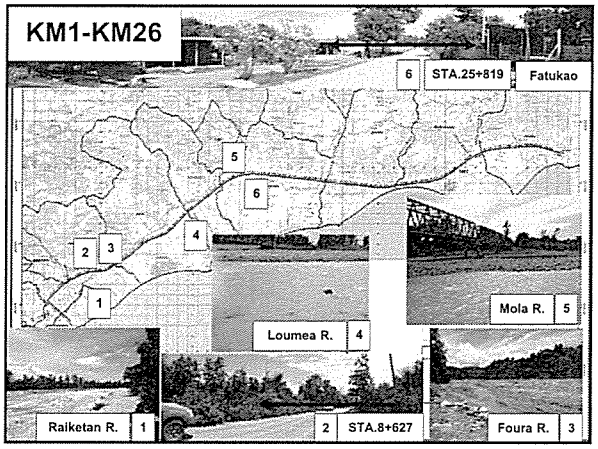
Study Area: 50 m strips on both sides of pipeline route

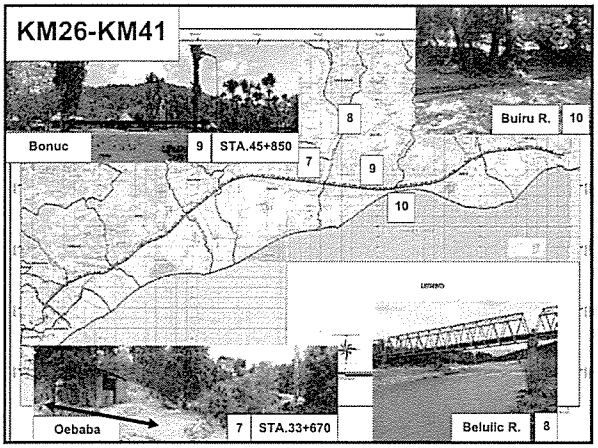
HIGHWAY

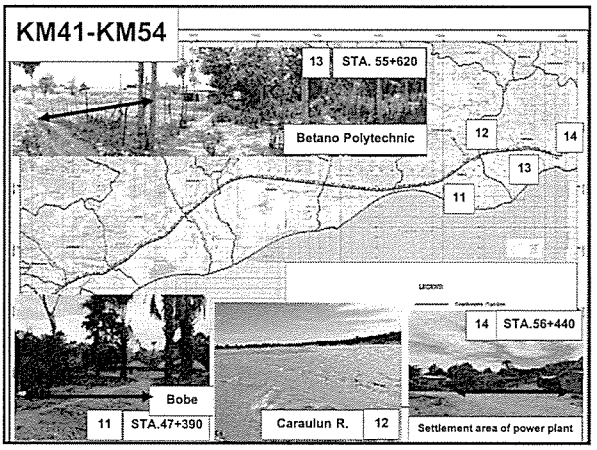


4


CONDENSATE PIPELINE
5

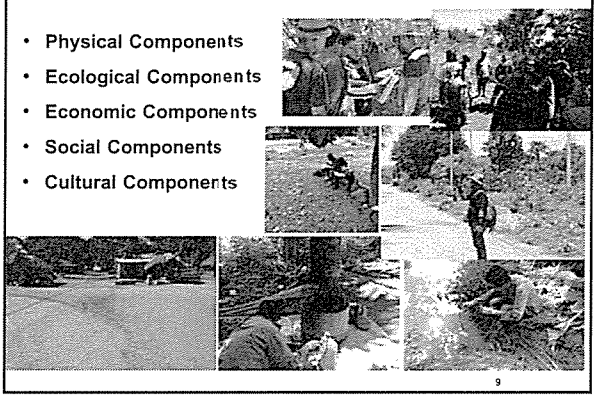

KM1-KM26
6
STA.25+819
Fatukao
5
6
4
2
3
1
Mola R.
5
Loumea R.
4
Raiketan R.
1
2
STA.8+627
Foura R.
3


KM26-KM41
8
Buiru R.
10
Bonuc
9
STA.45+850
7
9
10
Oebaba
7
STA.33+670
Beluiic R.
8


KM41-KM54
13
STA. 55+620
Betano Polytechnic
12
14
13
11
14
STA.56+440
Bobe
11
STA.47+390
Caraulun R.
12
Settlement area of power plant

EXISTING ENVIRONMENTAL CONDITION

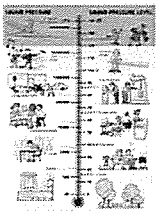
- Physical Components
- Ecological Components
- Economic Components
- Social Components
- Cultural Components



9

AMBIENT AIR QUALITY AND NOISE

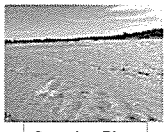
- Most of study area is residential, cropping area, and un-developing area.
- The primary air pollutants is Particulate Matter (PM) or dust and noise which cause by vehicular traffic.
- Air quality and noise level is within standard.



Source: Tasi Mane Project - Betano Petroleum Refinery and Beaco LNG Plant, Strategic Environmental Impact Statement, Final Report, 2012.

10

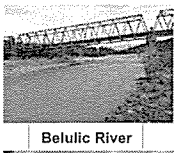
SURFACE WATER QUALITY



Caraulun River



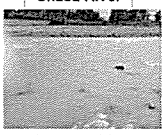
Ukasa River



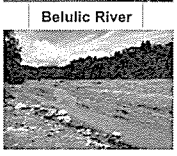
Belulic River



Mola River



Loumea River



Foura River

The water quality of the rivers is within the standards and can be used as freshwater preservation, livestock and irrigation.

11

GROUNDWATER QUALITY

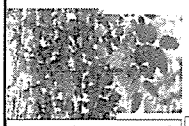


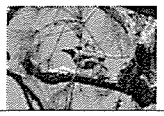


The water is suitable for domestic use and agriculture.

TERRESTRIAL ECOLOGY

Class	Condensate Pipeline
Plant	92
Wildlife	
Mammals	9
Birds	28
Reptiles	5
Amphibians	5
Total	47


Rosewood (*Pterocarpus indicus*)


Timor Friarbird (*Philemon inornatus*)


Streaky-breasted Honeyeater (*Meliphaga reticulate*)

SOCIO-ECONOMIC SURVEY


Ainaro District


Ainaro Sub-district


Cova Lima District


Suai Sub-district


Hato Udo Sub-district


Leo Lima Village


Zumalai Sub-district


Raimea, Tashilin , Zulo Village


Foho Ailico Village


Bobe and Bonuc Community


Beco Village


Labarai Village

14

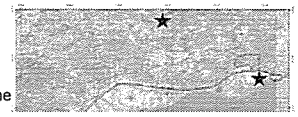
SOCIO-ECONOMIC SURVEY

Opinion	Suggestion
- Agree ▪ Job opportunity for local people ▪ Community and country development	▪ Present project affected area to local people ▪ Local people participation in each step of EIS study ▪ Provide water supply for community ▪ Appropriate compensation and same compensation rate ▪ Inform project construction plan ▪ Concern sacred place

15

TRAFFIC SURVEY

- Access Road to Betano Refinery
- Access Road to Condensate Pipeline







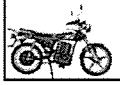




- Motorcycle
- Very good traffic flow



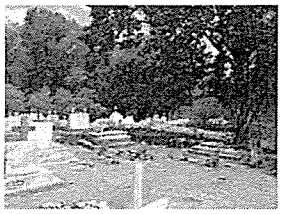
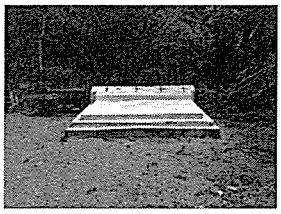






16

CULTURAL COMPONONETS

Cemetery in Bobe sub-village (km. 35-50)

17

CONSTRUCTION PHASE

Potential Impacts

- Fugitive dust
- Traffic problem and accident
- Increase of noise
- Disturbance on community
- Wastewater and solid waste
- Wastewater from hydrostatic test

18

CONSTRUCTION PHASE

Mitigation Measures









- Spray water
- Cover truck with tarpaulin sheet
- Limit speed at 40 km/hr
- Installation of safety signs
- Monitor noise levels near sensitive receptor
- Monitor pH, conductivity, temperature before discharging water from hydrostatic test
- Provide complaint channel for villager
- Give priority to local employment
- Prohibition of throwing solid waste into water sources
- Inform construction schedule to villagers 3-6 months in advance

19

OPERATION PHASE

Component	Potential Impact
Condensate Pipeline	- Risk from leakage - Public health and safety for local resident

20

OPERATION PHASE

Component	Mitigation Measures
Condensate Pipeline	• Provide SCADA system • Leakage inspection once a year in compliance with the ASME/ANSI standard • Daily visual investigation along the pipeline route • Install warning sign along the pipeline route • **In case of leakage:** - There would be remediation program i.e. soil contamination - Monitoring of surface water and groundwater quality • Support and participate in communities' activities • Distribute Emergency manual to people • Build up knowledge, understanding and confidence on pipeline system • Provide first aid kits in project concerned sub-villages
Provide complaint channel and CSR program	

DEACTIVATION PHASE

- Demolition and removal of structures
- Impacts and mitigation measures are as same as those of construction phase
- Remediation program i.e. land rehabilitation

22

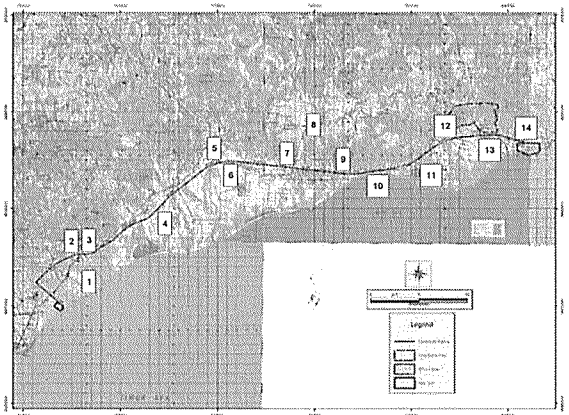
THANK YOU

For Your Attention

Poster of the Project Information

CONDENSATE PIPELINE

- Location: From Betano Refinery (Betano Village, Same Sub-district, Manufahi District) along southern shoreline to tank farm at Camenaãa Village, Suai Sub-district, Covalima District.
- Length of condensate pipeline: 78 km.
  - Light Naphtha, Heavy Naphtha and Diesel ϕ 8 inches
  - Condensate ϕ 12 inches.
- Project objective: Transportation of product and condensate








HIGHWAY CONDENSATE PIPELINE





The water quality of the Caraulun, Ukasa, and Belulic river are within the standards and is used as freshwater preservation, livestock and irrigation.



The water is suitable for domestic and agriculture

Traffic condition: Very good traffic flow which are motorcycle, passenger car, light truck, and bicycle.



CLIMATE & METEOROLOGICAL

- The study areas display a typical tropical monsoonal climate
- There are 2 seasons; wet season; start from December to July and dry season from August to November

AMBIENT AIR QUALITY

- The primary air pollutants is Particulate Matter (PM) or dust which cause by vehicular traffic
- PM10 is approximately 25-40 µg/m³ less than the 24-hr average of WHO and NEPM guidelines, and U.S. EPA standard which 50 and 150 µg/m³ respectively

NOISE

- The primary source of noise is vehicular traffic.
- L_{eq} is range of 49.5-64.9 dB



Opinion	Suggestion
Agree	• Spray water at construction area to mitigate dust • Job opportunity from the project for local people
• Community benefit and country development	• Closely contact with chief of village during project construction period
• Job opportunity	• Project should respect to local culture • Appropriate mitigation measures for project impact

PRE-CONSTRUCTION PHASE

Fugitive dust from land preparation	Spray water
Land acquisition	Pay the compensation in fair price
Waste from site clearance	Reuse for communities and agricultural activities

CONSTRUCTION PHASE

Fugitive dust	• Cover truck transporting construction material with tarpaulin sheet • Limit speed at 40 km/hr • Routine maintenance of vehicles • Avoid transportation in rush hours
• Noise pollution and annoyance • Traffic Problem and risks	• Inform local communities • Limit work 06.00 a.m.-06.00 p.m. • Provide temporary by-pass • Put up indication and warning sign • Avoid transportation in rush hours
Soil erosion/landslide	• Backfilling must be done immediately after pipe laying • Using less time for construction near the water source • Avoid construction during heavy rain
Solid waste	• Prohibition of discharge of waste to water sources
• Agricultural area disturbance • Vegetation and wildlife disturbance	• Obtain permission for cutting trees from the relevant agencies • Use efficient equipment to reduce noise level, dust and fume • Inform construction plan to landowners 3-6 month in advance
Disturbance of Historic and Scared sites	• Avoid the residential areas, historic and scared places, education institute and government offices • Consult with local leaders and relevant local agencies before construction • Stop the construction and inform concerned authority for proper management if historic object is found



OPERATION PHASE

Pipeline Leakage Risk	• Have welding inspection by expert • Regularly maintain pipeline twice a year • Provide SCADA system • Organize emergency practices • Leakage inspection once a year in compliance with the ASME B31.8 standard
Public health and safety for local resident	• Support and participate in communities' activities • Distribute Emergency manual to people • Build up knowledge, understanding and confidence on pipeline system • Provide first aid kits in project concerned sub-villages




DEACTIVATION PHASE

There would be no deactivation phase

APPENDIX 13D

MINUTES OF CONSULTATION MEETINGS

31 March 2016

Government Officer and NGO

TIMORGAP	MINUTES of MEETING (MoM) Public Consultation on EIA study for Betano Refinery project with Government Institutions and Stakeholders in TIMOR GAP, E.P office – Dili	REFINERY & PETROLEUM SERVICES UNIT

RECORD OF MEETING

No	Participant Name & Organization	
1	*List Attached (see attachment 10A)*	
2		
3		
4		
5		
6		
7		
8		

Date	31st March 2016
Time Start	10.00 am
Time finish	2.45 pm
Location	TG Conference Room, Timor Plaza
Recorder	Elvina da Silva & Noelia Pereira
Doc No	
Date Signed	

- Safety Briefing from by Mr. Samuely de Araujo - Quality, Health, Safety & Environment (QHSE) Unit Staff
- Opening Remarks from Mr. Francisco Monteiro - TIMOR GAP, E.P. President & CEO
- Presentation on General Perspective on the Refinery Project, the Context of the Refinery Project & Previous Refinery Project Related Studies by Mr. Roberto Belo, Refinery & Petroleum Service Unit (RPSU)Staff
- Presentation on the EIA Requirements for the Refinery Project (Based on the Decree Law 5/2011 on Environmental Licensing Law) by Mr. Quirmado Pinto (QHSE Staff)
- Presentation on the EIA Study for Betano Refinery Project by Mrs. Budsaba Israng kura Na Ayudhaya and Mr. Songsak Bhaddee, TEAM Consulting

No.	Questions	Answers
1	Mr. Charles Scheiner, Lao Hamutuk: • In relation to the impact to Betano Polytechnic, Bobe sub-village and resettlement area; are you proposing to realign both the pipeline and the highway or just the pipeline?	Mr. Songsak Bhaddee, TEAM Consulting: • Alignment of condensate pipeline has to be beside the highway.
2	• Mrs. Filomena Oliveira, Ministry of Public Works, Transport & Communications: what is the reason for the pipeline to be constructed underground instead of above ground?	• Final design will be based on the result of detailed investigation that will be performed at further stage.
3	• Mr. Antonio Freitas, Director General of Statistics (Ministry of Finance): What is the distance to move the pipeline route up to the north to avoid impact on the Betano Polytechnic, Bobe sub-village and resettlement area?	• TEAM Consulting: Mitigation measures will be formulated to address the impacts, especially from noise.
4	• Mr. Charles Scheiner, Lao Hamutuk: Is the EIA Study for both the pipeline and the highway?	• Mr. Francisco Monteiro, TIMOR GAP, E.P. President & CEO: Only Pipeline, the highway will be the responsibility of the Ministry of Public Works, Transport & Communications
5	• Mr. Antonio Freitas, Director General of Statistics (Ministry of Finance): Is there any implication on the financial aspect?	• Mr. Songsak Bhaddee, TEAM Consulting: The budgeting and responsibilities will be included as part of the mitigation measures in the EMP which the draft will be submitted to TG next week.
6	• Mr. Charles Scheiner, Lao Hamutuk: Will the construction of the pipeline take place after the highway?	• Mr. Francisco Monteiro, TIMOR GAP, E.P. President & CEO: Ideally the pipeline and highway should be built simultaneously. If for some reason the highway is not fully constructed, the right of way (row) of the highway has already been reserved for the construction of the pipeline.
7	• Mr. Ismenio da Silva, Development Fund Human Capital (Ministry of Planning and Strategic Investment)): Has the land been released from the community?	• Mr. Francisco Monteiro, TIMOR GAP, E.P. President & CEO: As previously mentioned that the construction of both highway and refinery should be done at the same time. However if there are delays in the construction of the highway, the land of right of way (row) of the highway for the pipeline will be secured. At the moment the land has already been released for the highway route from Suai to Zumalai. The land to be released from Zumalai to Betano would depend on availability of the budget and resources.

No.	Questions	Answers
8	Mr. Charles Scheiner, Lao Hamutuk: • Since there is no deactivation phase for condensate pipeline, does that mean the pipeline will be left underground? • If the pipeline is left underground then it will rust and leak into the ground water.	• Mr. Songsak Bhaddee, TEAM Consulting: The appropriate mitigation measures for impact during deactivation phase of the pipeline would be recommended in the EIS report. • Mr. Francisco Monteiro, TIMOR GAP, E.P. President & CEO – This question is best to be addressed in the future.
9	Mr. Ismenio da Silva, Development Fund Human Capital (Ministry of Planning and Strategic Investment)): • Who is going to protect the pipeline underground?	• Mr. Francisco Monteiro, TIMOR GAP, E.P. President & CEO: To secure the pipeline, both the highway and the right way for the pipeline will be secured using signs to designate the No Go zone. If possible with sufficient budget, then fences will be built to keep people from entering both the highway and pipeline areas. Also there will be a need for socialization to inform the nearby communities not to disturb the properties of both the highway and the pipeline.
10	Mr. Paulino da Cruz, Ministry of Justice (Department of Land and Property) – suggestions: • During the relocation process, it is highly recommended not to only relocate the people but also their animals. It would surely create negative impacts, such as health issues, if those animals were to be situated closely to the community housings. • Both the pipeline and highway should be managed as an integrated project	Mr. Francisco Monteiro, TIMOR GAP, E.P. President & CEO : • If possible, TG would like to manage all the Tasi Mane Projects, however that is not possible. Some of the projects are managed by relevant ministries. TG hopes that all projects will run smoothly and continues to work closely with the relevant ministries on the management of these projects.
11	Mr. Eugenio Sarmento – Ministry of Tourism (Secretariat of State for Art and Culture) - suggestion: • Ensure that any artifacts found during the construction to be preserved. Sacred and cemeteries should also be considered when it comes to land preparation for the construction.	Mr. Francisco Monteiro, TIMOR GAP, E.P. President & CEO: • It would be recommended in the EIA report that in case of "Chance fine" during construction the relevant agencies would be promptly informed for proper management.
12	Mr. Charles Scheiner, Lao Hamutuk: • Will there be any impacts from using one pipeline to transport multiple products (gasoline, diesel, naphtha, etc.)? • What happen if there are spills, accidents and explosions? What are the impacts to the community, water, sea and groundwater?	• Mr. Roberto Belo, Refinery & Petroleum Service Unit (RPSU) Staff: According to the design, different product will be transported via different pipelines. • Mr. Songsak Bhaddee, TEAM Consulting: The control system will monitor if there is leaking in pipeline. The system will measure the difference in the pressure in the pipeline. If there are changes then the people will be notified. If there is a leakage the people will

No.	Questions	Answers
	• PTT has the history with environmental problems, how does TG ensure that those things do not happen in TL?	inspect and take samples of the soil and water. • Mr. Francisco Monteiro, TIMOR GAP, E.P. President & CEO: TG feels comfortable working with ATT. It is very hard to judge just because of what has happened in the pasts. TG will focus on the positive as focusing on negative will make it harder to work with any other companies.
15	Mr. Paul Alves – Secretariat of State of Professional Training and Employment - suggestions: • The priority of the employment should be given to the local community.	Noted

END OF RECORD

Note: This Minutes of Meeting (MoM) is provided by TIMOR GAP, E.P office –Dili.

4 April 2016

Betano Village

TIMORGAP	MINUTES of MEETING (MoM) **Public Consultation on EIA study for Betano Refinery project with local communities in Bemetan sub-village, Betano village, Same sub-district, Manufahi district**	**REFINERY & PETROLEUM SERVICES UNIT**

RECORD OF MEETING

No	Participant Name & Organization			Date	April 04, 2016
1.	Mr. Vicente da Costa Pinto (VP)	TIMOR GAP, E.P.		Time Start	09.00 am
2.	Mr. Rony Joel da Costa Barreto (RJB)	TIMOR GAP, E.P.			
3.	Mr. Quirmado Pinto (QP)	TIMOR GAP, E.P.		Time finish	12:30 pm
4.	Mr. Roberto Belo (RB)	TIMOR GAP, E.P.		Location	Betano Village
5.	Mr. Edmundo Soares (ES)	TIMOR GAP, E.P.			
6.	Ms. Madalena Viana (MV)	TIMOR GAP, E.P.		Recorder & Editor	DES
7.	Ms. Carmelita Baptista (CB)	TIMOR GAP, E.P.		Doc.No	
8.	Mr. Domingos Elisito do E. Santos (DES)	TIMOR GAP, E.P.		Data Sign	
9.	Mr. Lucas Faria (LF)	TIMOR GAP, E.P.			
10.	Mr. Songsak Badee (SBa)	TEAM Consulting			
11.	Mrs. Chalida Nieobubpa (CN)	TEAM Consulting			
12.	Mrs. Budsaba I. Na Ayudhaya (BA)	TEAM Consulting			
13.	Mr. Chaloemchai Nakkhwan (CN)	TEAM Consulting			
14.	Ms. Supichaya Wongchinawit (SW)	TEAM Consulting			
15.	Ms. Anshisa Chansila (AC)	TEAM Consulting			
16.	Mr.Komsan Yontchai (KY)	TEAM Consulting			
17.	Mr. Francisco Poto (FP)	NDPCEI			
18.	Mr. Francelino Cardoso (FC)	NDPCEI			
19.	***Please See the Attachment List (see attachment 10A)***	Local Leaders & Communities			

1. Opening Remarks by Master of Ceremony, Mr Joao dos Reis -Refinery Project Controller
2. Short Speech by Chief of Betano Village, Mr. Saturnino Tilman
3. Short Speech by Director of Refinery and Petroleum Services Unit , Mr. Vicente Pinto, TIMOR GAP, E.P
4. Short Speech by NDPCEI (National Directorate Pollution Control and Environmental Impact), Mr. Francisco Poto
5. Presentation on EIA study for Betano Refinery Project Mr.Songsak Bhaddee and Mrs. Budsaba Ayudhaya, TEAM Consulting
6. Closing Ceremony by Director of QHSE (Quality, Healthy, Safety and Environmental), Mr, Rony da Costa, TIMOR GAP,E.P

No	Question	Answer
1.	Tito conzaga community be metan sub-village • According to the slide presentation by TEAM Consultant from Thailand that to mitigate the negative impact on pipeline route, so, what is the mitigation procedure? • How impact to the water, because all of us here consumed ground water?	• SBa- The Mitigation risk for pipeline route has to do measurement for pipeline construction will do the test to insure that there is no leakage and use systems that we called hydro static test. Normally maintenance once a year and can do leakage test according to the standards that we called ASME standard. And then the control system will automatically will detected if there any leakage. • Answered by SBa-In case of leakage that would be remediation programs such as soil sample and water will be taken to the laboratories test and then there will be monitoring of surface water and groundwater quality.
	Suggestions: • Mr. Elias Tilman suggested to TG that, during construction period there will be impact from dust so I suggested that road should be given asphalt so that can be minimize dust. • Request to technical Engineers to do details study so that can be reduce the negative impact and increase the income to this country of Timor-Leste.	NOTED

END OF RECORD

Note: This Minutes of Meeting (MoM) is provided by TIMOR GAP, E.P office –Dili.

5 April 2016

Hatu-Udo Sub-district

TIMORGAP	MINUTES of MEETING (MoM) **Public Consultation on EIA study for Betano Refinery project with local communities in Hatu-Udo sub-district, Ainaro district**	**REFINERY & PETROLEUM SERVICES UNIT**

RECORD OF MEETING

No	Participant Name & Organization			Date	April 05, 2016
1.	Mr. Vicente da Costa Pinto (VP)	TIMOR GAP, E.P.		Time Start	09:00 am
2.	Mr. Rony Joel da Costa Barreto (RJB)	TIMOR GAP, E.P.			
3.	Mr. Quirmado Pinto (QP)	TIMOR GAP, E.P.		Time finish	12:00 pm
4.	Mr. Roberto Belo (RB)	TIMOR GAP, E.P.		Location	Hatu-udo Sub-District Ainaro
5.	Mr. Edmundo Soares (ES)	TIMOR GAP, E.P.			
6.	Ms. Madalena Viana (MV)	TIMOR GAP, E.P.		Recorder & Editor	DES
7.	Ms. Carmelita Baptista (CB)	TIMOR GAP, E.P.		Doc.No	
8.	Mr. Domingos Elisito do E. Santos (DES)	TIMOR GAP, E.P.		Data Sign	
9.	Mr. Lucas Faria (LF)	TIMOR GAP, E.P.			
10.	Mr. Songsak Badee (SBa)	TEAM Consulting			
11.	Mrs. Chalida Nieobubpa (CN)	TEAM Consulting			
12.	Mrs. Budsaba I. Na Ayudhaya (BA)	TEAM Consulting			
13.	Mr. Chaloemchai Nakkhwan (CN)	TEAM Consulting			
14.	Ms. Supichaya Wongchinawit (SW)	TEAM Consulting			
15.	Ms. Anshisa Chansila (AC)	TEAM Consulting			
16.	Mr.Komsan Yontchai (KY)	TEAM Consulting			
17.	Mr. Francisco Poto (FP)	NDPCEI			
18.	Mr. Francelino Cardoso (FC)	NDPCEI			
19.	***Please See the Attachment List (see attachment 10A)***	Local Leaders & Communities			

1. Opening Remarks by Master of Ceremony, Mr Joao dos Reis -Refinery Project Controller
2. Short Speech by Head of Municipal Ainaro Mr. Albertino de Araujo
3. Short Speech by Director of Refinery and Petroleum Services Unit , Mr. Vicente Pinto, TIMOR GAP, E.P
4. Short Speech by NDPCEI (National Directorate Pollution Control and Environmental Impact), Mr. Francisco Poto
5. Presentation on EIA study for Betano Refinery Project Mr.Songsak Bhaddee and Mrs. Budsaba Ayudhaya, TEAM Consulting
6. Closing Ceremony by Director of QHSE (Quality, Healthy, Safety and Environmental), Mr, Rony da Costa, TIMOR GAP,E.P

No	Question	Answers
1	Chief of Hatu-Udo Administrator • If the pipes cross the river and the depth of pipe only 1 ½ meter, can you guarantee that the river will not damage the pipe?	SBa- The study for this project already done by consultant from Thailand, they have compared two types of structure, the first one will be on rack crossing the big river and the other one is underground pipe. According to the Detailed Design the pipeline the pipeline would be on rack in parallel with existing bridge across the river.
2	Mr. Mariano de Almeida, Chief of Leo-lima Village • If the project affected to cultural places, it will be considered by the project owner?	• VP- Yes, consideration to sacred places will be taken before commencement of the project
3	Administrator of Ainaro District • Is there any possibility to do another public consultation regarding the project to the affected people in Aldeia Ainaro Kiik? (suggestion)	• VP- TIMOR GAP as mandated to administer and manage the project will always be ready to conduct a public consultation in order to disseminate the benefit of the project to the affected people if require.
4	Lucio Ribeiro, Agriculture staff • If the pipeline explosive or damage because of the earthquake automatically have impact to the community • Distance of the pipe to the community	• VP- the pipeline has been design based on the Timor Leste earthquake historical data. Thus, the risk of earthquake has been well calculated. • VP- the distance from pipeline route to the community around 50 – 60 M (buffer zone)

END OF RECORD

This Minutes of Meeting (MoM) is provided by TIMOR GAP, E.P office –Dili.

6 April 2016

Cassa Village

RECORD OF MEETING

No	Participant Name & Organization			Date	April 06, 2016
1.	Mr. Vicente da Costa Pinto (VP)	TIMOR GAP, E.P.		Time Start	09:00 am
2.	Mr. Rony Joel da Costa Barreto (RJB)	TIMOR GAP, E.P.			
3.	Mr. Quirmado Pinto (QP)	TIMOR GAP, E.P.		Time finish	12:00 pm
4.	Mr. Roberto Belo (RB)	TIMOR GAP, E.P.		Location	Cassa Village
5.	Mr. Edmundo Soares (ES)	TIMOR GAP, E.P.			
6.	Ms. Madalena Viana (MV)	TIMOR GAP, E.P.		Recorder & Editor	DES
7.	Ms. Carmelita Baptista (CB)	TIMOR GAP, E.P.		Doc.No	
8.	Mr. Domingos Elisito do E. Santos (DES)	TIMOR GAP, E.P.		Data Sign	
9.	Mr. Lucas Faria (LF)	TIMOR GAP, E.P.			
10.	Mr. Songsak Badee (SBa)	TEAM Consulting			
11.	Mrs. Chalida Nieobubpa (CN)	TEAM Consulting			
12.	Mrs. Budsaba I. Na Ayudhaya (BA)	TEAM Consulting			
13.	Mr. Chaloemchai Nakkhwan (CN)	TEAM Consulting			
14.	Ms. Supichaya Wongchinawit (SW)	TEAM Consulting			
15.	Ms. Anshisa Chansila (AC)	TEAM Consulting			
16.	Mr.Komsan Yontchai (KY)	TEAM Consulting			
17.	Mr. Francisco Poto (FP)	NDPCEI			
18.	Mr. Francelino Cardoso (FC)	NDPCEI			
19.	***Please See the Attachment List (see attachment 10A)***	Local Leaders & Communities			

1. Opening Remarks by Master of Ceremony, Mr Joao dos Reis -Refinery Project Controller
2. Short Speech by Deputy of Municipal Ainaro Mr. Alcino Barros
3. Short Speech by Director of Refinery and Petroleum Services Unit , Mr. Vicente Pinto, TIMOR GAP,E.P
4. Short Speech by NDPCEI (National Directorate Pollution Control and Environmental Impact), Mr. Francisco Poto
5. Presentation on EIA study for Betano Refinery Project Mr.Songsak Bhaddee and Mrs. Budsaba Ayudhaya, TEAM Consulting
6. Closing Ceremony by Director of QHSE (Quality, Healthy, Safety and Environmental), Mr, Rony da Costa, TIMOR GAP,E.P

No	Question	Answers
1.	Mr. Carlos Cardoso do Rego, (Casa Community) - • What would be the mitigation plan if there is any leakage?	• SBa - The consultant would provide emergency plan to mitigate the impact as well as monitoring program. Aside from that, we have to install safety system e.g. SCADA system to control the pressure and monitoring any potential impact during the operation phase; we also have daily inspection and annual inspection to the pipe.
2.	Marcelino de Araujo, (Casa Community) • I am worried about the depth of buried pipe only 1–1, 5 m, in case of heavy rain the pipe will be destroyed by river flow.	• SBa – on river crossing section the pipeline would be put on rack in parallel with existing bridge at the same height of the bridge, thus, it would be safe from river flow.
3.	Mr. Veriato Amaral, (Casa Community) • Who are going to do the pipe maintenance?	• SBa – TG as project owner will be responsible for conducting regular maintenance and monitoring
4.	Village chief suggested that: • For the cultural cases; I would suggest the existing cemeteries we can relocate, however to the sacred places we cannot relocate , it should be considered by the project proponent • Moreover the communities have lack of	• VP- Culture ceremony is "the Must" to be considers prior the project construction is kicked off. • Noted

No	Question	Answers
	awareness; the proponent must socialize the risk associated with pipe explosion	

END OF RECORD

Note: This Minutes of Meeting (MoM) is provided by TIMOR GAP, E.P office –Dili.

8 April 2016

Zumalai Sub-district

TIMORGAP	MINUTES of MEETING (MoM) Public Consultation on EIA study for Betano Refinery project with local communities in Zumalai sub-district, Covalima district	REFINERY & PETROLEUM SERVICES UNIT

RECORD OF MEETING

No	Participant Name & Organization			Date	April 08, 2016
1.	Mr. Vicente da Costa Pinto (VP)	TIMOR GAP, E.P.		Time Start	09:00 am
2.	Mr. Rony Joel da Costa Barreto (RJB)	TIMOR GAP, E.P.			
3.	Mr. Quirmado Pinto (QP)	TIMOR GAP, E.P.		Time finish	12: 00 pm
4.	Mr. Roberto Belo (RB)	TIMOR GAP, E.P.		Location	Zumalai Sub-District Ainaro
5.	Mr. Edmundo Soares (ES)	TIMOR GAP, E.P.			
6.	Ms. Madalena Viana (MV)	TIMOR GAP, E.P.		Recorder & Editor	DES
7.	Ms. Carmelita Baptista (CB)	TIMOR GAP, E.P.		Doc.No	
8.	Mr. Domingos Elisito do E. Santos (DES)	TIMOR GAP, E.P.		Data Sign	
9.	Mr. Lucas Faria (LF)	TIMOR GAP, E.P.			
10.	Mr. Songsak Badee (SBa)	TEAM Consulting			
11.	Mrs. Chalida Nieobubpa (CN)	TEAM Consulting			
12.	Mrs. Budsaba I. Na Ayudhaya (BA)	TEAM Consulting			
13.	Mr. Chaloemchai Nakkhwan (CN)	TEAM Consulting			
14.	Ms. Supichaya Wongchinawit (SW)	TEAM Consulting			
15.	Ms. Anshisa Chansila (AC)	TEAM Consulting			
16.	Mr.Komsan Yontchai (KY)	TEAM Consulting			
17.	Mr. Francisco Poto (FP)	NDPCEI			
18.	Mr. Francelino Cardoso (FC)	NDPCEI			
19.	***Please See the Attachment List (see attachment 10A)***	Local Leaders & Communities			

1. Opening Remarks by Master of Ceremony, Mr Joao dos Reis -Refinery Project Controller
2. Short Speech by Head of Sub-District Administrator Zumalai Mr.Manuel Freitas
3. Short Speech by Director of Refinery and Petroleum Services Unit, Mr. Vicente Pinto, TIMOR GAP, E.P
4. Short Speech by NDPCEI (National Directorate Pollution Control and Environmental Impact), Mr. Francisco Poto
5. Presentation on EIA study for Betano Refinery Project Mr.Songsak Bhaddee and Mrs. Budsaba Ayudhaya, TEAM Consulting
6. Closing Ceremony by Director of QHSE (Quality, Healthy, Safety and Environmental), Mr, Rony da Costa, TIMOR GAP, E.P

No	Question	Answer
1	Jaime Barreto, Zulo community Village • If the pipeline pass through our garden and damaged or explosive how to solve?	• SBa- during the operation phase will install SCADA system in Betano and Suai. The system will automatically detect if there any leakage along the pipeline. • TIMOR GAP: as pipeline operator would have the emergency team to promptly solve the problem if there is something wrong with the pipeline.
2	Afonso dos Santos, Zulo village chief • Maximum involving of Local people, so that we are not only watching? • If there is negative impact on water or contamination to the water and Soil how to mitigate the risk?	• VP- the contractor is required to employee local people based on Timor Leste Local Content regulation. The work opportunity will provide based on the skill available locally. • SBa- soil around the area will be tested in laboratories if it is contaminated. There would be remediation programs for example, water and soil will be taken for treatment and clean soil will put in place to replace contaminated soil. • During pipeline construction, there will be a test to insure that there is no leakage by using system that we call hydro static test. • RdC-EIA study team will Identify and quantify the potential negative impacts and positive impact from the proposed project with respect to the environment (physical, biological, economic, social, and cultural) and propose prevention, mitigation, and monitoring measures in the future.
	• How much is the distance from pipeline to the farms and community stay by?	• VP- that distance from pipeline to the community around 50 – 60 m (buffer zone)

END OF RECORD

Note: This Minutes of Meeting (MoM) is provided by TIMOR GAP, E.P office –Dili.

APPENDIX 13E

INVITATION LETTERS SENT TO ADMINISTRATORS OF CONCERNED DISTRICTS, SUB-DISTRICTS AND CHIEFS OF EIGHT VILLAGES

Level 3, Timor Plaza, Suite 301 - 314
Rua Presidente Nicolau Lobato, Comoro
Dili, Timor-Leste
T. + 670 331 0953 F. + 670 331 0952
www.timorgap.com

Ref. No. TG.RPSU.16.032

Loron : 11 de Marsu de 2016
Bodik ba : Sr. Albertino de Araujo, Administrador Municipio Ainaro
Kopia ba : Sr. Francisco Monteiro, President & CEO
Assuntu : Konvite atu partisipa iha Konsultasaun Publiku kona ba estudu Avaliasaun Impaktu Ambiental ba Projeto Pipeline Route no Betano Refinaria

Ho Respeitu,

Liu husi karta ida ne'e ami hakarak informa ba ita bo'ot katak, TIMOR GAP hanesan empreza publika ne'ebe tuir **DECRETO-LEI No. 13/2011** hetan mandatu hodi hatutan kna'ar Governu Timor-Leste nian hodi hala'o negosiu iha seitor Petroleu. Hanesan ita hotu hatene, tuir programa Dezenvolvemento Nasional ba Projetu Tasi Mane, sei hari'i Planta Refinaria iha area Betano no Baze Logistika iha area Suai.

Objetivu husi Konsultasaun Publiku ida ne'e atu habelar informasaun kona ba Avaliasaun Impaktu Ambiental ba Projeto Betano Refinaria no dalan kadoras (Pipeline Route) husi Suai (area Suai Supply Base) ba Betano ne'ebe sei kanaliza ka transporta mina matak no produtu hirak ne'ebe mak sei produs husi Planta Refinaria ba Suai molok haruka ba merkadu domestiku no Internasional.

Ho ida ne'e TIMOR GAP ho laran luak konvida ita bo'ot nia disponibilidade atu partisipa iha programa Konsultasaun Publiku ba Estudus Avaliasaun Impaktu Ambiental ne'ebe temi ona iha leten (agenda aneksu).

Ikus husi biban ida ne'e ami mos la haluha hato'o ami nia obrigadu wa'in ba servisu hamutuk hirak ne'e, hodi atinzi susesu wa'in ne'ebe ita hotu mehi husi Mega Projetu Tasi Mane.

Sinseiramente,

Vicente Pinto
Diretor ba Unidade Refinaria no Serbisu Petroleu

TIMORGAP

Level 3, Timor Plaza, Suite 301 - 314
Rua Presidente Nicolau Lobato, Comoro
Dili, Timor-Leste
T. + 670 331 0953 F. + 670 331 0952
www.timorgap.com

Ref. No. TG.RPSU.16.032

Loron : 11 de Marsu de 2016
Bodik ba : Sr. Jose Pina Cardozo, Administrador Municipio Suai
Kopia ba : Sr. Francisco Monteiro, President & CEO
Assuntu : Konvite atu partisipa iha konsultasaun publiku kona ba estudu Avaliasaun Impaktu Ambiental ba projeito Pipeline Route no Betano Refinaria

Ho Respeitu,

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Sinseiramente,

Vicente Pinto
Diretor ba Unidade Refinaria no Serbisu Petroleu

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Rua Presidente Nicolau Lobato, Comoro
Dili, Timor-Leste
T. + 670 331 0953 F. + 670 331 0952
www.timorgap.com

Ref. No. TG.RPSU.16.032

Loron	: 11 de Marsu de 2016
Bodik ba	: Sr. Carlito P. de Araujo, Administrador Municipio Manufahi
Kopia ba	: Sr. Francisco Monteiro, President & CEO
Assuntu	: Konvite atu partisipa iha konsultasaun publiku kona ba estudu Avaliasaun Impaktu Ambiental ba projeito Pipeline Route no Betano Refinaria

Ho Respeitu,

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Sinseiramente,

Vicente Pinto
Diretor ba Unidade Refinaria no Serbisu Petroleu