

The Democratic Republic of Timor-Leste

Ministry of Public Works

**PREPARATORY SURVEY REPORT
ON THE PROJECT FOR
THE CONSTRUCTION OF
UPRIVER COMORO BRIDGE
IN THE DEMOCRATIC REPUBLIC
OF TIMOR-LESTE**

FEBRUARY 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

INGÉROSEC CORPORATION

NIPPON ENGINEERING CONSULTANTS CO., LTD.

IDEA CONSULTANTS, INC.

PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the consortium of INGÉROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO., LTD. and IDEA CONSULTANTS, INC.).

The survey team held a series of discussions with the officials concerned of the Government of the Democratic Republic of Timor-Leste, and conducted field investigations. As a result of further studies in Japan and the explanation of survey result in Timor-Leste, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Democratic Republic of Timor-Leste for their close cooperation extended to the survey team.

February, 2014

Kazunori Miura
Director General,
Economic Infrastructure Department
Japan International Cooperation Agency

SUMMARY

SUMMARY

(1) Outline of the Country

The Democratic Republic of Timor-Leste (hereinafter referred to as “Timor-Leste”) is an island county covering the eastern half of Timor Island which is located at the eastern edge of the Lesser Sunda Islands in Southeast Asia. The Population of Timor-Leste is approximately 121 million in (2012, Source: World Development Indicators, World Bank) and its area is approximately 14,900 km². Dili, the capital of Timor-Leste, is located at the northwest coast area, and approximately 230 thousand people (2010, Source: Population Census 2010), 20% of the total population of Timor-Leste, live in Dili.

About 60% of the country is composed of the mountainous area whose geography is hilly and variegated typified by Rameau Crests running through the center of Timor-Leste, and about the half of the country composes of steep slopes whose gradient is more than 40%.

Geologically, Timor-Leste belongs to the Australian Continental Plate where accumulated limes form the foundation rock, and base material of the foundation rock forming the coastal area and Comoro River Basin is phyllite. Phyllite is fragile and has a characteristic to be erodible under weathering.

Timor-Leste belongs to the Tropical Monsoon Climate region, and rainy season and dry season are identified clearly. In the rainy season in the northern area at which Dili is located, annual average precipitation for 5 months from December to April is approximately between 1,000mm and 1500mm, and November is the transitional phase from dry season to rainy season. As for the temperature in Dili, minimum temperature is between 18 and 23 degrees C, and Maximum temperature is 28 and 33 degrees C.

Timor-Leste had been independent in 2002. It was the first new sovereign country in 21 century and continued economic growth despite riots in 2006, recording 12.8% of the GDP growth rate in 2008. GDP per capita in 2011 was 3,949 USD. Main industry in Timor-leste is agriculture—which covers about 25% of GDP—oil and natural gas. Major agricultural products are rice, corn and coffee beans. The industrial structure has a proportion of which primary industry is 25.6%, secondary industry is 18.1% and tertiary industry is 56.3% according to CIA World Factbook, 2012 est.

(2) Background and Outline of the Project

The population of Dili is 234,026 (2010 population census). Its population growth rate is 4.1% per annum, which is higher than the national average of 2.45%. By 2020, the population of the city is predicted to exceed 30% of the total population.

Currently the population of Dili is about 20% of the total population, and in the city center in the east of Dili, topographically there is little available land left for new housing developments. Therefore, the population distribution of the capital is expanding in the west side where the airport is located and across the Comoro River flowing south to north through the developing

area in the west. Accordingly east-west traffic within the city is rapidly increasing. However, since there is only one bridge crossing the Comoro River at present, during times when the traffic is heavy, traffic congestion is caused by the limited traffic capacity of this bridge, which paralyzes traffic within the city. Also, from the viewpoints of disaster prevention and proper development of the city, it is necessary to improve the current situation of the existing Comoro Bridge.

As an urgent measure to mitigate the traffic congestion, the Government of Timor-Leste has started the construction to expand the bridge from the existing one lane to two lanes per direction, and the two-lane bridge per direction has been operated since June, 2013. However, according to the traffic demand forecast in the Timor-Leste National Road Master Plan(2010-2019) by ADB, both the number of vehicle ownership and traffic are predicted to increase greatly in the future. Therefore, there is a pressing issue to construct a new bridge across the Comoro River to distribute the traffic within the city properly and mitigate the congestion. Based on the above-mentioned situation, the Government of Timor-Leste has made a request to the Government of Japan for the construction of the Upriver Comoro Bridge whose bridge length is 210m and development of the access roads.

This Project is to secure smooth and stable traffic in east-west direction in Dili urban area by constructing a new bridge crossing the Comoro River upstream from the existing bridge and developing its access road connecting a new bridge and existing trunk road.

As a result of examining the objective area and scale of the Project based on the request by the Government of Timor-Leste and the above-mentioned project purpose, it is proposed that the project scope by Japan's Grant Aid would be the construction of a new two-lane bridge whose bridge length is approximately 250m and the development of two-lane access roads whose length is approximately 3.2km.

The Government of Timor-Leste has identified six economic development zones in the country based on the Strategic Development Plan (SDP) 2011-2030, which is the long-term development plan. Foremost among these is the Tiber-Dili-Hera Integrated Economic Zone (the area connecting the northern coast from east to west on either side of Dili), where it is planned to promote development of economic infrastructure such as roads and bridges, etc. and create an area for promoting development of services, logistics, industry, housing and business.

The SDP also specifies a plan to construct New Tiber Port with annual handling capacity of 1 million tons of freight by 2020, and since demand for physical distribution is expected to increase greatly from now on, it states the importance of constructing an access road to connect the new port with the urban area. For this reason, this project meets the long-term development policy in Timor-Leste.

(3) Outline of the Survey Results and Contents of the Project

JICA dispatched the Preparatory Survey Team (hereinafter referred to as "Survey Team) to Timor-Leste from 18th June 2013 to 27th July 2013.

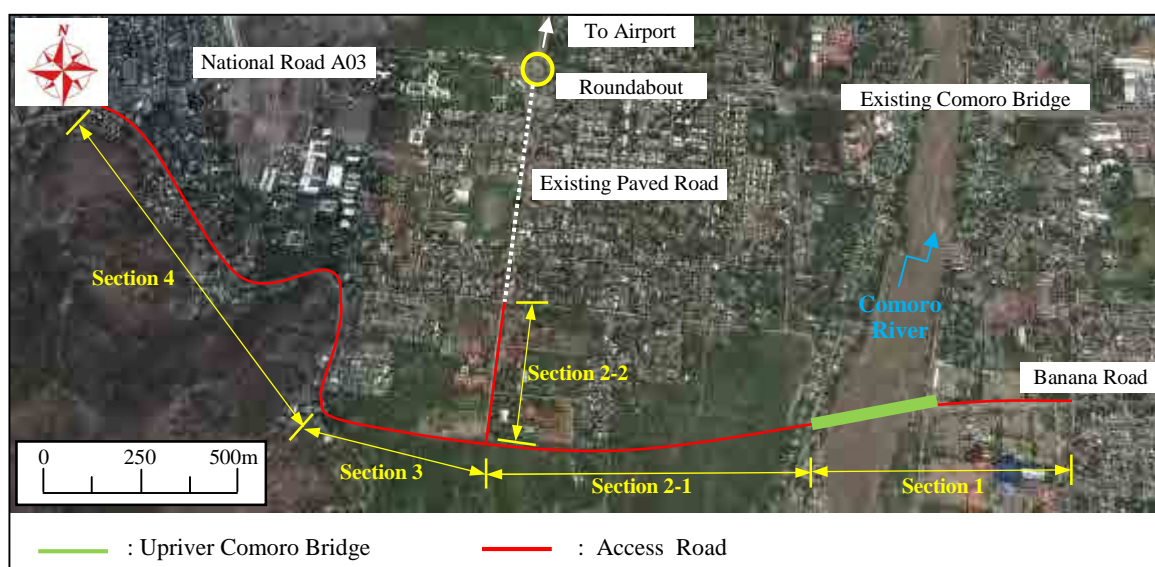
The Survey Team held a series of discussions with the officials concerned of Timor-Leste, and confirmed the current condition of the existing bridge and road, expected new bridge site, expected route of access road, and flow regime of Comoro River through the field survey around the project site.

Though the field survey, since it was confirmed that a currently undeveloped access road, is essential for supporting east-west traffic which is expected to increase in future, the Survey Team examined the bridge position considering alignment of the access road and development area of the access road.

Also, the Survey Team confirmed in discussions with the Government of Timor-Leste that the local side hoped to widen the bridge and access road to four lanes in the future. Moreover, after the field survey, the Government of Timor-Leste made a written request to the Government of Japan for detailed design on four lanes while recognizing that the bridge and access road constructed in the Project will have two lanes.

In response to this request, upon considering the future traffic demand and impacts on environmental and social considerations, it has been decided to construct a provisional two-lane bridge and access road in the Project while allowing for expansion to four lanes in the future. The Survey Team conducted project planning based upon the work in Japan after the field survey taking the above survey results into account.

Figure-1 shows the Project area and Table-1 shows the outline of the Project. The Survey Team carried out local discussions with the Government of Timor-Leste regarding the scope and contents of the Project implemented by Japan's Grant Aid from 16th to 24th January 2014, and then obtained the basic agreement from the Government of Timor-Leste.



Source: Google Earth

Figure-1 Project Area

Table-1 Outline of the Planned Facilities

Item		Description						
Upriver Comoro Bridge	Bridge Type	6 Span Continuous PC Box Girder Bridge						
	Bridge Length	249.0m						
	Spans	33.70m+4@45.00m+33.70m						
	# of Lane	2 lanes						
	Width	Carriageway:3.5m/direction Shoulder:0.5m Footpath: 2.0m (north side), 0.75m(south side) Total width: 11.55m						
	Pavement	Carriageway: Asphalt Concrete 7cm Footpath: Asphalt Concrete 3cm						
	Horizontal Alignment	R = ∞ (Straight)						
	Longitudinal Gradient	0.5%						
	Cross Slope	2.0%						
	Construction Method	Fixed Scaffolding						
	Abutment	Reversed T-Shaped Abutment						
	Pier	Wall Type Pier (Oval Type)						
	Foundation	Bored Piles, φ 1.2m						
	Revetment	Concrete Block Type						
Pier Protection	Foot Protection Block							
Access Road	Total Length	3.2km						
	Beginning Point (Right Bank Side)	Unpaved intersection of Banana Road at which is the edge of existing 4 lane road						
	End Point (Left Bank Side)	Crossing point with National Road A03						
	Width	Section	Footpath	Shoulder	Carriage-way	Shoulder	Footpath	Utility Space
		Section 1 (Right Bank Side)	1.0m	0.5m	3.5m×2	0.5m	2.0m	1.0m
		Section 2-1,3 (Embankment Section)	1.0m	0.5m	3.5m×2	1.0m	2.0m	1.0m
		Section 4 (Limited Land Section)	-	1.0m	3.0m×2	1.0m	-	-
		Section 2-2 (Branch to Airport)	1.5m	0.5m	3.5m×2	0.5m	1.5m	-
	Pavement		Type-1			Type-2		
		Wearing Course	Asphalt Concrete 3cm			Asphalt Concrete 5cm		
		Binder Course	Asphalt Concrete 4cm			-		
Base Course		Mechanical Stabilized Stone 20cm			Mechanical Stabilized Stone 15cm			
Sub Base Course		Crusher-Run 20cm			Crusher-Run 20cm			
	Footpath	Asphalt Concrete 3cm Base 15cm (equivalent to subbase material)			Gravel 20cm (equivalent to base material)			
Drainage Facilities	Side Ditch (U-shape Type, Concrete Lining Type) 、 Crossing Culvert (BOX Type, Pipe Type)、 Catch Basin、 Inlet and Outlet							
Ancillary Facilities	Kerb Stone、 Rataining Wall、 Guardrail 、 Street Light、 Road Sign、 Line Marking、 Bus Stop							

(4) Schedule and Approximate Cost of the Project

Total project schedule is also estimated as 36.5 months including a tendering schedule (detailed design 10 months, construction 26.5 months). An approximate cost borne by Timor-Leste side is estimated as 6.24 million USD.

(5) Evaluation of the Project

The relevance and effectiveness are shown as follows;

1) Relevance

i. Target Beneficiaries

Target beneficiaries of securing smooth and stable traffic in east-west direction in Dili urban area are mainly nationals in Dili District including impoverished groups, numbering about 230 thousand people. As the target beneficiaries are so many, about 20% of total population in Timor-Leste, the relevance of the Project is high.

ii. Living Improvement of Residents

The development in the project area, the western area of Dili District, is delayed compared with that in the city center, so living improvement of residents are urgently required. Therefore, the relevance of the Project is high.

iii. Coordination with the long-term development plan

In the SDP that is a long-term development plan in Timor-Leste, the northern corridor which composes of National Road A01 and A03 is recognized as an important corridor stimulating the economic growth in the country. Therefore, the coordination of the Project, which is expected to be a bypass of National Road A03, and the SDP is high. Besides, since the importance of the development of access roads with the development of a New Tibar Port is described in the SDP, a new bridge and access roads are expected to contribute to a physical distribution as a part of the above-mentioned access road. Accordingly, the relevance of the Project is high.

iv. Coordination with the assistance policy of Japan

As one of the assistance policy of Japan to Timor-Leste, “The development of infrastructure for promotion of the economy” is mentioned. Since the Project will contribute to the smooth and stable traffic in Dili urban area, the Project meets the above assistance policy and the relevance of the Project is high.

2) Effectiveness

2-1) Quantitative Effect

The Project is to support the traffic demand in Dili urban area that is estimated to increase rapidly from now on, and contribute to the smooth and stable traffic as well as the promotion of economy.

Accordingly, it is suggested that the effectiveness of the Project is 1) Increase of traffic crossing Comoro River accompanied by the increase of traffic capacity by the construction of a new bridge, 2) Improvement of average travel speed, and 3) Increase of freight traffic accompanied by stimulated physical distribution.

Table-2 shows the indicators of quantitative effect, baselines, and target values in 3 years later after the completion of the Project.

Table-2 Indicators of Quantitative Effect

Indicator	Baseline (2013)	Target Value (2020) 【3 years after completion】
Traffic Volume (pcu/day) ^{※1)}	38,000 ^{※2)}	57,000 ^{※3)}
Average Travel Speed (km/h)	40 ^{※2)}	60
Freight Traffic (vehicle/day)	3,400 ^{※2)}	4,700 ^{※3)}

※1 pcu: passenger car unit

※2 value at the existing bridge

※3 total traffic volume of the existing bridge and new bridge

2-2) Qualitative Effect

- i. Traffic jam in Dili will be mitigated by the distribution of traffic in the city
- ii. An alternative route of the existing bridge and National Road will be secured in case of emergency such as in disaster, and etc.
- iii. Punctuality of the physical distribution will be ensured by securing the logistics route.
- iv. Economic development along the planned road will be promoted by the development of road in the Project area

Preparatory Survey Report on the Project for the Construction of Upriver Comoro Bridge in the Democratic Republic of Timor-Leste

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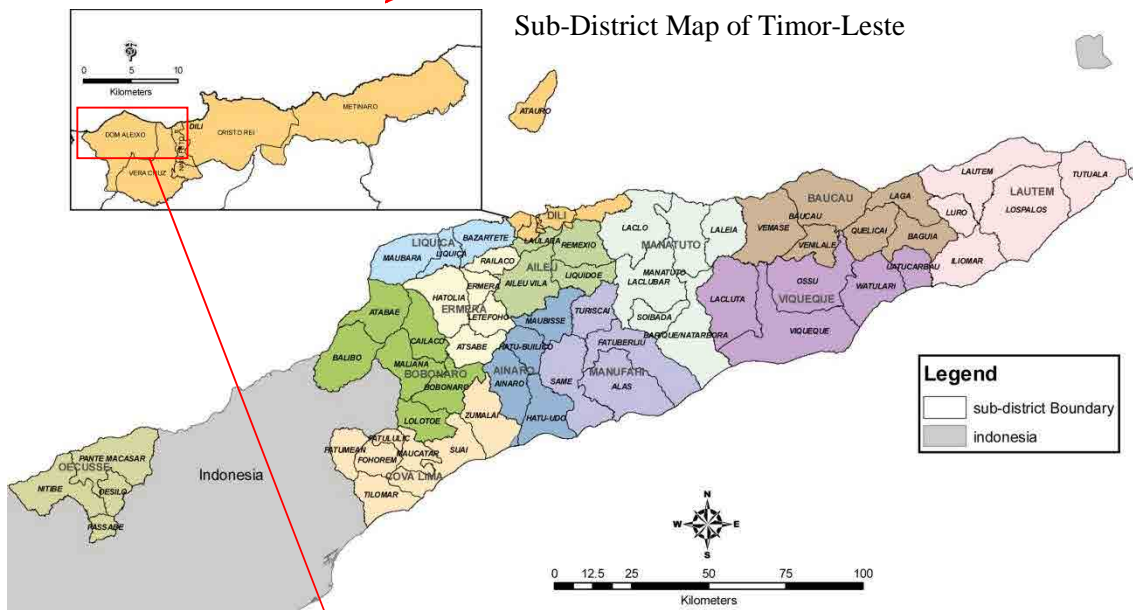
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Source : ATLAS



Source : Population Census 2010



Source : Google Earth

Location Map



Perspective (1/2)



Perspective (2/2)

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Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADB	Asian Development Bank
AP	Affected Person
ARAP	Abbreviated Resettlement Action Plan
CBR	California Bearing Ratio
DNTPSC	National Directorate of Land, Property and Cadastral Services
DRBFC	Directorate of Roads, Bridges and Flood Control
EIA	Environmental Impact Assessment
E/N	Exchange of Note
EMP	Environmental Management Plan
ESU	Environmental Social Unit
G/A	Grant Agreement
GDP	Gross Domestic Product
GRP	Grievance Redress Committee
H.W.L.	High Water Level
IEE	Initial Environmental Examination
JICA	Japan International Cooperation Agency
MAF	Ministry of Agriculture and Fisheries
MCIE	Ministry of Commerce, Industry and Environment
M/D	Minutes of Discussion
MOF	Ministry of Finance
MPW	Ministry of Public Works
MSA	Ministry of State Administration
NDE	National Directorate of Environment
NDF	National Directorate of Forestry
NGO	Nongovernmental Organization
PAU	Project Affected Unit
PC	Prestressed Concrete
PCU	Passenger Car Unit
P/Q	Prequalification
PVC	Polyvinyl Chloride
PIU	Project Implementation Unit
PSU	Project Support Unit
RC	Reinforced Concrete
SDP	Strategic Development Plan
TA	Technical Assistance
TEU	Twenty-foot Equivalent Unit
TOR	Terms of Reference
UNTAET	United Nations Transitional Administration in East Timor
USAID	United States Agency for International Development
USD	US Dollar
WB	World Bank

CHAPTER 1

BACKGROUND OF THE PROJECT

Chapter 1 Background of the Project

1-1 Background and Outline of the Request for Grant Aid

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Concerning the new bridge, the general location and scale of the bridge are stated, however, there is no detailed description about the scope and scale of construction of the access road. Accordingly, in this Survey, from the viewpoint of setting forth the basic policy of design, it was important to examine the scope and scale of new bridge and access road construction upon confirming the background of the Project, conditions around the target area and the relevance and necessity of the Project. Table 1-1-1 shows the contents of the request as stated in the official request document.

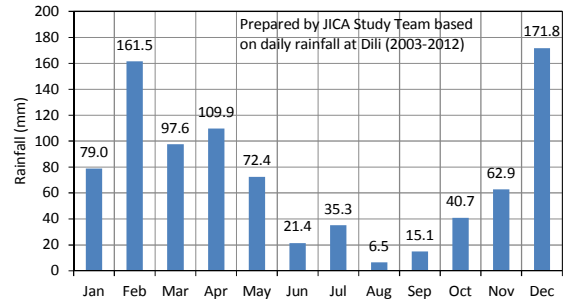
Table 1-1-1 Contents of the Request from Timor-Leste' Side

Target Facilities	Position and Scope	Scale
New bridge	The rough position connecting with Banana Road upstream of the existing bridge is stated.	Bridge length 210m, width 7m, 3 spans
Access road	No specific position or scope is stated.	No specific scale is stated

1-2 Natural Condition

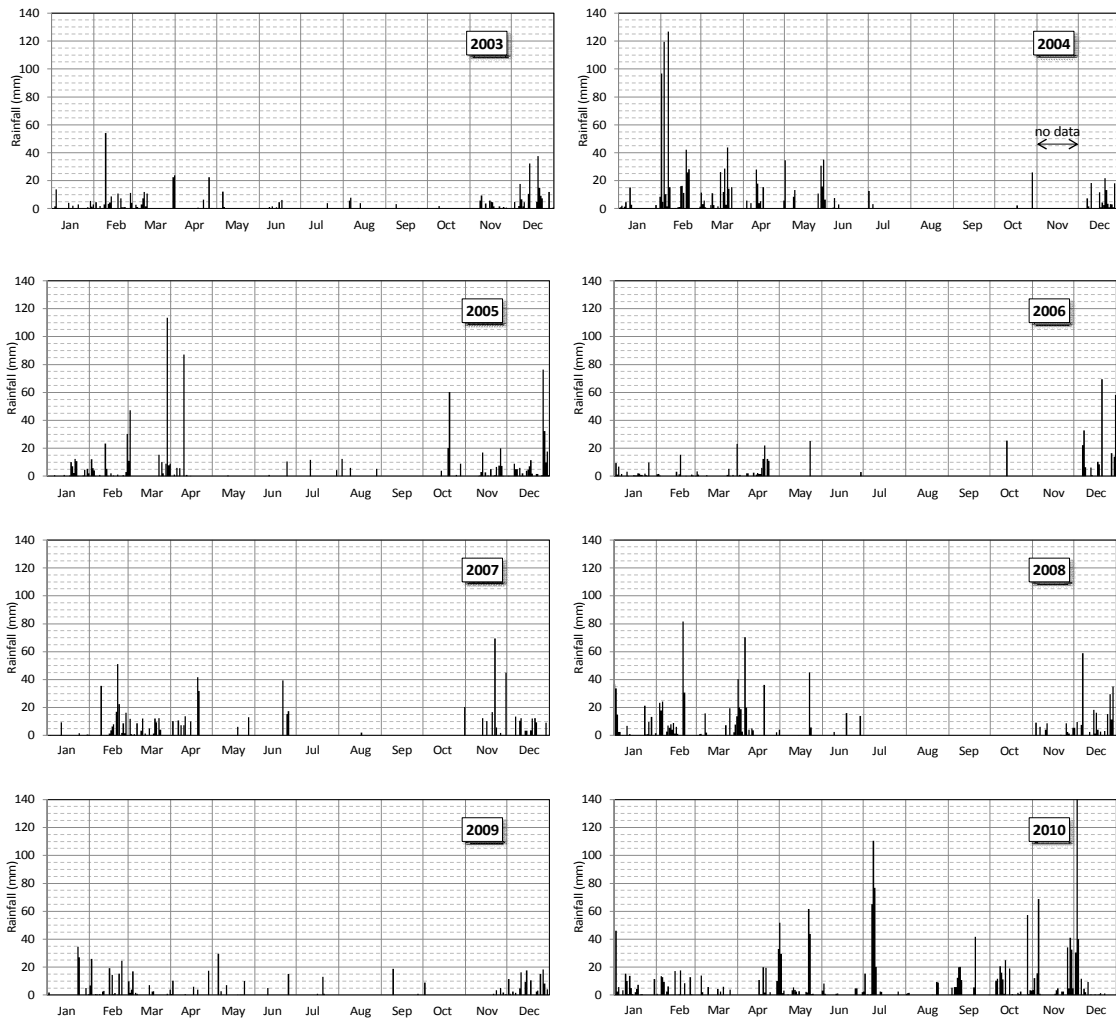
(1) Rainfall

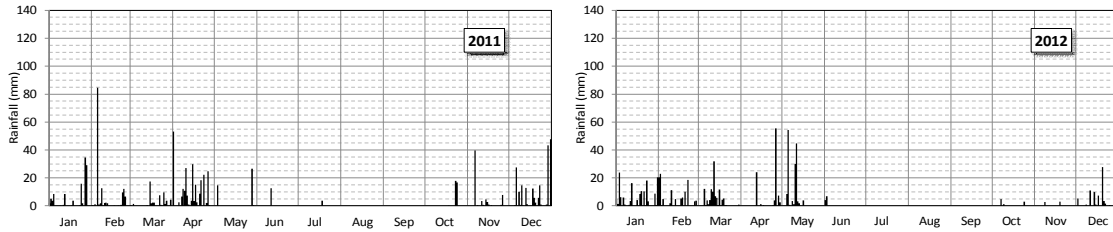
Daily rainfall amount has been recorded in Dili meteorological station and Figure 1-2-1 shows monthly rainfall based on these daily rainfall data in the year from 2003 to 2012. And Figure 1-2-2 shows daily rainfall hyetograph for each year. Rainy season lasts from December to June next year and high rainfall amount is recorded in February and December. However, annual maximum daily rainfall is occasionally recorded in either July or November, the beginning or end of rainy season, respectively.



Source: Prepared by Survey Team based on daily rainfall data in Dili Station

Figure 1-2-1 Monthly Rainfall of Dili Station





Source: Dili Station

Figure 1-2-2 Daily Rainfall of Dili Station

Annual rainfall from 2003 to 2012 is shown in Table 1-2-1 and average annual rainfall for the 10 years is 874.1 mm. Meanwhile, average annual rainfall of Comoro River basin is calculated to be 1,445 mm, by weighted mean method using isohyetal map illustrated in “Report on the Basic Design Study on the Project for the Implement of Roads and Bridges in the Democratic Republic of Timor-Lest (2003), JICA” shown in Figure 1-2-3.

Average annual rainfall	Area
500~1,000 mm	10.3 km ²
1,000~1,500 mm	106.0 km ²
1,500~2,000 mm	90.8 km ²
Total	207.1 km²

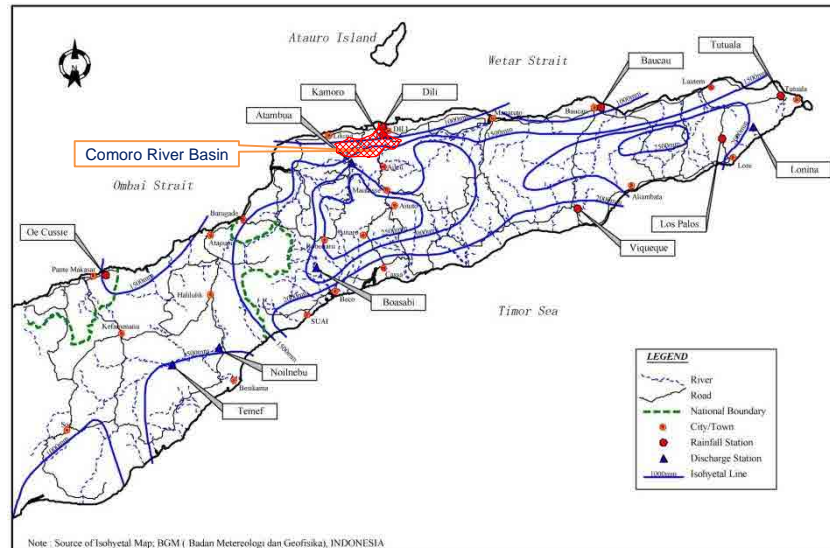
$$\text{Average annual rainfall of Comoro River basin} = \frac{750 \times 10.3 + 1250 \times 106.0 + 1750 \times 90.8}{207.1} = 1,444.3 \text{ (mm)}$$

Table 1-2-1 Annual Rainfall in Dili Station

Year	Rainfall (mm)
2003	527.6
2004	1,167.9
2005	885.1
2006	479.2
2007	768.7
2008	1,019.8
2009	525.5
2010	1,716.4
2011	911.8
2012	739.3
Average	874.1

Source: Dili Station

Average rainfall over Comoro River basin, which is mentioned in “2-2-2 Basic Plan, (3) River Planning”, is calculated by multiplying rainfall of Dili station by correction factor 1.7. Correction factor is expressed as the ratio of average annual rainfall over Comoro River basin to that of Dili station (1,444.3mm/874.1mm=1.7).



Source: The survey team revised Figure-2.3 in “Report on the Basic Design Study on the Project for the Implement of Roads and Bridges in the Democratic Republic of Timor-Leste, JICA”

Figure 1-2-3 Isohyetal Map In Timor-Leste

(2) Natural Condition Survey

Outline of the natural condition survey conducted in the Preparatory Survey is shown below.

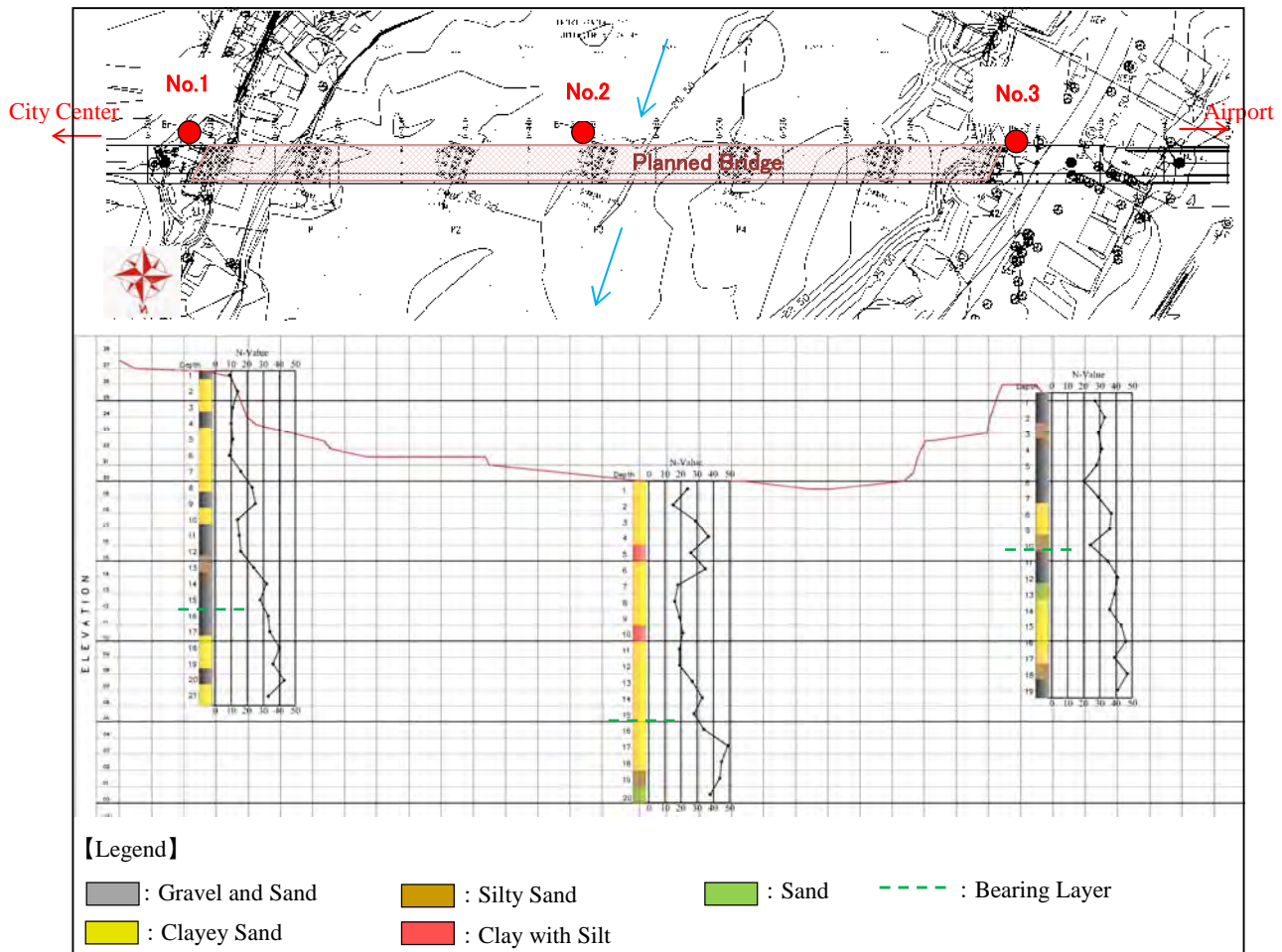
1) Topographic Survey

Installation of bench marks, the topographic survey around the expected access road area, and longitudinal, cross-section and river topographic survey of Comoro River were conducted around the bridge site and access road expected in the Preparatory Survey and the river area required for the hydraulic analysis. Based on the topographic survey, a topographic map around the expected bridge site and access road and the profile and cross section of the river have been prepared. These surveys were conducted by a qualified local consultant commissioned by the Survey Team.

2) Geotechnical Survey

2-1) Boring Survey

Boring survey was conducted at the 3 points shown in the Figure 2-2-9 to confirm the bearing layer around abutments and piers of the planned bridge by a qualified local consultant commissioned by the Survey Team. Sampling of materials and laboratory tests were also done to confirm the characteristics of sampled soil. Figure 2-2-9 shows the boring location, soil type and N-Value in each layer. The depth of boring was down to a point where more than 30 of N-Value was confirmed continuously for 5m depth, and its upper surface was determined to be the bearing layer of the bridge.



Source: Survey Team

Figure 1-2-4 Location and Results of Boring Survey

Soil condition of each survey point is as follows;

① No.1 (around the abutment at right bank side)

From the ground level, layer of gravel and sand and clay layer that relative density is low accumulate for 12m, and deeper from there, layer of gravel and sand that N-Value is more than 20, and deeper from 15.5m, more than 30 of N-Value are found. Adequate vertical bearing capacity is expected at this point.

② No.2 (around the pier in the center of river)

From the surface of river bed, clayey sand layer that relative density is low accumulates for about 12m. Between 9 and 25 of N-Value is found there. Deeper from there, dense clayey sand that N-Value is more than 30 is found for 6m. Adequate vertical bearing capacity is expected at this point.

③ No.3 (around the abutment at left bank side)

From the ground level, low-density gravel and loose embankment layer of sand accumulate for 5m, deeper from there, clay layer is found. From there, silty sand and coarse sand are found and both of them have more than 30 of N-Value. Adequate vertical bearing capacity is expected at this point.

2) Soil and Material Investigation

In order to utilize as basic data for the pavement design of access road, the trial pit excavation was conducted for 1m depth at 9 points selected at 500m intervals along the expected route. Material sampling and laboratory tests were also conducted to confirm the characteristic of soil texture. Figure 1-2-5 shows the location of trial pit excavation and Table 1-2-2 shows the soil texture and CBR value of each layer.

At the survey points of #1, #2, #7, #8, #9 on the existing road, layers of dense gravel and sand were mainly found and CBR values between 26 and 64 were confirmed. At the other points, layers of silty sand were mainly found and CBR values between 12 and 29 were confirmed. No Unsuitable soil was found and sufficient bearing capacity is expected at any survey points. Soil and Material Investigation was conducted by the qualified local consultant commissioned by the Survey Team.



Source: Survey Team

Figure 1-2-5 Location of Trial Pit Excavation

Table 1-2-2 Soil Texture and CBR Value of Each Survey Point

Depth (mm)	Test Pit Location																	
	# 1		# 2		# 3		# 4		# 5		# 6		# 7		# 8		# 9	
	Soil Type	CBR(%)	Soil Type	CBR(%)	Soil Type	CBR(%)	Soil Type	CBR(%)	Soil Type	CBR(%)	Soil Type	CBR(%)	Soil Type	CBR(%)	Soil Type	CBR(%)	Soil Type	CBR(%)
50																		
100																		
150		51				27		25		29				36		28		63
200											29							
250																		
300																		
350																		
400		29				29		22		23				26		36		27
450																		
500					64													
550											24							
600																		
650																		
700																		
750																		
800		49				18		17		28				46		29		34
850																		
900																		
950																		
1000																		


Legend
 : Gravel and Sand
 : Silty Sand
 : Sand with Clay

Source: Survey Team

3) Riverbed Material Investigation

Riverbed investigation was conducted to identify the average grain size of riverbed material by image analysis using the Area-Grate Method as basic data to examine the local scouring at the bridge pier. This investigation was conducted at 12 points on both edge and center of 4 cross sections of the river, expected bridge position and its upstream and downstream. Figure 1-2-6 shows the investigation points and grain sizes of riverbed materials at each point.

Location	Grain Size			
	Max. (mm)	Min. (mm)	Median (mm)	Average (mm)
#1 Right Bank	107.3	5.5	33.6	53.7
#1 Right Bank 2	75.9	3.6	16.9	30.3
#1 Center	123	6.9	28.1	55.9
#2 Right Bank	86.3	4.1	12.7	26.7
#2 Left Bank	85.1	4.7	25.1	42.1
#2 Center	158.8	5.9	30.6	56.7
#3 Right Bank	82.3	4.9	19.1	30.6
#3 Left Bank	77.1	5.4	15.1	24.9
#3 Center	72.1	5.5	20.7	31.9
#4 Right Bank	73.3	4.6	13	21.7
#4 Left Bank	40.8	5	11.8	16.9
#4 Center	55.8	5.3	17.3	25.1



Source: Survey Team

Figure 1-2-6 Points of Riverbed Material Investigation and Grain Size at Each Points

(3) Current River Characteristics of Comoro River

1) Outline of Comoro River Basin

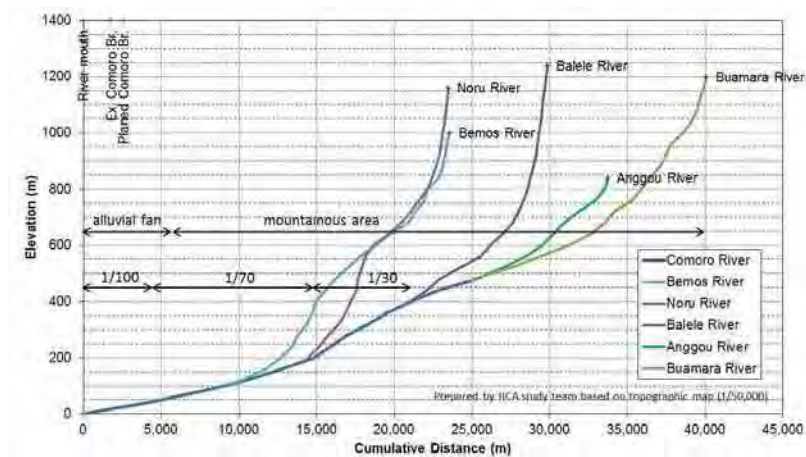
Comoro River basin has a catchment area of 207.1 km², which covers about 30 km east-west and about 4 - 8 km north-south as shown in Figure-4. Most of the river basin area is occupied by mountainous area. From the west, Anggou River, Buamara River and Balete River join and it changes the name to Comoro River. Comoro River flows joining Noru River and Bemom River, which are right bank tributaries, in the mountainous area and reaches head of alluvial fan located about 5.5 km from the river mouth. And then, it flows straight to the river mouth on the alluvial fan formed by repeating flood inundation.



Source : Report on the Basic Design Study on the Project for the Implement of Roads and Bridges in the Democratic Republic of Timor-Leste, JICA

Figure 1-2-7 Comoro River Basin

Longitudinal profile of Comoro River system is prepared based on topographic map of 1:50,000-scale and is illustrated in Figure 1-2-8. Longitudinal slopes of 5 tributaries flowing in mountainous area are 1/10 - 1/24. Regarding Comoro River, longitudinal slope is 1/30 in mountainous area and 1/70 for the downstream reaches from the confluence with Noru River (14 km from river mouth). Longitudinal slope gets gentler as the river flows downstream.



Source : Digital topographic map revision and database operation manual for the study on urgent establishment of topographic mapping in East Timor (2000), JICA

Figure 1-2-8 Longitudinal Profile of Comoro River System

2) River Channel

Planned Upriver Comoro Bridge is located at 2.6 km from the river mouth or at the midpoint of alluvial fan, which is 5.5 km in length. Characteristics of existing Comoro River on the alluvial fan are described below.

2-1) Longitudinal Riverbed Slope

Longitudinal profile of riverbed of Comoro River is made up based on topographic data prepared in “Digital topographic map revision and database operation manual for the study on urgent establishment of topographic mapping in East Timor (2000), JICA” (Figure 1-2-9), and is illustrated in Figure 1-2-10.

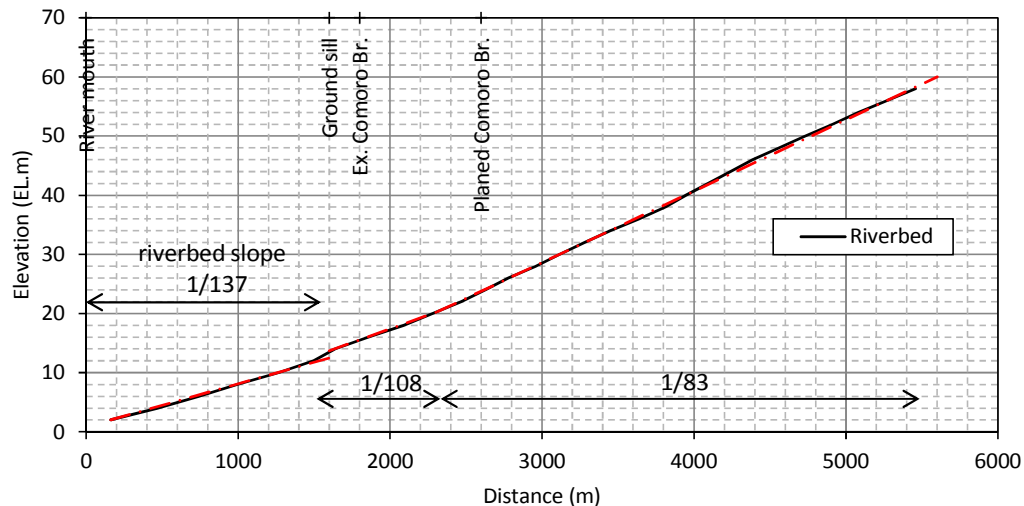


Source : The Survey Team revised output of “Digital topographic map revision and database operation manual for the study on urgent establishment of topographic mapping in East Timor (2000), JICA”

Figure 1-2-9 Contour of Alluvial Fan

Stretch	Riverbed slope
0 km ~ 1.6 km	1/137
1.6 km ~ 2.3 km	1/108
2.3 km ~ 5.5 km	1/83

A ground sill (H=2.6m) has been installed at 1.6 km from the river mouth and forms a changing point for riverbed slope. Riverbed slope (I=1/108) from the ground sill to 2.3 km is gentler than that (I=1/83) upstream of 2.3 km because the ground sill restrains riverbed material movement and deposits them upstream of it. Riverbed slope at planned Upriver Comoro Bridge site (2.6 km) is 1/83.



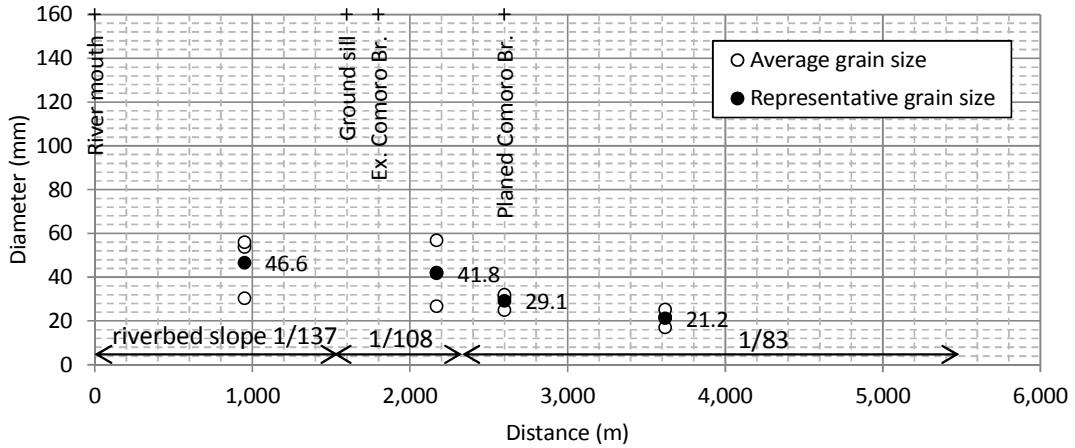
Source : Survey Team

Figure 1-2-10 Longitudinal Profile of Riverbed

2-2) Representative Grain Size

Riverbed material investigation was conducted at 4 cross-sections (described in (2) “Natural

Conditions Survey”). 3 points were selected within 1 cross-section. Representative grain size for each cross-section is calculated to average these 3 grain sizes (Figure 1-2-11). Ordinarily riverbed grain size gets smaller as riverbed slope gets gentler, i.e. as the river flows downstream. Figure 1-2-11, however, shows adverse trend because larger gravel and sand are removed by large-scale gravel extraction using heavy machinery upstream of 2.6 km.



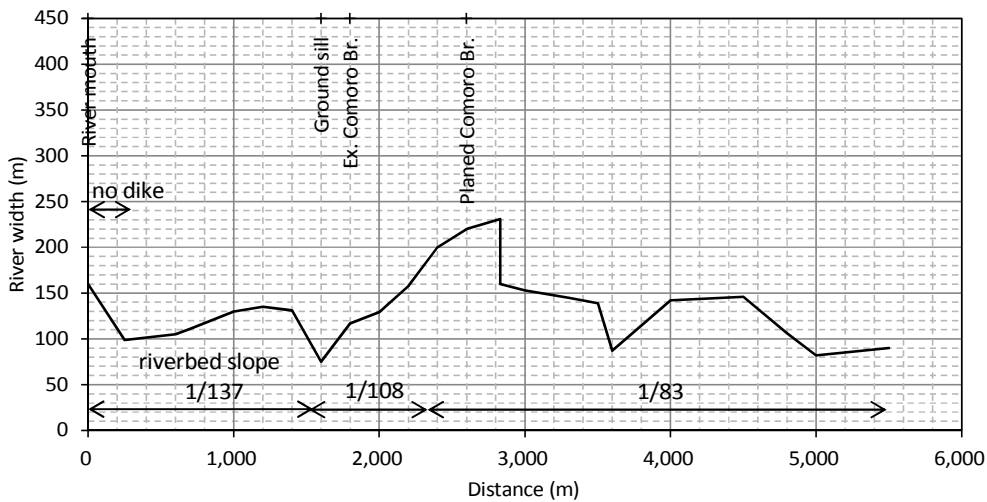
Source : Survey Team

Figure 1-2-11 Grain Size of Riverbed Material

2-3) River Width

Existing river width measured software “Google Earth” is shown in Figure 1-2-12. River width from the river mouth to the groundsill (1.6 km) is 100 – 140 m but it is reduced to 70 m at the section of the groundsill. In the upper reaches of the groundsill, river width gets wider and is a maximum width of 230 m at 2.8 km from the river mouth.

Massive reclamation land exists from 2.8 km to 3.8 km on the left bank in the river channel and therefore river width suddenly decreases at 2.8 km. In addition, river width seems to have been reduced artificially because former revetment or dike remains at 0.7 km and 1.6 km-2.7 km on landside of the left bank (See the Photo below).



Source: Survey team

Figure 1-2-12 River Width



Former masonry revetment
(0.7km on left bank)



Former dike
(1.9km on left bank)

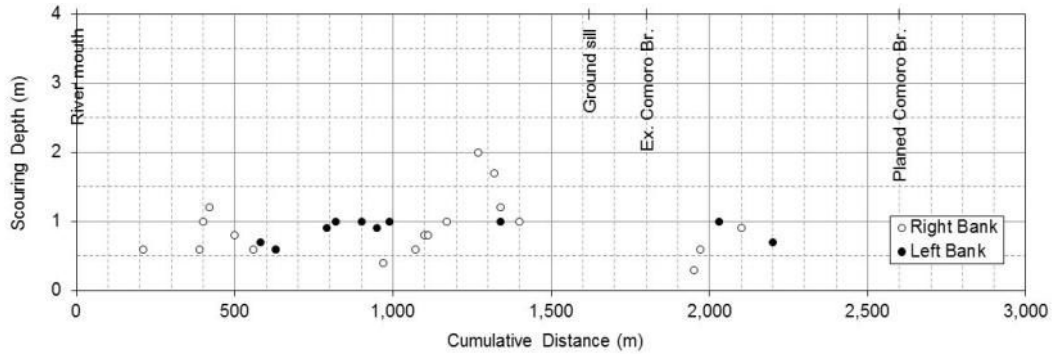


Former dike
(2.8km on left bank)

Photo: Former Revetment and Dike on Left Bank

3) Scour in Front of Revetment

From the river mouth (0 km) to 2.2 km, revetments are installed on the left and the right riverbanks. Riverbed, where water course is close to revetment, is scoured in front of revetment during flood. Scouring depth in front of revetment is survey in this study and the result is illustrated in Figure-16. According to the figure, scouring depth is 2 m in maximum and less than 1 m at most reaches. If scour proceeds deeper, revetment loses passive earth pressure and collapses. Some revetments slide down or collapse at reaches downstream of the ground sill (1.6 km) as shown in Figure 1-2-13. The possible causes of scour are gravel extraction near revetment, fixed water course by rising of sandbar, etc. Local scour like this should be considered when the bridge piers and abutments are designed.



Source: Survey team

Figure 1-2-13 Scouring Depth in Front of Revetment



Scour



Damaged Revetment



Collapsed Revetment

Photo: Scour and Collapse of Revetment

1-3 Environmental and Social Considerations

1-3-1 Environmental and Social Conditions for the Project Area

(1) Local Government

Administrative divisions in Timor-Leste comprise 13 Districts, 65 Sub-Districts, 442 Suco and 2,225 Aldeia. The Project area covers five Aldeia (30 de Agosto, 4 de Setembro, FomentII, Golgota, Moris Foun) in Comoro Suco, Dom Alexio Sub-District, Dili District. When implementing environmental and social considerations such as land acquisition and involuntary resettlement, collaboration with the leaders of the Suco and Aldeia is essential.

(2) Racial Minorities and Language

As a result of interview with local residents, no ethnic minorities were found in the Project area. The main language is Tetun including Tetun-Terik, and most residents understand Tetun, although numerous other languages such as Mambai, Kemak, Makasae, Baikeno, Tokodede, Bunak, Naueti, Fataluku are also in use.

(3) Land Use and Land Ownership

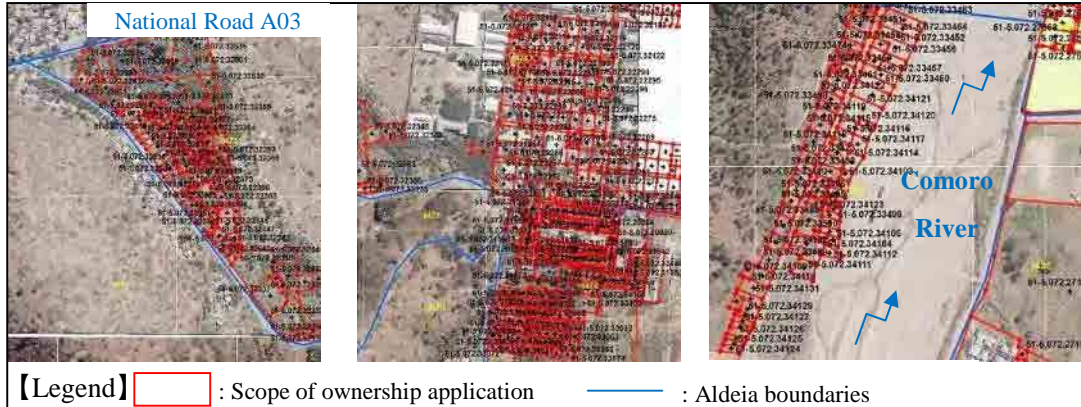
The right bank of the Project area is an industrial zone with factories along the road including manufacturers for blocks and other construction materials, while the left bank comprises mainly houses and other areas include distribution facilities as well as banana fields.

Since the occupation by Indonesia, land ownership in Timor-Leste has depended on the management by Suco (village) based on the approval by the village chiefs. After independence, the National Directorate of Land, Property and Cadastral Services (DNTPSC) initiated a nationwide cadastral survey in 2008 with full support by USAID under the project title of “Ita Nai Rai: Our Land” (started from 2007). Even though the support by USAID was terminated in 2011, DNTPSC has taken over the project and continued the cadastral survey under the budget of the Ministry of State Administration (MSA). This cadastral survey aims for the information collection from residents regarding the ownership of land. The residents can receive a Statement of Ownership with their photographs by submitting the land ownership applications with the information as a basis of their claim. These statements are open to public review at the local cadastral offices with the location maps in order to submit the formal objection by the third parties.

Upon surveying more than 35,000 land ownership applications submitted up to 2011, more than 92% of cases did not have any objections. According to these results, the Government of Timor-Leste compiled Decree Law 27/2011, which authorizes the ownership of land based on the claims by residents in cases without any objections. Therefore, many people have misunderstood in Timor-Leste that the applications for land ownership will be unconditionally authorized even when they occupy the land illegally without permission.

Many residents with the misperception that a Statement of Ownership represents the title deed to land were identified through this Preparatory Survey as well. Even though the cadastral

survey has already been completed in the Project area with five Aldeias, many claims of ownership has been made on the state land such as river bank and caused confusion as shown in Figure 1-3-1 because DNTPSC has received the applications from the residents without confirmation of the nationally owned land.



Source: DNTPSC

Figure 1-3-1 Claim of ownership in the project area through Ita Nai Rai

DNTPSC has not identified the official land owners and land boundaries in the Project area except for the land used for the official residence during Indonesian occupation. Regarding the privately owned land, many residents have claimed their ownership as is shown in Figure 1-3-1. However, according to the Socio Economic Status (SES) Survey described later, the official landowner who owns the majority of the Project area is likely to be the traditional large landowner; Mr. Carrascalao. Therefore, disputes may arise over the land ownership in the local community.

In the detailed design, the final SES Survey based on the consultation with MPW and DNTPSC needs to be implemented to clarify the ownership and boundaries of land in the Project area. The consultation with the local residents who submit the applications and Mr. Carrascalao also needs to be conducted for the clarification.

(4) Religious and Cultural Facilities, Educational and Medical Facilities

The only religious and cultural facility in the Project area is the Ave Maria monument located in the northwest shown in the photographs below. There are no educational or medical facilities such as schools and hospitals in the Project area.



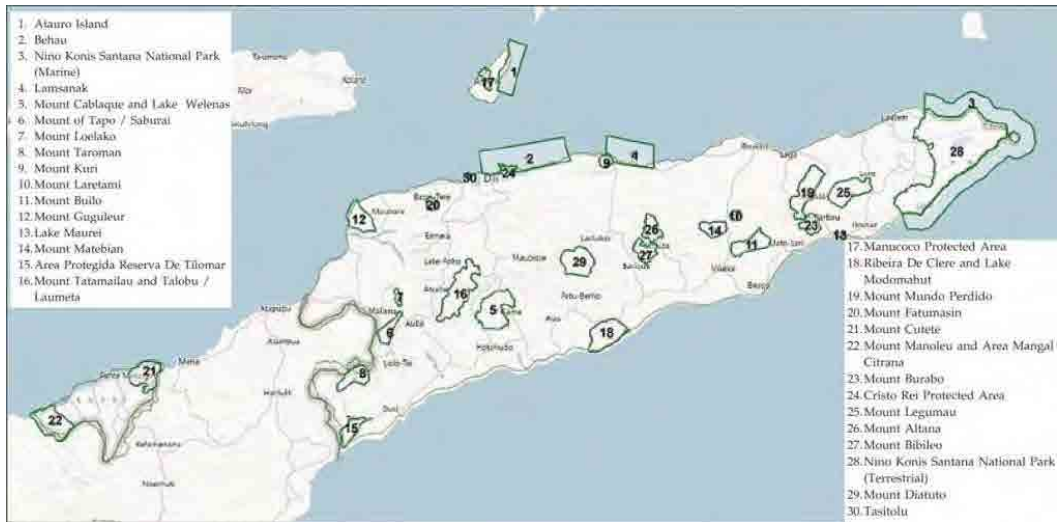
Photo:Gate of Ave Maria (left) and Monument (right)

(5) Ecosystems, Precious Species and Protected Areas

Timor-Leste submitted the fourth national report to the Secretariat of the UN Convention on Biological Diversity in 2011. The National Strategy and Action Plan on Biodiversity were also prepared simultaneously and 30 protected areas were designated in the both documents (see Figure 1-3-2).

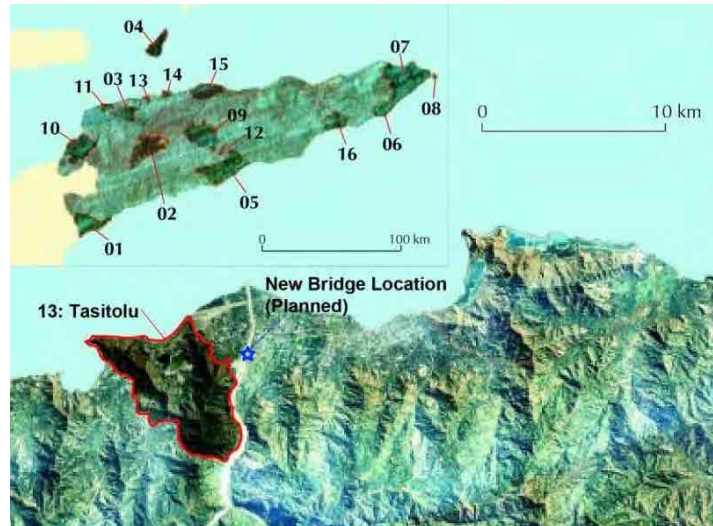
Many of the boundaries of these protected areas are unclear and detailed regulations have not been compiled for them. According to the interviews with the National Directorate of Forestry (NDF) under the Ministry of Agriculture and Fisheries (MAF) in charge of the governance of the protected areas as well as the National Directorate of Environment (NDE) under the Ministry of Commerce, Industry and Environment (MCIE), the Project area does not include any protected areas. Other protected areas are important bird areas designated by Bird Life International (an international NGO), and there are 16 important bird areas in Timor-Leste (see Figure 1-3-3).

As is shown in Figure 1-3-3, the closest Important Bird Area to the Project area is Tasitolu. Since this protected area is located adjacent to the Project area, important bird area has to be considered for the selection of the alternative options. Concerning other animals, even though three species of dove are designated as the endangered species, little progress has been made on making detailed classifications and designations of endangered species except for a few reptiles and marine creatures (see Table 1-3-1).



Source: Fourth National Report to the UN Convention on Biological Diversity, 2011

Figure 1-3-2 Protected Areas in Timor-Leste



Source: Important Bird Areas in Timor-Leste, 2007)

Figure 1-3-3 Important Bird Areas in Timor-Leste

According to the interview with NDF and NDE, no existence of the endangered species in the Project area was confirmed. Even though four endangered plant species including sandalwood (*Santalum album*) shown in the table are stated in the IUCN (International Union for Conservation of Nature) Red List, none of these have been found in the Project area.

Table 1-3-1 Name and Number of Endangered Species in Timor-Leste

Taxa	Number	Threatened
Vertebrates		
Amphibians	10	-
Freshwater fishes	48	1
Marine fishes	264	6
Freshwater and marine fishes	22	-
Terrestrial birds	151	4
Marine birds	16	-
Terrestrial and marine birds	91	3
Terrestrial mammals	69	2
Marine mammals	28	3
Freshwater reptiles	3	-
Terrestrial reptiles	47	-
Marine reptiles	13	6
Invertebrates		
Freshwater molluscs	2	-
Marine molluscs	278	2
Marine crustaceans	39	-
Coelenterates	2	-
Hexacorals	12	-
Insects	488	-
Plants		
Terrestrial	807	4
Marine	28	-
Freshwater	30	-
Total	2,448	31

Source: National Strategy and Action Plan on Biodiversity, 2011

The main species of vegetation in the Project area are food and commercial fruit trees such as banana trees, mango trees, coconut trees and papaya trees, etc., and there are also broadleaved species such as Pulai (*Alstonia scholaris*), silk trees (*Albizia julibrissin*), and banyan trees (*Ficus*

microcarpa), etc. Since the majority of the Project area is residential and farm land, most of the local vegetation is artificially planted by the residents rather than growing naturally. The leader of the Suco (village) of Comoro indicated that the banyan tree which has been traditionally respected as the sacred tree needs to be purified by a shaman prior to the cutting by the construction.



Photo: Plants in the Project Area

1-3-2 Environmental and Social Consideration System and Organization in Timor-Leste

(1) Environmental Legislation

The major laws relevant to the environmental social consideration in Timor-Leste are as follows.

- Constitution of the Republic of Timor-Leste
- Basic Law on Environment (Decree Law No. 26/2012 4th July)
- Environmental Licensing Decree Law (Decree Law No.5/2011 9th February)

The Environmental Licensing Decree Law stipulates the procedures for environmental impact assessment in Timor-Leste. It is mandatory for the implementer of the project with the potential environmental impact to receive the Environmental License issued by NDE under Ministry of Trade, Industry and Environment according to the Environmental Licensing Decree Law prior to the commencement of the project. Regarding the environmental categories in Timor-Leste, projects are categorized as follows similar to the JICA Guidelines;

Category A; Projects are expected to cause significant negative impacts on the environment and society.

Category B; Projects are expected to cause negative impacts to a certain extent.

Category C; Projects are expected to cause negligible or no impact.

The Environmental Licensing Decree Law also states the standard values for categorization in each field. Table 1-3-2 shows the standards for roads and bridges in the transport field. Since “significant negative impact” previously stated in the definition of Category A includes the impacts on socio-economic aspects such as involuntary resettlement, these categories are defined according to the holistic assessment.

Table 1-3-2 Classification of Environmental Category in Timor-Leste (Transportation Sector)

Project Type	Scale
Category A	
Construction of large roads in a metropolitan or large city	≥5km
Construction of national and regional roads	≥10km
Construction of rural roads	≥30km
Construction of bridges	≥300m
Category B	
Rehabilitation of existing roads, excluding community roads (including toll roads, bridge crossing, each with two lanes)	all
Construction of bridges	<300m

Source: Environmental Licensing Decree Law Annex I, II

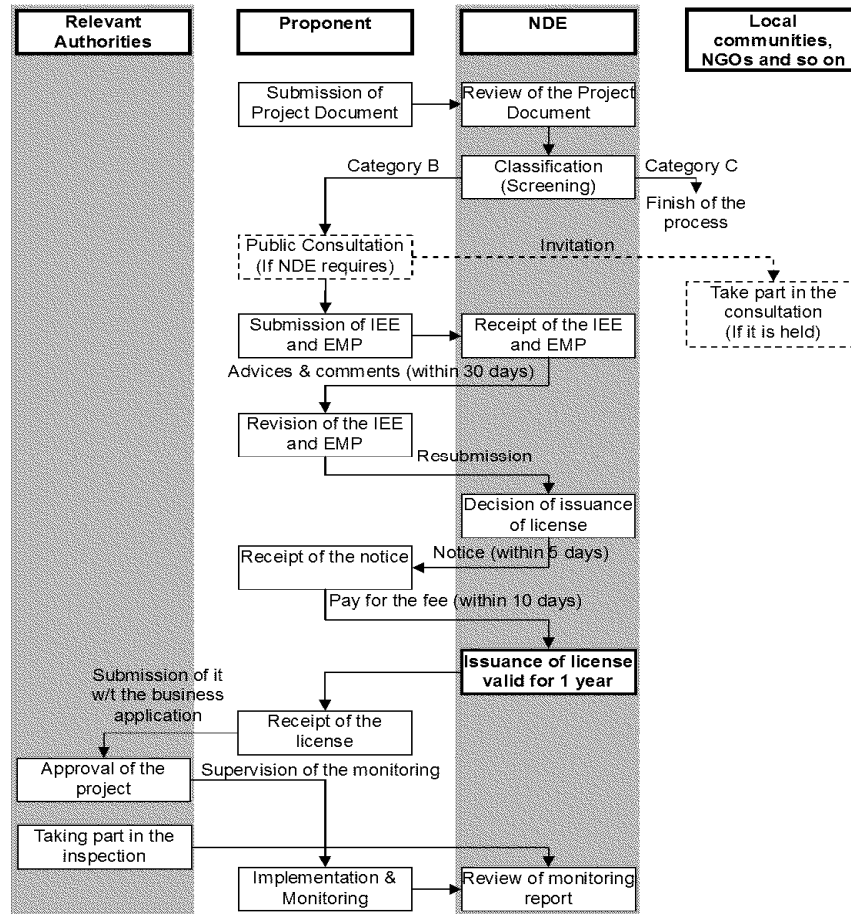
In order to receive the certification of category based on the standards in Timor-Leste, submission of a Project Document (PD) stating the project outline and scoping of environmental impacts as well as an Environmental License Application is required. According to the contents of PD, each project is categorized in A, B or C. While preparation and submission of Environmental Impact Statement (EIS) and Environmental Management Plan (EMP) to NDE are required for Category A projects, preparation and submission of Initial Environmental Examination (IEE) and EMP to NDE are required for Category B projects. No specific process is required for Category C projects.

According to the interview with the relevant governmental agencies, it is confirmed that the project is likely to be categorized “B” based on the scale of proposed bridge and its access roads. Figure 1-3-4 indicates the procedure from the application for category recognition to issuance of the Environmental License for Category B and C projects. Currently category for the Project is expected to be determined by the submission of the PD and Environmental License Application to NDE by MPW based on the scope of the Project which is supposed to be determined through this Preparatory Survey.

Preparation of detailed rules and regulations stipulating the environmental standards for noise and vibration, water quality etc. has just started with the support by donors such as ADB and no specific rules and regulations have established as of the commencement of this Preparatory Survey. However, according to Section 165 of the Constitution of the Republic of Timor-Leste, previously executed laws are valid unless otherwise run against the Constitution. For example, in Section 3 of the Regulation No.1999/1 on the Authority of the Transitional Administration in Timor-Leste, the United Nations Transitional Administration in East Timor (UNTAET) states that laws executed before October 25, 1999 (when UNTAET was established) are valid except for some legislation related to the military affairs, etc.

Concerning the cutting of trees, Regulation No.2000/17 on the Prohibition of Logging Operations and the Export of Wood from Timor-Leste was enacted by UNTAET after it took over from Indonesian rule. However, a decision on the applicability of this law to the Project will be made based on the field survey by NDF officers for the trees to be cut in the detailed design stage due to the lack of definition of forests in Timor-Leste,.

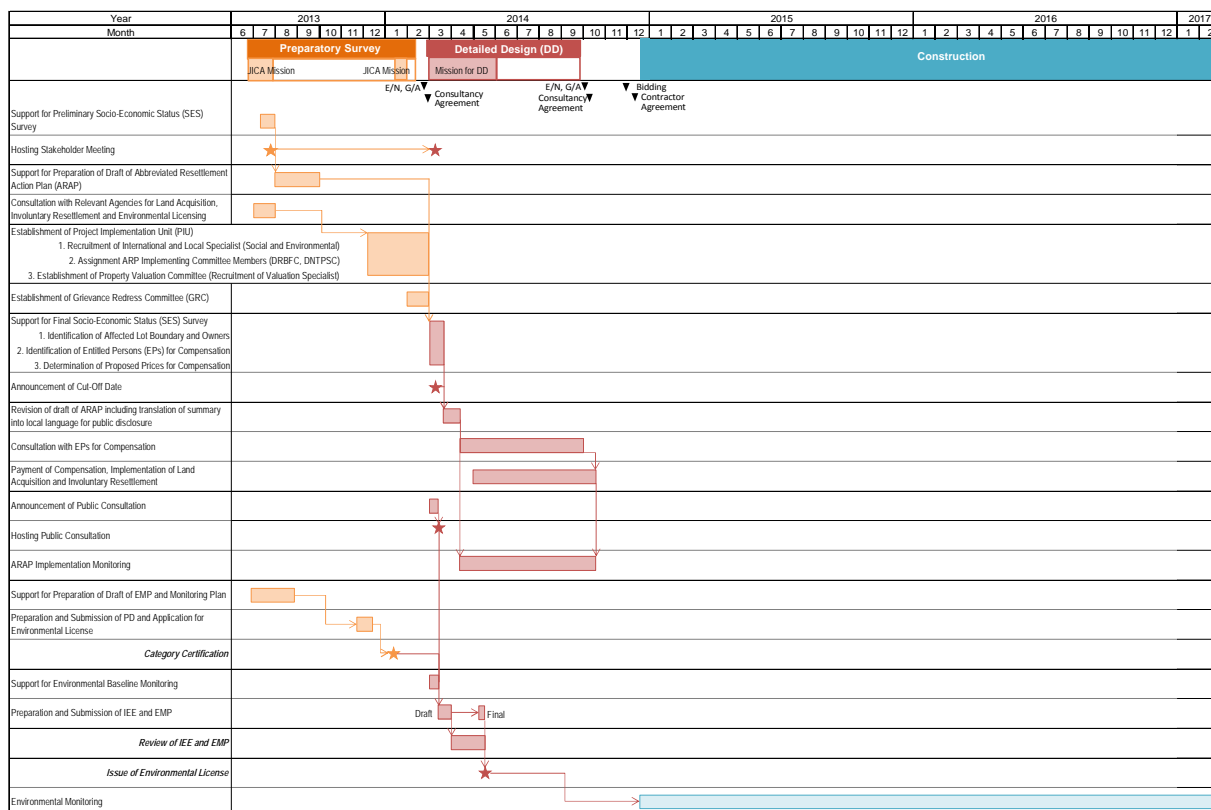
Table 1-3-3 shows the schedule for implementation of environmental and social consideration by the Timor-Leste side based on the assumption that the Cabinet meeting for the approval in Japan will be held in February 2014. (The items indicated in italics are the tasks for the issuance of the Environmental License by NDE).



Source: Prepared by the JICA Environmental Impact Assessment advisor

Figure 1-3-4 Application Process for Environmental License in Timor-Leste (Category B & C)

Table 1-3-3 Draft of Project Implementation Schedule for Environmental and Social Consideration



(2) Land Legislation

The relevant laws that are currently established or are under preparation in Timor-Leste are as follows. (Laws are already enforced unless indicated as draft).

- Constitution of the Republic of Timor-Leste (Sections 54 and 141)
- Civil Code 2011
- Law 01/2003 Juridical Regime for Immovable Property
- Decree Law 19/2004 Regulating Leasing of State Land
- Law 12/2005 On Leasing Between Private Individuals
- Decree Law 27/2011 Regime to Regulate Ownership of Immovable Property in Undisputed Cases
- Decree Law No. 6/2011: Compensation for Resettlement from State Land
- Land Law: Special Regime for the Determination of Ownership of Immovable Property (draft)
- Land Expropriation Law (draft)

In addition to these laws, guidelines of the safeguards for the involuntary resettlement in transport sector projects are currently prepared based on the Land Expropriation Law with the support by ADB. However, the land acquisition for the Project needs to be implemented based on the consultation and the agreement with the local residents since there is no legislation clearly

stipulating the process of expropriation for privately owned land. Although Decree Law No. 6/2011 contains the provisions for the expropriation of nationally owned land, it is highly likely that the majority of the Project area is privately owned land apart from the zone used for official residence during the era of rule by Indonesia.

(3) JICA Guidelines and Policy for Environmental and Social Considerations in Timor-Leste

Categories for the environmental and social impact according to the guideline of JICA and the Government of Timor-Leste are similar as previously described and no discrepancies are identified. Moreover, Environmental Licensing Decree Law in Timor-Leste and JICA Guidelines for Environmental and Social Consideration regarding the Environmental Impact Assessment (EIA) processes are highly consistent because JICA has dispatched the EIA Advisor to Timor-Leste since 2009 to support the establishment of the EIA system in Timor-Leste.

However, preparation of the relevant laws for general environmental and social consideration in Timor-Leste has just started including the development of the safeguard policy and guideline based on the laws still in draft. These policy and guideline are highly consistent with JICA Guidelines for Environmental and Social Consideration since they are in accordance with the safeguard policy of ADB and WB.

With the consideration for such current conditions, JICA Guidelines for Environmental and Social Consideration and explanatory materials were shared to enforce the understanding for the environmental and social consideration in general at the M/D consultations conducted in the first field survey in Timor-Leste. Initiative for the environmental and social consideration by the Timor-Leste side with the support by JICA was highlighted thorough the explanations. Following seven principles were also introduced and emphasized as the important aspects in the general policy of environmental and social consideration stated in the JICA Guideline for Environmental and Social Consideration.

- i. A wide range of impacts must be addressed.
- ii. Measures for environmental and social considerations must be implemented from an early stage to a monitoring stage.
- iii. JICA is responsible for accountability when implementing cooperation projects.
- iv. JICA asks stakeholders for their participation.
- v. JICA discloses information.
- vi. JICA enhances organizational capacity.
- vii. JICA makes serious attempts at promptness.

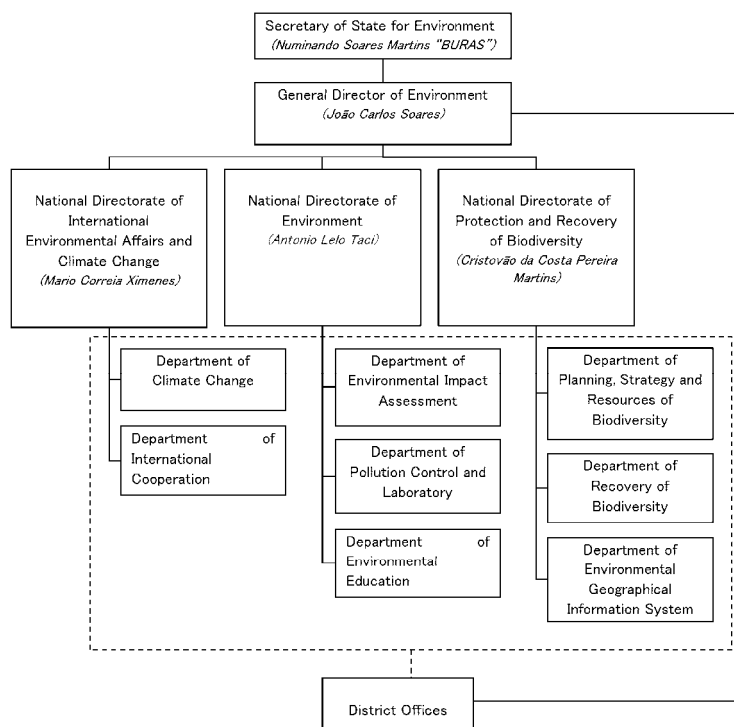
(4) Environmental and Social Consideration Agencies and Their Roles

Table 1-3-4 shows the major agencies involved in the environmental and social consideration with their roles.

Table 1-3-4 Relevant Governmental Agencies and Roles

Name of Agency	Roles
Ministry of Public Works, Directorate of Road, Bridge and Flood Control (DRBFC)	<p>As a project proponent and implementer, overall environmental social consideration including the followings;</p> <ul style="list-style-type: none"> • Hosting stakeholder consultation • Preparation and submission of application documents for Environmental License • Preparation and submission of IEE and EMP (requirement for category B project) • Hosting public consultation • Hosting consultation on land ownership, land boundary, and replacement cost • Security of budget and implementation for land acquisition, involuntary resettlement, and relocation of obstacle including infrastructure system • Implementation of monitoring
Ministry of Public Works, National Directorate of Housing and Urban Planning	<ul style="list-style-type: none"> • Information provision for replacement costs for housing • Support to regulate new construction in the project area
Ministry of Commerce, Industry and Environment, National Directorate of Environment (NDE)	<ul style="list-style-type: none"> • Certification for environmental category • Review of application documents for environmental license • Issue of environmental license • Support and supervision for environmental monitoring
Ministry of Justice, National Directorate of Land, Property and Cadastral Services (DNTPSC)	<ul style="list-style-type: none"> • Participation for the consultation on land ownership, land boundary, and replacement cost • Information provision for replacement cost for land and property • Determination of land ownership and land boundary • Support and supervision of monitoring on land acquisition and involuntary resettlement
Ministry of Agriculture and Fisheries, National Directorate of Forestry	<ul style="list-style-type: none"> • Information provision for replacement cost for plants and crops • Confirmation of the necessity for the replacement planting based on the field survey during detailed design
Ministry of State Administration	<ul style="list-style-type: none"> • Coordination of governmental agencies and local community (Suco; village and Aldeia)

Capacity development for MPW needs to be conducted as early as possible due to the lack of department and personnel in charge of environmental and social consideration. The experience and knowledge at DRBFC; the implementing and responsible agency of the Project, are limited with few officers and a technical advisor dispatched by the ADB who experienced the application process for Environmental Certificate through the Mola bridge project etc. No officers with the experience and knowledge of the land acquisition and the involuntary resettlement are assigned at DRBFC. Reorganization of NDE was conducted in 2013 and current organizational structure is indicated in Figure 1-3-5.



Source: Prepared by JICA EIA Advisor

Figure 1-3-5 Organizational Structure of National Directorate of Environment (as of Jun. 2013)

1-3-3 TOR for the Scoping Plan and Environmental and Social Consideration Survey

Preliminary assessment was conducted by extracting the environmental and social aspects with potential impacts. Possibility for the change of the scope of the Project was also considered for the assessment. The results are summarized as the draft of scoping and shown in in Table 1-3-5.

Table 1-3-5 Draft of Scoping

Category		Potential Impact	Rating		Evaluation
			Pre-Const./ Const. Phase	Operational Phase	
Natural Environment	1	Topography and Geology	D	B+	Construction Phase: Since major earthwork is not planned except for minor cut and fill and all slopes will be protected with reference to “ Slope Protection Guideline (draft)”, no significant impact is expected. Operational Phase: Positive impact is expected due to the bank protection work associated with the construction of bridge abutment.
	2	Groundwater	D	D	Construction Phase: Major pumping of groundwater during construction is not planned during construction. Since muddy water from drilling will be discharged after separation of sediment, no significant impact is expected. Operational Phase: Since groundwater will not be pumped during operational phase, no impact is expected.
	3	River flow, Hydraulic regime, Hydrology	D	D	Construction Phase: As the construction work in the river channel is planned to be conducted in the dry season, no significant impact is expected. Operational Phase: Since the design of the bridge intends to

					minimize the impact on river flow, no significant impact is expected.
	4	Coastal, Marine System	D	D	Construction and Operational Phase: No significant impact is expected as the project area is located more than 2 km away from the coastline.
	5	Ecosystem, Conservation Area	D	D	Construction Phase: Since the project area is located in the urban area of the Dili district, preservation area and endangered species are not identified. Tasitolu important bird area located in the southeast of the project area is considered for the study of alternative access route for the new bridge. Even though significant logging is not planned, necessity of permission for logging will be confirmed with National Directorate of Forestry, Ministry of Agriculture and Fisheries during the detailed design phase. Operational Phase: No significant impact is expected due to the constructed bridge and its access roads.
	6	Climate	D	D	Construction Phase: Since no major change on environment triggering climate change such as deforestation, no significant impact is expected. Operational Phase: No significant impact is expected due to the constructed bridge and its access roads.
	7	Global Warming	B-	B+/-	Construction Phase: Slight increase of CO2 is expected due to the construction vehicle and traffic jam. Operational Phase: While increase of CO2 is expected due to the increase of traffic in the project area, decrease of CO2 is also expected due to the mitigation of traffic jam of the existing Comoro Bridge through the provision of the alternative route by the new bridge.
Countermeasure for Environmental Pollution	8	Air Pollution	B-	B+/-	Construction Phase: Temporal slight air pollution is expected due to the transport of construction materials and traffic jam by the traffic control. Operational Phase: While decrease of dust due to the pavement in the project area and decrease of exhaust gas due to the mitigation of traffic jam of the existing Comoro Bridge are expected, increase of exhaust gas is expected due to the increase of traffic.
	9	Water Pollution	B-	B+/-	Construction Phase: There are some possibilities for water pollution due to the discharge from the construction area including construction camp. Operational Phase: While improvement of water quality is expected due to the decrease of erosion and discharge of sediment by the pavement, decrease of water quality is also expected by oil leakage from the disabled vehicle on the road due to the increase of traffic volume.
	10	Waste Management	B-	D	Construction Phase: Increase of waste is expected from the construction area including the construction camp. Operational Phase: No significant impact with influence on adjacent area is expected.
	11	Soil Contamination	D	D	Construction Phase: Even though there are some possibilities for oil discharge from the construction vehicle, the amount is limited and not expected to trigger soil contamination. Operational Phase: No significant impact is expected.

	12	Noise, Vibration	B-	B-	Construction Phase: Some noise and vibration are expected due to the construction activities. Operational Phase: Some noise and vibration are expected due to the increase of the traffic volume.
	13	Subsidence	D	D	Construction Phase: Possibility for the subsidence is low due to the consideration for groundwater pumping and discharge of water from the construction. Stability of the soil will be confirmed by the field tests (boring test and sample-pit test). Operational Phase: No impact triggering subsidence is expected.
	14	Odor	B-	D	Construction Phase: Emulsified asphalt and asphalt mixture may cause odor during construction. Operational Phase: No impact causing odor is expected.
	15	Bottom Sediment	D	D	Construction Phase: Contamination of bottom sediment is not expected. Influx of sediment needs to be prevented by the sediment control measures. Operation Phase: No significant impact is expected by the structures such as bridge pillars and bridge foundation.
Social Environment	16	Involuntary Resettlement	B-	D	Pre-Construction Phase : Certain scale of involuntary resettlement is expected. Construction and Operational Phase: Since involuntary resettlement will be completed prior to the construction, no impact is expected.
	17	Local economic conditions including employment, livelihood conditions.	B+/-	B+	Pre-Construction Phase : Some positive and/or negative impacts on livelihood including employment may occur due to the involuntary resettlement. Construction Phase: Temporal positive impact on employment is expected due to the construction activities. Operational Phase: Positive impact on local economy is expected due to the mitigation of traffic jam, increase of traffic, and roadside development.
	18	Land-use, Resource-use	B+/-	B+	Pre-Construction Phase : While owners of the land and unauthorized residents will be clarified by the socio-economic status survey, land acquisition by the project may provide impact on the land-use of adjacent areas. Operational Phase: Revitalization of land-use and resource-use is expected due to the mitigation of traffic jam, smoothing traffic, and roadside development.
	19	Water use	C	D	Construction Phase: Use of river water in the project area is unknown. Operational Phase: No impact is expected.
	20	Social Infrastructure and Social Service	B-	B+	Construction Phase: Temporal impact on social infrastructure services such as relocation of electrification lines may occur. Traffic jam due to the construction activities is also expected. Operational Phase: Improvements on traffic including the access for the social services are expected.
	21	Social and Community Organization	D	B+	Construction Phase: Separation of the local community by the construction activities is not expected. Operational Phase: Communication among Aldeias is expected to be enhanced by the improvements on traffic.

22	Conflict of interest in the community, Inequity of damage and benefit	B+/-	C	<p>Pre-Construction Phase: Since certain compensation will be provided for the affected persons required involuntary resettlement including unauthorized residents, some conflict may occur among beneficiaries of compensation, neighbors without compensation, and official landowners.</p> <p>Construction Phase: While temporal employment for local residents is expected by the construction activities, conflict may occur between the people employed for the construction and the people without employment.</p> <p>Operational Phase: If there are some issues in the process of land acquisition, conflicts and inequity in the community may remain after the completion of the construction.</p>
23	Cultural Heritage	B-	B+	<p>Construction Phase: Countermeasures to minimize the impact on Ave Maria; religious monument in the project area will be taken.</p> <p>Operational Phase: The access to Ave Maria is expected to be enhanced due to the road improvements.</p>
24	Landscape	B-	B+	<p>Construction Phase: Temporal negative impact on landscape may occur due to the construction material and vehicle.</p> <p>Operational Phase: Positive impact on landscape is expected as the new bridge provides the view spot.</p>
25	Public Health, Transmissible Disease (HIV/AIDS etc.)	B-	D	<p>Construction Phase: Risk for the outbreak of transmissible disease by the employee of the construction needs to be considered and minimized.</p> <p>Operational Phase: No impact is expected.</p>
26	Work Environment, People Safety	B-	B+/-	<p>Construction Phase: Risk of traffic accident may increase in the project area and adjacent area due to the construction activities and traffic of construction vehicle.</p> <p>Operational Phase: While risk of traffic accident may increase due to the increase of traffic, improvements of the pedestrian's safety are expected by the construction of sidewalk.</p>
27	People in poverty	B+/-	B+	<p>Pre-Construction Phase: People in poverty among the affected persons needs to be identified through socio-economic status survey and public consultation during detailed design phase.</p> <p>Construction Phase: Temporal employment for the construction activities is expected.</p> <p>Operational Phase: Positive impacts are expected due to the improvements on access to the adjacent areas.</p>
28	Indigenous People	D	D	Pre-Construction/ Construction Phase, Operational Phase; No indigenous people is identified in the project area.
29	Gender, Rights of Children	D	D	Pre-Construction/ Construction Phase, Operational Phase; Even though no specific impact is expected, existence of impact is supposed to be assessed based on the existing conditions.

- Rating Category: A+ Significant positive impact is expected.
A- Significant negative impact is expected.
B+ Certain positive impact is expected.
B- Certain negative impact is expected.
C Impact is unknown. (as of preparatory survey phase)
D No impact is expected.

TOR for environmental and social consideration was prepared and summarized in Table 1-3-6

based on the study for the survey items and the methods of survey for the extracted potential impacts.

Table 1-3-6 TOR of Environmental Social Consideration

Potential Impact		Survey Items	Methods of Survey
1	Topography and Geology	1) Topography in the project area 2) Geology in the project area	1) Topographic survey, Confirmation of surface drainage by field survey 2) Geotechnical survey (boring test)
2	Groundwater	Condition of utilization of groundwater in the project area	Interview with the relevant organization and neighbors, field survey
3	River flow, Hydraulic regime, Hydrology	1) Flow regime at the proposed bridge location 2) Magnitude of the potential floods at the proposed bridge location 3) Construction plan in the river channel	1) Hydrologic and hydraulic analysis 2) Interview with neighbors 3) Interview with the members of the relevant projects
4	Coastal, Marine System	Potential impact by the construction activities (if any)	Interview with the relevant organization
5	Ecosystem, Conservation Area	1) Endangered species and protected areas in the project and adjacent area 2) Trees with the potential to be cut by the project	1) Interview with the relevant organization, literature review 2) Field survey
6	Climate	Potential impact by the construction activities	Interview with the relevant organization
7	Global Warming	Current and future traffic volume	Traffic survey, Forecast of traffic demands
8	Air Pollution	1) Current and future traffic volume 2) Issues of air pollution in the project area (if any)	1) Traffic survey, Forecast of traffic demands 2) Interview with neighbors, field survey
9	Water Pollution	1) Water quality standard in the Government of Timor-Leste (if any) 2) Issues water pollution in the project area (if any)	3) Interview with the relevant organization 4) Interview with neighbors, field survey
10	Waste Management	Current condition of waste collection	Field survey, literature review
11	Soil Contamination	1) Soil quality standard in the Government of Timor-Leste (if any) 2) Issues of soil contamination in the project area (if any)	1) Interview with the relevant organization 2) Interview with neighbors, field survey
12	Noise, Vibration	1) Noise and vibration criteria in the Government of Timor-Leste (if any) 2) Issues of noise and vibration in the project area (if any)	1) Interview with the relevant organization 2) Interview with neighbors, field survey
13	Subsidence	1) Geology in the project area 2) Issues of subsidence in the project area (if any)	1) Geotechnical survey (boring test) 2) Interview with neighbors, field survey
14	Odor	1) Odor standard in the Government of Timor-Leste (if any) 2) Issues of odor in the project area (if any)	1) Interview with the relevant organization 2) Interview with neighbors, field survey
15	Bottom Sediment	1) Bottom sediment quality standard in the Government of Timor-Leste (if any) 2) Issues of contamination of bottom sediment in the project area (if any)	1) Interview with the relevant organization 2) Interview with neighbors, field survey
16	Involuntary Resettlement	1) Number of potential Project Affected Unit (PAU) and Affected Person(AP) 2) Current scheme of relevant laws and regulations 3) Implementation system and competency	1) Socio-Economic Status Survey (SES Survey) 2) Interview with relevant organization 3) Literature review

17	Local economic conditions including employment, livelihood conditions	Current status of local economy such as livelihoods of APs and local industry	SES survey
18	Land-use, Resource-use	Land and resource use in the project area	1) SES Survey 2) Interview with relevant organization
19	Water use	Water use in the project area	Field survey
20	Social Infrastructure and Social Service	Structures and infrastructure facilities to be relocated	Field survey
21	Social and Community Organization	Social and community organization and their current status in the project and adjacent area (if any).	1) Field survey 2) Interview with neighbors and relevant organization
22	Conflict of interest in the community, Inequity of damage and benefit	Impact by the construction activities (if any)	1) SES Survey 2) Interview with relevant organization
23	Cultural Heritage	Cultural heritage in the project area and potential impact by the construction activities (if any)	1) Field survey 2) Interview with neighbors and relevant organization
24	Landscape	Potential impact by the construction activities (if any)	Field survey
25	Public Health, Transmissible Disease (HIV/AIDS etc.)	Current condition of public health including transmissible diseases and strategies to prevent them	Literature review
26	Work Environment, People Safety	Occupational safety standards in Timor-Leste (if any)	Literature review
27	People in poverty	Identification of people in poverty in the project area (if any)	SES Survey
28	Indigenous People	Identification of indigenous people in the project area (if any)	Interview with neighbors
29	Gender, Rights of Children	Potential impact on women and children in the project area by the construction activities (if any) and safety measures for women and children	SES Survey, Field survey

1-3-4 Results of Survey for Environmental and Social Consideration

Table 1-3-7 shows the results of the survey implemented based on the TOR previously described.

Table 1-3-7 Results of Survey for Environmental Social Consideration

Potential Impact		Results of Survey
1	Topography and Geology	According to the field survey, it was confirmed that occasionally surface runoff is retained in the project area during the rainy season and causing ponding due to the excess runoff from the hill located in south west of the project area. The current drainage condition is expected to be improved by the appropriate drainage facilities installed by the project. Results of geotechnical survey confirmed the geological stability as it mainly consists of the sand and gravel layer with vertical bearing capacity.
2	Groundwater	No water supply system from the groundwater was identified in the project area. Significant amount of groundwater pumping is not planned by the construction.
3	River flow, Hydraulic regime, Hydrology	Construction activities in the channel will be conducted during the dry season when flow path is limited in the channel with sufficient area for diversion route. Diversion route will be constructed to maintain the flow during the construction activities in the channel.

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4	Coastal, Marine System	According to the interview with National Directorate of Environment at Ministry of Commerce, Industry and Environment (NDE), no impact is expected.
5	Ecosystem, Conservation Area	According to the interview with NDE and National Directorate of Forestry at Ministry of Agriculture and Fisheries (NDF), no protected area and endangered species exist in the project area. In terms of the tree cutting, confirmation by NDF will be needed during the detailed design as previously described.
6	Climate	According to the interview with NDE, no impact is expected.
7	Global Warming	Based on the traffic survey, future traffic volume in 3 years after the completion of the bridge and access roads is forecasted. Comparing to the zero option, emission of CO ₂ is expected to be decreased due to the mitigation of traffic jam by the construction of the new bridge to accommodate the rapid increase of traffic demand. Traffic jam is not expected during the construction period in the project area and emission of CO ₂ by construction vehicle is also expected to be limited.
8	Air Pollution	Based on the traffic survey, future traffic volume in 3 years after the completion of the bridge and access roads is forecasted. Comparing to the zero option, exhaust gas is expected to be decreased due to the mitigation of traffic jam by the construction of the new bridge and its access road. According to the interview with neighbors, they complained more about dust by the vehicular traffic than exhaust gas. This issue is expected to be resolved by the pavement of the access roads. Watering on the roads is needed to prevent dust by the construction vehicle during the construction period.
9	Water Pollution	According to the interview with NDE, no major issue of water pollution exists in the project area. Neighbors also did not complain about the water quality through the interview. Drainage by the construction activities needs to be treated in an appropriate manner. Even though water contamination is not expected during operation period due to the construction of the drainage facilities, the sediment accumulated in the facilities have risks to be drained into the existing drainage system as river.
10	Waste Management	Currently wastes are collected only in metropolitan area of Dili including the project area. Since 3 collection points were identified in the project area by the field survey, general waste generated by the construction is expected to be collected and disposed appropriately. Construction waste such as surplus soil is supposed to be transported to the designated disposal site according to the consultation with the Government of Timor-Leste.
11	Soil Contamination	According to the interview with NDE and JICA EIA Advisor, no quality standard exists in the Government of Timor-Leste. Specific complaints about soil pollution were not observed through the interview with the neighbors. Even though use of construction materials causing soil contamination is not expected, regular inspection is needed to prevent leakage of oil from the construction vehicle.
12	Noise, Vibration	According to the interview with NDE and JICA EIA Advisor, no criteria exist in the Government of Timor-Leste. Specific complaints about noise and vibration were not observed through the interview with the neighbors. Since the areas adjacent to the residential district are identified, operation hours of construction vehicle as well as construction methods and vehicle need to be considered to minimize the influence of noise and vibration. Impact by the increase of traffic volume due to the new bridge and its access road can be expected during operation period.
13	Subsidence	As previously described, results of geotechnical survey confirmed the geological stability as it mainly consists of the sand and gravel layer with vertical bearing capacity. Specific complaints about subsidence were not observed through the interview with the neighbors. Major impact is not expected due to the appropriate drainage during construction and operation period.
14	Odor	According to the interview with NDE and JICA EIA Advisor, no standard exists in the Government of Timor-Leste. Specific complaints about odor were not observed through the interview with the neighbors. Even though emulsified asphalt and asphalt mixture may cause some odor, impact is expected to be minor due to the limited application period.

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15	Bottom Sediment	According to the interview with NDE and JICA EIA Advisor, no quality standard exists in the Government of Timor-Leste. Specific complaints about bottom sediment and sink were not observed through the interview with the neighbors. Major impact is not expected due to the appropriate drainage during construction and operation period.
16	Involuntary Resettlement	According to the results of study to accommodate future traffic demands and to minimize the impact, the current estimated number of Project Affected Unit (PAU) is 32 and Affected Person (AP) is 144. Details of the survey and study are described in 3-11.
17	Local economic conditions including employment, livelihood conditions.	According to the results of Livelihood Survey for 20% of the target household of SES Survey (10 households), many affected persons engaged in student and labor were identified. Details of the survey are described in 3-11. No local industry with the possibility to be impacted by the project exists. Even though some land acquisition is expected to be conducted for the existing agricultural land such as banana plantation, appropriate compensation will be provided for the APs. Roadside development is expected to stimulate the local industry after completion of the project for the existing undeveloped areas.
18	Land-use, Resource-use	Majority of the project area is used for agricultural and residential purpose. Even though no specific resource exists in the project area, gravel extraction for commercial use is conducted in the river channel. Even though gravel extraction near the bridge needs to be controlled to protect the bridge pier and abutment, appropriate compensation is expected to be paid for the extractors.
19	Water use	River water use was not identified in the project area.
20	Social Infrastructure and Social Service	All roads in the project area are unpaved and/or undefined and the current traffic volume in the project area is small. Therefore, traffic jam due to the construction activities is not expected. Since the construction activities may influence the water and electricity services in the project area, the extent and method of relocation need to be consulted with the relevant agency during the detailed design. Since 3 public water stations were identified in the project area, their locations were considered for the study of the route of the access roads to minimize the impact. Positive impact is expected due to the improvements of access to the vicinity of the project area during the operation period.
21	Social and Community Organization	The project area is located in 5 Aldeias in Comoro Village (Suco Comoro). Village Chief (Xefe de Suco) and Aldeia Chief (Xefe de Aldeia) share information and coordinate daily basis in addition to the monthly meetings. Positive impact is expected due to the improvements of access to the vicinity of the project area during the operation period.
22	Conflict of interest in the community, Inequity of damage and benefit	Informal/Illegal residents and their houses are increased in the river banks and even Village Chief cannot keep track of them. Some of the residents are likely to expect compensation money and therefore, they proceed to construct the houses. Since the expectation of the residents in the project area for the compensation is significant, public consultation in the detailed design needs to be held in a careful manner. (Even during the SES Survey, minor disputes occurred among the residents.)
23	Cultural Heritage	No cultural heritage facility exists in the project area except for the religious monument; Ave Maria. Since the construction is planned within the current road width, no major impact is expected except for the minor relocation of the entrance gate.
24	Landscape	No significant view spot and landscape with special features exist in the project area. It was confirmed that the Government of Timor-Leste has expected to introduce the bridge design with the consideration for the landscape.
25	Public Health, Transmissible Disease (HIV/AIDS etc.)	Even though HIV infection rate in Timor-Leste is considered to be relatively low (0.18% of Adult population; 2010), consideration for the prevention of the spread of an infection to the residents in the project area is needed. It is also important to call attention for the possibility for the infection of malaria and dengue fever as they are major infection diseases in Timor-Leste.
26	Work Environment, People Safety	Since the standard for work environment and safety is not established in Timor-Leste, countermeasures for the accident prevention need to be prepared for the construction employees.
27	People in Poverty	Even though the results of SES Survey confirmed the excess of expenditure over the income at

		the majority of the households, income itself is above the poverty line in Timor-Leste.
28	Indigenous People	According to the interview with neighbors and Village Chief, it was confirmed that no indigenous people live in the project area.
29	Gender, Rights of Children	According to the results of SES Survey, it was confirmed that no household consists only of women and children exists in the project area. Few women have jobs except for the household running small shop at home.

1-3-5 Impact Assessment

Based on the results of the survey previously described, environmental and social impacts were assessed for the items evaluated A, B and C in the draft of scoping and summarized as the results of the assessment shown in Table 1-3-8.

Table 1-3-8 Draft of Scoping and Environmental Impact Assessment

Category		Potential Impact	Scoping		Results of Survey		Evaluation
			Pre- and Const. Phase	Operational Phase	Pre- and Const. Phase	Operational Phase	
Natural Environment	1	Topography and Geology	D	B+	D	B+	Construction Phase : Since the results of geotechnical survey indicates the stability of the project area, major impact is not expected. Operational Phase : Positive impact is expected due to the construction of bank protection and drainage facilities.
	2	Global Warming	B-	B+/-	B-	B+	Construction Phase: Since the traffic jam in the project area is not expected and the exhaust gas from the construction vehicle is limited, major impact on global warming is not expected. Operational Phase: Comparing to the zero option, decrease of CO2 is expected due to the mitigation of the traffic jam.
Counter-measure for Environmental Pollution	3	Air Pollution	B-	B+/-	B-	B+	Construction Phase: While impact of the exhaust gas from the construction vehicle is expected to be limited, dust by the construction vehicle has potential to impact on the project area. Operational Phase: Comparing to the zero option, decrease of exhaust gas is expected due to the mitigation of the traffic jam. Dust is also expected to be decreased by the pavement.
	4	Water Pollution	B-	B+/-	B-	B+/-	Construction Phase: Drainage from the construction activities needs to be treated to prevent the impact on the river and the existing drainage systems. Operational Phase: Due to the construction of the permanent drainage facilities, water contamination is not expected during operation period. However, the drainage facilities need to be cleaned periodically as the sediment accumulated in the facilities have risks to be drained into the existing drainage system such as river and cause water pollution.
	5	Waste	B-	D	D	D	Construction Phase: Since the waste generated by the construction activities

		Management					including construction debris will be collected and treated in an appropriate manner, no major impact is expected. Operational Phase: No impact is expected after the completion of the bridge and its access roads.
	6	Noise, Vibration	B-	B-	B-	B-	Construction Phase: Some noise and vibration are expected for the residential district in the vicinity of the construction area due to the construction vehicle and activities. Operational Phase: Some noise and vibration are expected due to the increase of the traffic volume and new access roads.
	7	Odor	B-	D	D	D	Construction Phase: Major impact is not expected as the application period of emulsified asphalt and asphalt mixture is limited. Operational Phase: No impact causing odor is expected.
Social Environment	8	Involuntary Resettlement	B-	D	B-	D	Pre-Construction Phase : Project area and scale have been proposed to minimize the impact as well as to accommodate the future traffic demand. Final Socio-Economic Status Survey needs to be conducted during the detailed design to confirm the Abbreviated Resettlement Action Plan (ARAP) including the number of household and people to be relocated. Construction and Operational Phase: Since involuntary resettlement will be completed prior to the construction, no impact is expected.
	9	Local economic conditions including employment, livelihood conditions.	B+/-	B+	D/B+	B+	Pre-Construction Phase : Appropriate compensation will be paid based on the ARAP for the Affected Persons (APs) by land acquisition and involuntary resettlement. Construction Phase: Temporal positive impact on employment is expected due to the construction activities. Operational Phase: Positive impact on local economy is expected due to the roadside development.
	10	Land-use, Resource-use	B+/-	B+	B+/D	B+	Pre-Construction Phase : Appropriate compensation will be paid for the owners of banana plantation and gravel extractors. Land owners will be clarified through the process of land acquisition. Operational Phase: Revitalization of land-use and resource-use is expected due to the roadside development.
	11	Water use	C	D	D	D	Construction Phase : Since water resource use such as river water is not identified in the project area, no impact is expected. Operational Phase: No impact by the new bridge and its access roads is expected.
	12	Social Infrastructure and Social Service	B-	B+	B-	B+	Construction Phase : Temporal impact on social infrastructure services such as relocation of water and electrification lines may occur. Operational Phase: Positive impacts are

							expected due to the improvements on the access for the social services.
13	Social and Community Organization	D	B+	D	B+		Construction Phase: Separation of the local community by the construction activities is not expected. Operational Phase: Positive impacts are expected due to the improvements on the access for the local communities adjacent to the project area.
14	Conflict of interest in the community, Inequity of damage and benefit	B+/-	C	B-	C		Pre-Construction/Construction Phase: Some conflict may occur among local residents for the amount and contents of compensation. Operational Phase: Even though conflicts and inequity in the community may remain after the completion of the construction, the possibility is unknown as of the preparatory survey.
15	Cultural Heritage	B-	B+	D	B+		Construction Phase: As the temporal impact on the religious monument is limited to the relocation of its entrance gate, no permanent impact is expected. Operational Phase: Positive impacts are expected due to the improvement of the access to the religious monument.
16	Landscape	B-	B+	D	B+		Construction Phase : Since no specific landmark and view spot exist in the project area, no major impact is expected. Operational Phase: Positive impact on landscape is expected as the new bridge is supposed to be designed with the consideration for landscape to be a landmark and to provide a view spot.
17	Public Health, Transmissible Disease (HIV/AIDS etc.)	B-	D	D	D		Construction Phase: Risk for the outbreak of transmissible disease by the employee of the construction is supposed to be minimized by the education and awareness rising for the employees. Operational Phase: No impact is expected.
18	Work Environment, People Safety	B-	B+/-	B-	D		Construction Phase: Consideration will be needed for the work environment and safety during the construction. Operational Phase: No work is expected risking the safety for the construction employees and the users of the new bridge and its access roads after the completion.
19	People in poverty	B+/-	B+	D	D		Pre-Construction, Construction, and Operational Phase : Since no one under poverty line according to the results of Socio-Economic Status Survey is identified, no impact is expected.

Rating Category: A+ Significant positive impact is expected.
A- Significant negative impact is expected.
B+ Certain positive impact is expected.
B- Certain negative impact is expected.
C Impact is unknown. (as of preparatory survey phase)
D No impact is expected.

1-3-6 Comparison of Alternative Plans

As was described in chapter 2-2-1 Design Policy (2) Scope and Scale of the Project, the bridge location and optimal route of the access road were selected through the study of a number of alternative plans. Three major alternatives are listed in terms of technology, cost and environmental/social considerations in Table 1-3-9. Even though an alternative without the construction of the bridge and the access road (zero option) was also considered, such option is unable to mitigate congestion in the east-west direction across Comoro River as requested by the Government of Timor-Leste. Therefore, zero option was not adopted as the major alternative plan. The location of these three alternatives is shown in Figure 2-2-1.

Table 1-3-9 Summary of Alternatives

Name	Alternative Route 1	Alternative Route 2	Alternative Route 3
Area of Construction	From the end of 4 lanes on Banana road to the connection point with National Route A03		
Description	The route utilizing the existing residential road and connecting to the existing road along the hillside.	The route through the existing banana plantation and connecting to the existing road along the hillside.	The route utilizing the existing road along the hillside.
Length of Bridge and Access Road	Approximately (Approx.) 2.7km	Approx. 3.5km	Approx. 4.3km
Adjacent Land Use	Residential	Residential, Agricultural (Banana Plantation)	Residential, Green tract (hillside area)
Geometric Characteristics of the Road	Steep slope in both horizontal and longitudinal direction due to the utilization of the existing road.	Smooth geometric shape due to the new section consisting of the majority of the alternative.	Steep slope in both horizontal and longitudinal direction due to the utilization of the existing road.
Construction Cost	Approx. 178 Million USD	Approx. 194 Million USD	Approx. 210 Million USD
Social Environment	Approx. 70 households will be required for the involuntary resettlement in order to expand the existing road.	Approx. 32 households will be required for the involuntary resettlement	Approx. 40 households will be required for the involuntary resettlement in order to expand the existing road.
Natural Environment	Approx. 170 trees will be cut due to the construction.	Approx. 185 trees will be cut due to the construction.	Approx. 210 trees will be cut due to the construction.
Recommended Optimal Alternative, Basis for the Selection of the Alternative	This route is not recommended for the following reasons; <ul style="list-style-type: none"> • The geometric shape of the road cannot sustain the required functions. • The number of the households required the involuntary resettlement will be the largest among these 3 alternatives. 	This route is recommended as the optimal alternative for the following reasons; <ul style="list-style-type: none"> • The smooth geometric shape of the road will be maintained. • The number of the households required the involuntary resettlement will be the minimum among these 3 alternatives. 	This route is not recommended for the following reasons; <ul style="list-style-type: none"> • The geometric shape of the road cannot sustain the required functions. • The construction cost will be the largest among these 3 alternatives.

In order to define the area and scale of the construction in the recommended alternative, the impacts were compared and studied by dividing the route into sections according to the functions and features. These sections are shown in Figure 1-3-6 and impacts in the each section by the different scale are summarized in Table 1-3-10. As a result the study including the consideration for the future traffic demands, it was confirmed that the affected persons (APs) and the project

affected units (PAUs) can be minimized by the construction of two lanes for all sections and scaling down the pavement work on Section 4 limited to the width of the existing road (option g in Table 1-3-10). According to the current information, it is estimated that the number of APs is 144 (the number of APs required for involuntary resettlement is 141), PAUs is 32, and the area of land acquisition is approximately 2.6 ha.

Moreover, the simple study was conducted to study the impacts by the land acquisition for 4 lanes near future in response to the request of the Government of Timor-Leste. (For the impact by the additional two lanes, only PAUs were identified. The number of APs was estimated based on the average number of household members obtained from the SES survey.) Consequently, the possibility for the expansion of Section 2 and 3 to 4 lanes was confirmed by maintaining the pavement width in Section 4 as the existing road width (option b in Table 1-3-10) due to the estimated number of APs and PAUs which are less than 200 and 50 respectively according to the current conditions.

However, the following aspects should be considered;

- Land acquisition and resettlement in excess of the Project scope can cause the difficulty in the public consultation and impede the smooth implementation of the Project.
- Even though the declaration of cutoff date, land acquisition and involuntary resettlement are usually conducted for the project with finalized the scope and implementation plan, the request of the Government of Timor-Leste for future expansion to 4-lanes is not based on the neither concrete road network plan nor forecast of future traffic demand. Implementation of land acquisition, involuntary resettlement and restrictions on construction of new buildings in the project area according to the uncertain plans or excessive traffic demand forecast could increase the negative impacts and risk to violate the JICA guidelines and safeguard policy that require to avert and minimize any potential impacts.



Source: Survey Team

Figure 1-3-6 Sections of Proposed Route

Table 1-3-10 Summary of Study Results based on SES Survey

Option No.	Design Option				Current PAUs	Current APs	APs need resettlement
	Section1	Section2	Section3	Section4			
a	2 Lanes	4 Lanes	4 Lanes	2 Lanes	62	321	311
b	2 Lanes	4 Lanes	4 Lanes	Pavement Only	39	190	183
c	2 Lanes	4 Lanes	2 Lanes	2 Lanes	60	309	299
d	2 Lanes	4 Lanes	2 Lanes	Pavement Only	37	178	171
e	2 Lanes	4 Lanes	N/A	N/A	30	150	148
f	2 Lanes	2 Lanes	2 Lanes	2 Lanes	55	279	269
g	2 Lanes	2 Lanes	2 Lanes	Pavement Only	32	148	141
h	2 Lanes	2 Lanes	N/A	N/A	25	120	118
i	4 Lanes	N/A	N/A	N/A	34	205	205
j	2 Lanes	N/A	N/A	N/A	18	96	96

□ : Potential project area/scale

Based on the results previously described, the scope and scale of the Project are corresponded to option g. Option g was compared to the plan to construct the access road to the airport roundabout (Option h) and the plan to construct only the bridge and minimum access road (Option j) considering the implementation schedule, construction costs and capacity of the Government of Timor-Leste to conduct the land acquisition and the involuntary resettlement. The pros and cons of each plan are indicated in Table 1-3-11. The costs of land acquisition and the involuntary resettlement to be paid by the Government of Timor-Leste are listed in Chapter 1-3-11 Land Acquisition and Resettlement (Draft).

Table 1-3-11 Pros and Cons for Alternatives of the Project Area

Name of Alternative	Project Area	Pros	Cons
Option g	Section 1-4 (pavement only for section 4)	Both access roads to the airport and national road A03 from the new bridge will be constructed.	<ul style="list-style-type: none"> • Construction cost will be increased. • Commencement of the construction may be impacted according to the progress of land acquisition and involuntary resettlement.
Option h	Section 1 and 2	An access road to the airport from the new bridge will be constructed.	<ul style="list-style-type: none"> • Commencement of the construction may be impacted according to the progress of land acquisition and involuntary resettlement. • Traffic congestion may be caused at Airport Roundabout due to the traffic concentration • Required road width enough for freight vehicles cannot be secured due to the limited land of existing road to the airport
Option j	Section 1	<ul style="list-style-type: none"> • Construction cost will be minimized. • Target for involuntary resettlement will be limited to the informal residents in the banks and minimized. 	Effects of the new bridge may not be fully benefitted until access roads are completed by Timor-Leste side.

1-3-7 Study of Environmental Management Plan and Mitigation Measures (Draft)

Since the detailed rules and regulations associated with the environmental standards have not prepared in Timor-Leste, it is necessary to make it obligatory for the Contractors to implement the environmental management including the monitoring in the tender documents. The consultant is responsible for supervising the environmental management plan including the monitoring in collaboration with DRBFC and NDE. Table 3-7-1 shows the contents of the current draft of environmental management plan and mitigation measures for the issues evaluated the impact as A, B and C (excluding the positive impact rated as B+). This management plan will be finalized and submitted to NDE together with the Initial Environmental Examination (IEE) as the application documents for the Environmental Certification during the detailed design.

Table 1-3-12 Draft of Environmental Management Plan and Mitigation Measures

No.	Environmental Issue	Impact	Mitigation Measures	Implementer	Responsible Agency	Cost (USD)	
Construction Phase (Including Pre-Construction Phase for No.4,5,6)							
1		Air Pollution	Dust due to the traffic by the construction vehicle	Watering on the unpaved roads located in the route for the construction vehicle	Contractor	DRBFC Consultant	-
			Exhaust gas by the operation of the construction vehicle	No idling during the nonoperational period	Contractor	DRBFC Consultant	-
2	Environmental Pollution	Water Pollution	Runoff of muddy water by the excavation	Appropriate treatment and removal of the surplus soil to the dump site	Contractor	DRBFC Consultant	20,000
			Runoff of water with concrete by piling	Installation of drainage facilities such as water pump and tank including the regular inspection	Contractor	DRBFC Consultant	6,000
3		Noise, Vibration	Noise and vibration due to the traffic by the construction vehicle	<ul style="list-style-type: none"> • No idling during the nonoperational period • Enhancement on the compliance of the rules for operational hours 	Contractor	DRBFC Consultant	-
4	Social Environment	Involuntary Resettlement	Implementation of the involuntary resettlement	<ul style="list-style-type: none"> • Sufficient information disclosure for the local community through public consultation • Appropriate compensation based on the results of SES Survey 	DRBFC Consultant DNTPSC	DRBFC DNTPSC	1,950,000
5	Social Environment	Social Infrastructure and Social Service	Temporal suspension of services of water and electrification due to the relocation	<ul style="list-style-type: none"> • Sufficient notification of relocation for the local community • Installation of temporal duct and lines as needed 	Utility relocation company	DRBFC	12,000

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6		Conflict of interest in the community, Inequity of damage and benefit	Conflict in the local community due to the criteria of recipient of compensation and amount of compensation	<ul style="list-style-type: none"> Sufficient information disclosure for the local community through public consultation Decision and notification of amount of compensation through the leaders of the local community 	DRBFC Consultant DNTPSC	DRBFC DNTPSC	Included in No.4
7		Work Environment, People Safety	Accidents during the construction	<ul style="list-style-type: none"> Regular inspection on the construction vehicle Implementation of awareness rising training for construction employees 	Contractor	DRBFC Consultant	-
Operational Phase							
1	Environmental Pollution	Water Pollution	Runoff of sediment accumulated in the drainage facilities into the drainage system such as river	Regular cleaning of the drainage facilities	DRBFC	DRBFC	347,000
2		Noise, Vibration	Noise and vibration due to the traffic	Regular maintenance and inspection of pavement and drainage facilities	DRBFC	DRBFC	
Total Cost							2,335,000

NDE: National Directorate of Environment

NDF: National Directorate of Forestry

DNTPSC: National Directorate of Land, Property and Cadastral Services

1-3-8 Monitoring Plan (Draft)

Table 1-3-13 shows the Monitoring Plan (Draft) required for implementation of the Environmental Management Plan (Draft).

Table 1-3-13 Draft of Monitoring Plan

No.	Environmental Issue	Monitoring Item	Location	Standard	Frequency	Responsible Agency
Construction Phase (Including Pre-Construction Phase for No.4,5)						
1	Air Pollution	CO, NOx, SOx	Project Area	Environmental Standards in Japan	Every 4 months	Contractor, Consultant, DRBFC
2	Water Pollution	PH, BOD, SS	Downstream of Comoro River in the Project Area, End of the drainage system	Environmental Standards in Japan	Every 4 months	Contractor, Consultant, DRBFC
3	Noise, Vibration	Equivalent continuous A-weighted sound pressure level, vibration level	Project Area	IFC Guideline (55dB(A) for daytime)	Every 4 months	Contractor, Consultant, DRBFC
4	Involuntary Resettlement	Condition on the payment of compensation, Progress of involuntary resettlement	Project Area	Abbreviated Resettlement Action Plan	Every month	DRBFC

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5	Social Infrastructure and Social Service	Progress of relocation of social infrastructure and hindrance to the construction	Project Area	Project Implementation and Process Chart	Every month	DRBFC
6	Work Environment, People Safety	Occurrence of the accidents, Conditions of the inspection for the construction vehicle, Installation of safety facilities and equipment	Project Area	Ordinance on Industrial Safety and Hygiene in Japan	Every month	Contractor, Consultant, DRBFC
Operational Phase						
7	Water Pollution	PH, BOD, SS	Project Area	Environmental Standards in Japan	Every 6 months for 3 years after completion	DRBFC
8	Noise, Vibration	Equivalent continuous A-weighted sound pressure level, vibration level	Project Area	IFC Guideline (55dB(A) for daytime)	Every 6 months for 3 years after completion	DRBFC

DRBFC: National Directorate of Road, Bridge and Flood Control

NDE: National Directorate of Environment, Ministry of Commerce, Industry and Environment)

National Directorate of Land, Property and Cadastral Services

EMP: Environmental Management Plan

Table 1-3-14 shows the preliminary cost estimate for the monitoring previously described. As of the Preparatory Survey, construction period is expected approximately two years. The costs for the land acquisition and the involuntary resettlement are not included in Table 1-3-14. Costs for the land acquisition and the involuntary resettlement as well as for the establishment of the monitoring implementation system are listed in chapter 1-3-11. MPW is in charge of implementation including the security of the budget.

Table 1-3-14 Preliminary Cost Estimate for Environmental Monitoring

Item	Quantity	Unit	Unit Cost (in USD)	Subtotal Cost (in USD)
DRBFC Personnel in charge of Environmental Monitoring (including travel expense)	24	MM	400	9,600
NDE Personnel in charge of Environmental Monitoring (including travel expense)	24	MM	400	9,600
Domestic Environmental Specialist	24	MM	3,500	84,000
International Environmental Specialist	6	MM	15,000	90,000
Equipment and Analysis	1	LS	5,000	5,000
Reporting (Environment Monitoring Report during construction and post construction)	1	LS	10,000	10,000
Subtotal				208,200
20% Contingency Cost				41,640
Grand Total				249,840

1-3-9 Environmental Checklist

Based on the survey results previously described and the consultation with DRBFC (the

implementer of the Project), the Environmental Checklist (draft) was prepared according to the JICA guidelines for environmental and social consideration. This list has been checked based on the assumption that the draft of the environmental management plan and the monitoring plan will be implemented. The Environmental Checklist (draft) is shown in Appendix 4.

1-3-10 Stakeholder Meeting

Even though the scope of the project was not confirmed at the beginning of the preparatory survey, the survey team supported DRBFC to hold the stakeholder meeting through the explanation of its importance since it is essential to share information among stakeholders from the early phase of the project. Public consultation with the local residents will be held in the initial phase of the detailed design as shown in Table 1-3-3. Summary of the stakeholder meeting is described in Table 1-3-15.

Table 1-3-15 Summary of Stakeholder Meeting

Date	July 12 th , 2013
Location	MPW Corporative House
Attendees	MPW, DRBFC, DNTPSC, ADB, Leaders of Suco (Village) and Aldeia, NGO (La'o Hamutuk), JICA Survey Team
Agenda	<ol style="list-style-type: none"> 1. Objectives and Outline of the Preparatory Survey 2. Outline of the Project 3. Preferred scope of the Project according to the study of the alternative routes 4. Current Project Schedule 5. Summary of Environmental Social Consideration 6. Exchange of Views



Photo: Stakeholder Consultations

25 attendees including the JICA Survey Team actively participated the meeting and exchanged their opinions. The major comments were as follows:

- Since currently the project scope and design have not been determined yet, information disclosure for the local residents should be suspended. However, the results of this

Preparatory Survey including the topographic survey and SES Survey should be shared with relevant agencies as soon as they are compiled to conduct the joint study aiming for the minimization of the negative impacts by the Project. (NDE)

- Relevant governmental agencies should minimize the negative impact and avoid the potential risk as the implementation of the projects with the contribution to the national benefit entails certain risk. Even though information of land acquisition will be shared to the maximum extent, currently DNTPSC does not have sufficient data. (DNTPSC)
- Countermeasures for the interference such as the construction and planting in the project area aiming for the compensation need to be discussed, prepared and implemented in collaboration with DRBFC, DNTPSC and JICA. Even though I'll do my best for the information disclosure to the local residents as the leader of Aldeira, it is critical for DRBFC and DNTPSC to actively discuss on the countermeasures and clarify their policy for the local residents. (Leader of Aldeia; 9 de Setembro)
- Information regarding the location of the proposed bridge and roads including the drawing indicating the location needs to be shared at the detailed design phase. Share of the drawing is essential for the official announcement and consultation with the local residents to control the new construction and planting in the project area by the authority as the village chief. Consideration for the informal settlement in the project area needs to be highlighted for all relevant agencies according to our past experience. (Leader of Comoro Village; Suco)

In order to reflect these comments, the tasks need to be implemented are as follows;

- Sharing the report of the Preparatory Survey (English version) among stakeholders
- Enhancement of cooperation between DNTPSC and DRBFC for the implementation of the land acquisition and the involuntary resettlement.
- Information disclosure for the stakeholders including local residents (e.g. sharing the plan drawings).

1-3-11 Land Acquisition and Resettlement

(1) Necessity of Land Acquisition and Resettlement

As a result of the study for the alternative options, it was confirmed that certain land acquisition and resettlement will be required in order to achieve the Project goal aiming for the mitigation of traffic congestion by the construction of the new bridge and access road.

(2) JICA policies of involuntary resettlement

The key principle of JICA policies on the involuntary resettlement is summarized below.

- I. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
- II. When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.

- III. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.
- IV. Compensation must be based on the full replacement cost¹ as much as possible.
- V. Compensation and other kinds of assistance must be provided prior to displacement.
- VI. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.
- VII. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.
- VIII. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.
- IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

Above principles are complemented by World Bank OP 4.12, since it is stated in JICA Guideline that “JICA confirms that projects do not deviate significantly from the World Bank’s Safeguard Policies”. Additional key principle based on World Bank OP 4.12 is as follows.

- X. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers or others who wish to take advance of such benefits.
- XI. Eligibility of Benefits include, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.

¹ Description of “replacement cost” is as follows.

Land	Agricultural Land	The pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
	Land in Urban Areas	The pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
Structure	Houses and Other Structures	The market cost of the materials to build a replacement structure with an area and quality similar or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors’ fees, plus the cost of any registration and transfer taxes.

XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.

XIII. Provide support for the transition period (between displacement and livelihood restoration.

XIV. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.

XV. For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed Financial Plan etc.

(3) Comparison of JICA Guideline and the Guideline of the Government of Timor-Leste

Comparison of JICA Guideline and the Guideline of the Government of Timor-Leste is summarized in Table 1-3-16.

Table 1-3-16 Comparison of JICA Guideline and the Guideline of the Government of Timor-Leste

No	JICA Guidelines (GL)	Laws of the Government of Timor-Leste	Gap between JICA Guideline and Laws of the Government of Timor-Leste	Guideline of the Project
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	Law of Expropriations (Draft)	No major gap exists.	In conformity with JICA GL and the Government of Timor-Leste GL
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	Law of Expropriations (Draft)	No major gap exists.	In conformity with JICA GL and the Government of Timor-Leste GL
3.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	Law of Expropriations (Draft)	No major gap exists.	In conformity with JICA GL and the Government of Timor-Leste GL
4.	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	Law of Expropriations (Draft)	No major gap exists.	In conformity with JICA GL and the Government of Timor-Leste GL
	Compensation and other kinds of	Law of Expropriations	No major gap exists.	In conformity with JICA

5.	assistance must be provided prior to displacement. (JICA GL)	(Draft)		GL and the Government of Timor-Leste GL
6.	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	Law of Expropriations (Draft)	No major gab exists.	In conformity with JICA GL and the Government of Timor-Leste GL
7.	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	Law of Expropriations (Draft)	No major gab exists.	In conformity with JICA GL and the Government of Timor-Leste GL
8.	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	Law of Expropriations (Draft)	No major gab exists.	In conformity with JICA GL and the Government of Timor-Leste GL
9.	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	Law of Expropriations (Draft)	The Government of Timor-Leste GL highlights the importance of public involvement through information disclosure rather than direct promotion of public participation.	In conformity with JICA GL
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	Law of Expropriations (Draft)	No major gab exists.	In conformity with JICA GL and the Government of Timor-Leste GL
11	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advantage of such benefits. (WB OP4.12 Para.6)	Law of Expropriations (Draft)	No major gab exists.	In conformity with JICA GL and the Government of Timor-Leste GL
12	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Law of Expropriations (Draft)	No major gab exists.	In conformity with JICA GL and the Government of Timor-Leste GL

13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	Law of Expropriations (Draft)	Even though additional compensation for the value of estate is clearly stated for displaced persons whose livelihoods are land-based (Article 23), preference for the land-based resettlement strategies is not specified.	In conformity with the Government of Timor-Leste GL
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	Law of Expropriations (Draft)	No major gap exists.	In conformity with JICA GL and the Government of Timor-Leste GL
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	Law of Expropriations (Draft)	Particular attention for vulnerable groups is not specified.	In conformity with JICA/WB GL
16	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	Law of Expropriations (Draft)	The Government of Timor-Leste GL does not differentiate the type of report according to the number of involuntary resettlement.	In conformity with JICA/WB GL

(4) Policy of Land Acquisition and Resettlement

In Timor-Leste, because legislation stipulating the expropriation of private land is in the draft stage and the legal framework is not yet established, it is necessary to conduct land acquisition based on the consultation and agreement with residents. The policy for land acquisition and resettlement (draft) in the Project is described below. This policy reflects the results of discussion on the compensation standards described later.

- I. The Government of Timor-Leste will adopt the Project Resettlement Policy (the Project Policy) for “the Project for the Construction of Upriver Comoro Bridge” (the Project) since the existing national laws and regulations have not been fully prepared to address the issues on involuntary resettlement according to the international practices, including JICA’s policy. The Project Policy aims at supporting APs’ (Affected Persons) rehabilitation to ensure at least their pre-project conditions by following up the legal framework in Timor-Leste. Where any gaps exist between the legal framework and JICA’s policy on involuntary resettlement, practical approach consistent with both Timor-Leste Government practices and JICA’s policy will be studied and implemented.
- II. The Abbreviated Resettlement Action Plan (ARAP) will be prepared in accordance with the Project Policy. The summary of ARAP will be translated into local language (Tetun) and disclosed for the reference of APs and other stakeholders.
- III. Land acquisition and involuntary resettlement will be avoided where feasible, or minimized, by identifying possible alternative project designs with the least adverse impact on the communities

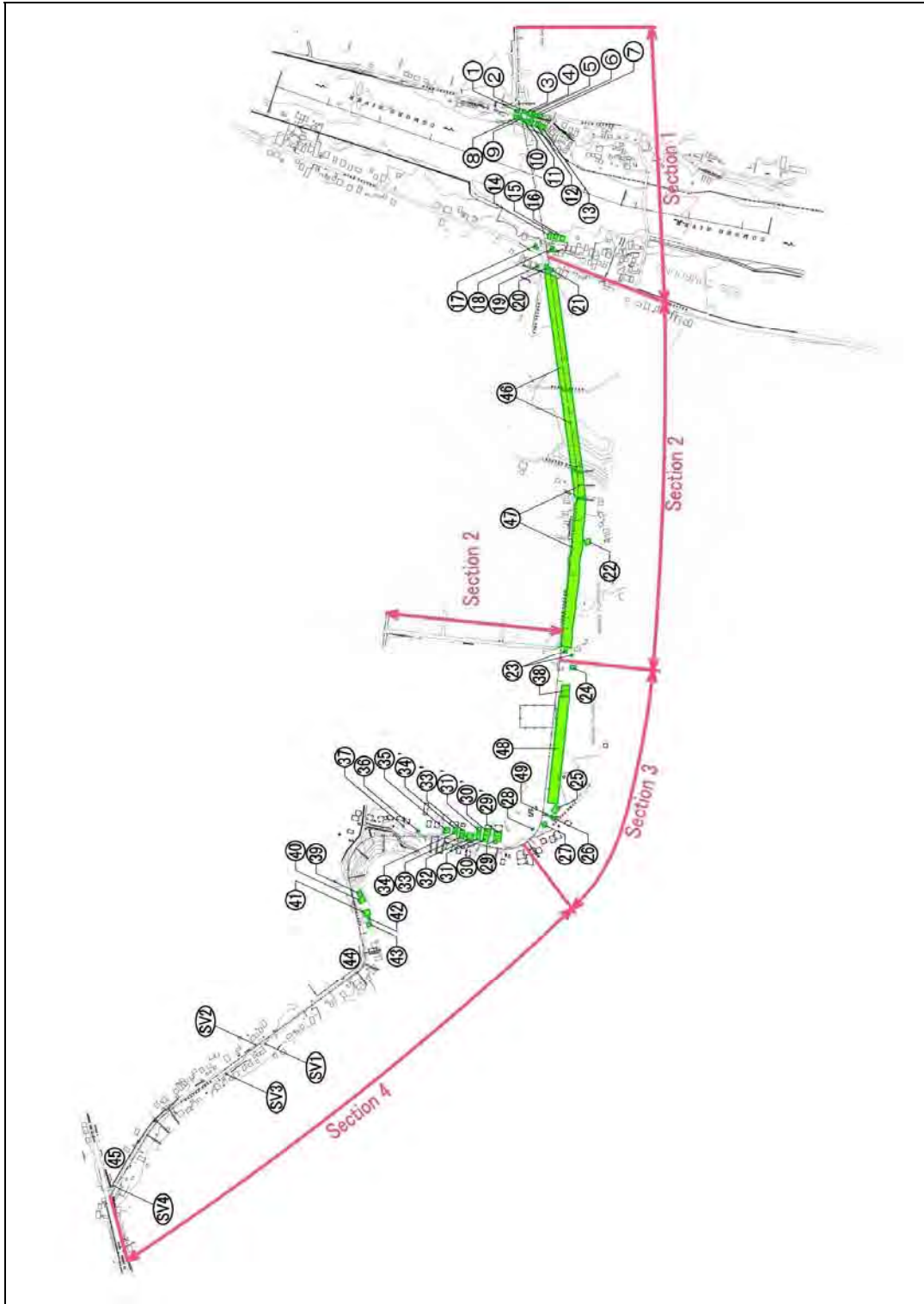
in the project area.

- IV. Where displacement of households is unavoidable, all APs (including communities) losing assets, livelihoods, and/or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.
- V. Compensation and support for rehabilitation will be provided to all APs, that is, any person or household or business suffering from the temporal and/or permanent adverse effects on the followings due to the project.
 - Standard of living, Livelihood
 - Immovable property such as house and land including agricultural, commercial land and their titles
 - Movable property such as agricultural crops and plants
 - Tenancy of land and structure such as house and office spaces
 - Employment opportunities and marketing opportunities
 - Social and cultural activities, relationships in terms of social and cultural aspects
- VI. All affected people will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic conditions and any factors that may discriminate against achievement of the objectives previously described. Lack of legal rights for the assets to be lost or adversely affected tenure, social and/or economic status will not prevent the APs from entitlements to such compensation including rehabilitation measures to achieve resettlement objectives. All APs living and/or working in any sector such as business agriculture within the project areas as of “Cut-off date” are entitled to compensation for their lost assets (immovable and/or movable assets).
- VII. “Cut-off-date” is set to define the eligibility of APs in the project area. Cut-off-date of the Project will be the commencement date of the latest census planned during detailed design period.
- VIII. Replacement cost will be determined based on the consultation among stakeholders and available data including the information from the past projects. Compensation will be provided with rehabilitation measures sufficient to assist APs in order to maintain at least pre-project social and economic conditions or improve them.
- IX. In case of APs’ partial loss of their immovable assets which the remainder will not be sufficient to sustain the current conditions, the APs will be considered for resettlement. The threshold of resettlement will be set based on the agreement through the consultation during the preparation process of ARAP.
- X. People temporarily affected such as street vendors will be considered as APs and transitional compensation will be provided.
- XI. Compensation will be provided not only for physical loss of immovable and/or movable assets but also for the transitional period to restore pre-project livelihood of APs.
- XII. The ARAP includes consideration for the needs of the most vulnerable people including poor, elderly and disable people, ethnic minorities, women and children in order to ensure their livelihood restoration and to improve their socio-economic status.
- XIII. APs and local communities will be involved in the process of preparation of ARAP based on the sufficient consultation and understanding for the content of land acquisition and resettlement including their rights and potential mitigation measures.
- XIV. Budgetary preparation and necessary arrangements will be committed by the Project Proponent (Ministry of Public Works, Directorate of Roads, Bridges, and Flood Control) to secure the costs for resettlement including land acquisition and transitional compensation.

- XV. Resettlement will not commence until the payments for all compensation are completed. Physical resettlement needs to be completed by the bid for construction.
- XVI. Institutional framework for Resettlement Management System (RMS) will be established to implement ARAP based on the initiative by the Project Proponent. RMS will include sufficient human resources for land acquisition, payment of compensation, livelihood restoration, public consultation, and monitoring.
- XVII. Reporting, monitoring and evaluation will be conducted as a part of RMS. An external monitoring team (international and local involuntary resettlement specialist) will be hired by the Project Proponent to evaluate, revise the process and support the implementation.

(5) Socio Economic Status (SES) Survey

The SES Survey was implemented to prepare the draft Abbreviated Resettlement Action Plan (ARAP). The scope of SES Survey encompasses the land and households with the potential impact by the presumed project area (bridge and 2-lane access roads in Sections 1 through 4) at the initial phase of the Preparatory Survey. The target households are indicated in Figure 1-3-7.



Source: Survey Team

Figure 1-3-7 Location of the Target Households of SES Survey

Results of the Socio Economic Status Survey are as described below.

Survey period: July 8 ~ July 24, 2013

Target households: 55 households (excluding the street vendors)

i. Population census results

The result of population census is shown in Appendix 6. The area of Socio-Economic Status Survey (SES Survey) including the population census covers five Aldeia, the gender breakdown (male to female) of residents is 1 : 1 and most residents are under 30 years old. There are no foreign nationals and the average number of people per household is five. Since SES Survey was implemented prior to the basic design and the decision on the scope of works, SES Survey was conducted for the area larger than option g in Table 1-3-10. The basic design was slightly modified according to the result of the survey to minimize the impact. Therefore, the extent of the impact by the Project needs to be confirmed by the topographic survey along the proposed bridge and access road during the detailed design. According to the results of the topographic survey, the final SES Survey needs to be conducted in order to finalize the numbers of affected persons (APs) and project affected units (PAUs).

The cutoff date is expected to be announced on the first day of the population census in the final SES Survey during the detailed design. However, since the public consultation is scheduled simultaneously, explanation and declaration of the cutoff date may be conducted during the public consultation depending on the schedule.

In order to prevent the influx of population to the Project area after the cutoff date, the width pegs need to be installed to clarify the area for the proposed access road at the initial phase of the detailed design. Furthermore, the existing conditions should to be recorded and the collaboration with the leaders of Suco and Aldeia. Regular monitoring will be conducted through the implementation of Abbreviated Resettlement Action Plan (ARAP) described later to prevent the new resettlement in the Project area.

Table 1-3-17 shows the current conditions of ownership and use of land and structures by the surveyed households. Most of the surveyed households were houses but some structures are used for other purposes as well. Even though many residents claim ownership of land and lease properties are few, no residents possess land right certificates or title deeds.

On the other hand, the leader of Suco and National Directorate of Housing and Urban Planning of MPW indicated that the majority of the land in the Project area is owned by the Mr. Carrascalao who owns the large part of the local area. Mr. Carrascalao claimed his ownership for all land in the Project area except for the area used as the official residence during the era of Indonesian rule which are shown as household 29~35 in Figure 1-3-7. He also mentioned that most of the current residents in the Project area have lived without his permission. However, as no documents certify the land ownership of Mr. Carrascalao, the ownership rights of the land and boundaries in the Project area need to be clarified through the public consultations during the detailed design. Since the legality of land owners cannot be judged due to the uncertainty of the land ownership in the Project area, all SES Survey results were recorded as the respondents answered except for the households 1~18 which illegally occupy the river bank. Therefore, the legality of land owners also needs to be investigated by the final SES Survey during the detailed

design.

Table 1-3-17 Ownership Type and Use of Land and Structure

Use of Lot	Ownership	Landlord	Ownership of Structure(s)	# of PAUs			# of APs		
				Legal	Illegal	Sub-Total	Legal	Illegal	Sub-Total
Required for Resettlement									
Residential	Self-owned		Yes	1	18	19	8	104	112
	Tenant	Public	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
		Private	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
Residential and Agricultural	Self-owned		Yes	0	3	3	0	11	11
	Tenant	Public	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
		Private	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
Residential and CBEs	Self-owned		Yes	0	2	2	0	8	8
	Tenant	Public	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
		Private	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
Others	Self-owned		Yes	2	3	5	6	4	10
	Tenant	Public	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
		Private	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
Sub-Total				3	26	29	14	127	141
Not Required for Resettlement									
Residential	Self-owned		Yes	0	0	0	0	0	0
	Tenant	Public	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
		Private	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
Residential and Agricultural	Self-owned		Yes	0	0	0	0	0	0
	Tenant	Public	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
		Private	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
Residential and CBEs	Self-owned		Yes	0	0	0	0	0	0
	Tenant	Public	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
		Private	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
Others	Self-owned		Yes	3	0	3	3	0	3
	Tenant	Public	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0

		Private	Yes	0	0	0	0	0	0
			No	0	0	0	0	0	0
Sub-Total				3	0	3	3	0	3
Grand Total				6	26	32	17	127	144

ii. Property and asset survey

Table 1-3-18 shows the results of SES Survey according to each type of land use in each Aldeia expected to be affected by the Project. The affected area was determined according to the impact by the Project with the assumption of the construction for the two-lane road over the entire section and the bridge as previously described. Since the size of land was estimated by the simple measurement prior to the decision on the scope of the Project, accurate measurement needs to be conducted through the final SES survey during the detailed design similar to the population census. This also applies to the structure and plants described later.

Table 1-3-18 Potential Affected Areas in the Preliminary Assumed Areas of Influence

Name of Aldeia	Use of Lot	Affected Area (m2)	Total Affected Area (m2)
Foment 2	Residential	450	553
	Agricultural	0	
	Residential +Agricultural	0	
	CBE (Commercial and Enterprises)	0	
	Residential+CBEs	54	
	Community/Public Facilities	0	
	Other	49	
30 de Agosto	Residential	0	6881
	Agricultural	6800	
	Residential +Agricultural	81	
	CBE (Commercial and Enterprises)	0	
	Residential+CBEs	0	
	Community/Public Facilities	0	
	Other	0	
4 de Setembro	Residential	844	8251
	Agricultural	6000	
	Residential +Agricultural	362	
	CBE (Commercial and Enterprises)	0	
	Residential+CBEs	325	
	Community/Public Facilities	0	
	Other	720	
Golgota	Residential	279	483
	Agricultural	0	
	Residential +Agricultural	64	
	CBE (Commercial and Enterprises)	0	
	Residential+CBEs	140	
	Community/Public Facilities	0	

	Other	0	
Moris Foun	Residential	516	7406
	Agricultural	6800	
	Residential +Agricultural	0	
	CBE (Commercial and Enterprises)	0	
	Residential+CBEs	0	
	Community/Public Facilities	0	
	Other	90	

Table 1-3-19 shows the results of SES Survey conducted for the structures expected to be relocated. The floor area was estimated by the simple measurement similar to the lots shown in Table 1-3-18. Since most of the Project area is residential, majority of the structures required relocation are houses. However, different consultation on relocation will be needed for the special structures such as cemetery.

Table 1-3-19 Potential Affected Structures in the Preliminary Assumed Areas of Influence

Name of Aldeia	Use of Affected Structure	Type of Structure					
		Permanent Structure	Total Floor Area (m2)	Semi-Permanent Structure	Total Floor Area (m2)	Temporary Structure	Total Floor Area (m2)
Foment 2	House	1	48	9	299	2	61
	Toilet	0	0	1	1	0	0
	Storage	0	0	0	0	0	0
	Store/Shop	0	0	0	0	1	9
	Foundation	0	0	0	0	1	36
	Kitchen	0	0	0	0	1	1
	Pig pen	0	0	0	0	0	0
	Other	0	0	0	0	0	0
Moris Foun C	House	0	0	4	179	2	83
	Toilet	0	0	0	0	3	7
	Storage	0	0	0	0	0	0
	Store/Shop	0	0	0	0	1	24
	Foundation	0	0	0	0	1	54
	Kitchen	0	0	0	0	2	17
	Pig pen	0	0	0	0	0	0
	Other	1	2	0	0	0	0
30 de Agustu	House	1	64	0	0	0	0
	Toilet	0	0	0	0	1	4
	Storage	0	0	0	0	0	0
	Store/Shop	0	0	0	0	0	0
	Foundation	0	0	0	0	0	0
	Kitchen	0	0	0	0	0	0
	Pig pen	0	0	0	0	0	0
	Other	0	0	0	0	0	0
4 de Setembro	House	4	367	6	416	3	75
	Toilet	0	0	1	1	4	25
	Storage	0	0	0	0	0	0

	Store/Shop	0	0	2	161	1	39
	Foundation	0	0	0	0	2	370
	Kitchen	0	0	0	0	4	75
	Pig pen	1	12	0	0	3	18
	Other	1	4	0	0	0	0
Golgota	House	3	382	2	88	0	0
	Toilet	0	0	0	0	0	0
	Storage	0	0	0	0	1	6
	Store/Shop	0	0	0	0	0	0
	Foundation	0	0	0	0	0	0
	Kitchen	0	0	0	0	0	0
	Pig pen	0	0	0	0	0	0
	Other	3	179	0	0	0	0
Total	15	1058	25	1145	33	904	

Permanent Structure: Structure made from inorganic materials such as concrete, brick and iron

Semi-Permanent Structure: Structure made from mixture of inorganic and organic materials

Temporary Structure: Structure made from organic materials such as straw, bamboo, soil

Table 1-3-20 shows the results of SES Survey for the livestock expected to be impacted, and Table 1-3-21 shows the results for the plants expected to be impacted. Since the livestock can be relocated, no compensation is expected for them except for the transitional compensation. Since the majority of the vegetation that may be eligible for the compensation was annual commercial crops such as bananas and sweet corn, the target for compensation will be defined by the final SES Survey during the detailed design according to the quantities in the affected area as of the cutoff date.

Table 1-3-20 Potential Affected Livestock in the Project Area

Name of Aldeia	Name and #of Livestock				Total by Aldeia
	chicken	pig	dog	goat	
Foment 2	0	4	2	0	6
Moris Foun C	0	0	0	0	0
30 de Agosto	0	0	0	0	0
4 de Setembro	25	17	0	1	43
Golgota	0	0	0	0	0
Total by Livestock	25	21	2	1	49

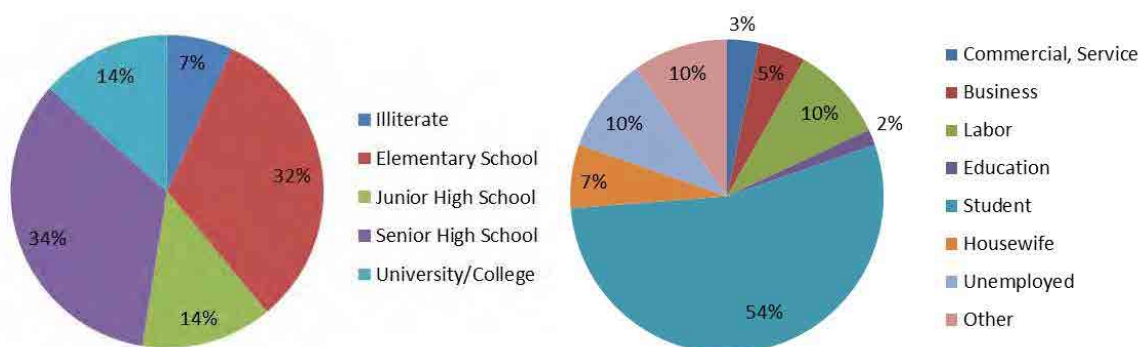
Table 1-3-21 Potential Affected Plants in the Project Area

Name of Aldeia	Name and # of Plants														Total by Aldeia
	banana	mango	ai-hanek tree	casava	palm	corn	lulik/sac red tree	betel palm	guava	orange	coconut	papaya	avocado	mimosa tree	
Foment 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moris Foun C	27	0	0	20	0	60	0	0	0	0	0	0	0	0	107
30 de Agosto	64	0	0	40	0	20	1	0	0	0	2	0	0	0	127
4 de Setembro	115	3	1	50	2	250	0	34	1	4	10	16	5	1	492
Golgota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total by Plants	206	3	1	110	2	330	1	34	1	4	12	16	5	1	726

iii. Livelihood survey

The livelihood survey was conducted for 10 households (equivalent to 20% of the households targeted in the SES Survey) as a part of SES Survey. Economic data was collected regarding occupations, incomes and monthly expenditure, etc. Interviews were also conducted to identify the requests for the compensation of land acquisition and involuntary resettlement. The surveyed households were randomly selected in the Project area in order to prevent the concentration for the specific area.

Figure 1-3-8 shows the academic backgrounds and occupations of the residents in the surveyed households. Regarding their academic background, more than 80% of the 59 valid respondents graduated junior high school or higher and 10% graduated university.



Source: Survey Team

Figure 1-3-8 Educational Background (Left) and Occupation (Right) of the Target Households

Regarding their occupations, out of the 61 persons who gave valid responses, more than half were students, while laborers (civil engineering, etc.) and unemployed persons occupied 10% each.

Table 1-3-22 shows the survey results related to the number of members of household, monthly income and expenditure and other items relevant to the household budget. According to the Timor-Leste Survey of Living Standard conducted in 2007, people living in poverty in Timor-Leste are defined as having monthly income of between 21.53 and 26.68USD and

approximately half of the households surveyed were in that range. However, since there are many students in the target households as previously described and some households like No. 15 in Figure 1-3-7 were composed entirely of university students with the claim of their income as zero, it was assumed that these households secured certain income by remittances and part-time work, etc.

Table 1-3-22 Composition, Duration of Residence and Economic Status of the Target Households

HH#	# of surveyed APs	# of APs with Jobs generating income	Ave. duration of residence (year)	Ave. Monthly Income in USD	Ave. HH savings in USD	Ave. Monthly Expenditure in USD	Ave. Monthly Balance in USD
HH 8	8	4	6	2000	0	2200	-200
HH 10	10	1	6	200	0	200	0
HH 15	6	0	1	0	0	100	-100
HH 19	8	1	19	300	0	335	-35
HH 24	3	2	32	1800	0	1800	0
HH 26	2	1	1	120	0	120	0
HH 33	10	2	9	30	0	30	0
HH 34'	10	2	8	200	40	160	40
HH 40	7	2	10	438	0	438	0
HH 43	8	2	30	535	0	535	0
Total	72						
Average	7	2	12	562	4	592	-30

Regarding the trends of the survey responses, since there was a polarization towards over-declaring households and under-declaring households, it will be necessary to take countermeasures such as requiring submission of evidence document for the final SES Survey in the detailed design. Although there may be some error regarding the income, as a general trend, the custom which spends all income without any saving was identified for the majority of the surveyed households. One of the main reasons for this was a lot of money regularly spent on ceremonial occasions among relatives. Even though there are few members who generate income in all the surveyed households, no households with the members working away from home to generate income were identified. Also, no recipients of pensions or social security were confirmed.

Regarding compensation, more people preferred financial payment rather than provision of alternative land. Three households already secured some land for their relocation. Concerning the location of the resettlement, 70% of households indicated that relocating within the same sub-district would not trigger to change school or workplace.

iv. Socially vulnerable persons

Since the livelihood survey was only a sampling survey, it will be necessary to confirm the income of all PAUs in the final SES Survey in the detailed design. As a result, it may be necessary to consider increasing the amount of compensation for the households under poverty line. According to the population census, any vulnerable households that comprise only women or elderly people over 60 years of age or include disabled persons were not identified in the Project area.

(4) Consultation over Compensation Standards and Reacquisition Prices, and Examination of Lifestyle Rebuilding Measures

Consultation on the standards for compensation, the unit prices for reacquisition and the measures for livelihood rehabilitation were held with MPW (DRBFC, National Directorate of Housing and Urban Planning) and DNTPSC. The major outcomes of the consultations were as follows.

- Adopt the same basic policy of compensation standards and livelihood rehabilitation measures similar to the other road projects in Timor-Leste. Eligible recipients of the compensation are as follows:
 - Persons who hold legal rights over land in the Project area
 - Persons who don't hold legal rights over land in the Project area but who can acquire rights if they claim them
 - Persons who cannot confirm legal rights or claim over the land they occupy but live and/or generate income in the Project area
 - Public facilities (cultural and religious facilities, etc.) in the Project area
- The losses of residents and wage earners in the Project area eligible for the compensation are as follows:
 - Target areas for the land acquisition
 - Structures affected by the land acquisition
 - Commercial crops and vegetation affected by the land acquisition
 - Temporary suspension of livelihood activities due to the construction works
- Reacquisition prices for the land and the structures will be determined by referring to the similar projects in Timor-Leste and taking the characteristics of the land in the Project area located in Dili urban area into consideration. The proposed prices will be a rough estimate due to the lack of the data of land prices in the commercial market in Timor-Leste and the final prices will be determined according to the consultations with the residents during the detailed design.
- Regarding the reacquisition prices of commercial crops and vegetation, data from the MAF will be utilized. If data is not available, reacquisition prices in the similar projects will be utilized.
- Securing the relocation land for the involuntary resettlement will not be conducted in

relocated similar to the other road projects in Timor-Leste as most people expressed their preference for the financial compensation rather than the provision of alternative land by the SES Survey.

- The financial compensation is assumed as the primary measure to support APs for their livelihood rehabilitation based on the consideration for the impacts during the preparation of relocation and the suspension of the activities for income generation due to the construction. However, if some requests for other supporting measures are made through the final SES Survey and public consultations during the detailed design, they will be considered as needed.

(5) Preliminary Cost and Source of Funds for Resettlement and Land Acquisition

According to the results of the surveys and consultations previously described, a preliminary cost was estimated for the option g shown in Table 1-3-10. The results are shown in Table 1-3-23.

Table 1-3-23 Preliminary Cost Estimate for Option g

(Section1-3:2lanes, Section4:Maintain the width of the existing road)

Item	Quantity	Unit	Rate (USD)	Cost (USD)
Land and Structures				
Land	25,820	m2	40	1,032,800
Permanent Structures	228	m2	500	114,000
Semi-Permanent Structures	544	m2	350	190,400
Temporary Structures	762	m2	200	152,400
Special Structure (Cemetery)	1	LS	500	500
Sub Total				1,490,100
Plants				
Sacred Tree	1	each	100	100
Ai hanek tree	1	each	50	50
Banana	193	each	5	965
Cassava	110	each	4	440
Corn	330	each	0.6	198
Coconut	11	each	50	550
Mango	3	each	15	45
Avocado	5	each	15	75
Palm	2	each	50	100
Betel Palm	34	each	50	1,700
Orange	4	each	84	336
Guava	1	each	32	32
Papaya	10	each	38	380
Sub Total				4,971

Transitional Allowance				
Transitional Allowance for PAUs losing structures (3month)	29	No	300	8,700
Transitional Allowance for Roadside Business (3month)	6	No	300	1,800
Transitional Allowance for Gravel Extraction Business (3month)	4	No	315	1,260
Sub Total				11,760
Monitoring and Training				
Full-time Staff at DRBFC	6	MM	400	2,400
Full-time Staff at SSLP	6	MM	400	2,400
Local Involuntary Resettlement Specialist	6	MM	3,500	21,000
International Involuntary Resettlement Specialist	6	MM	15,000	90,000
Sub Total				115,800
20% Contingency Cost				324,526
Grand Total				1,947,157

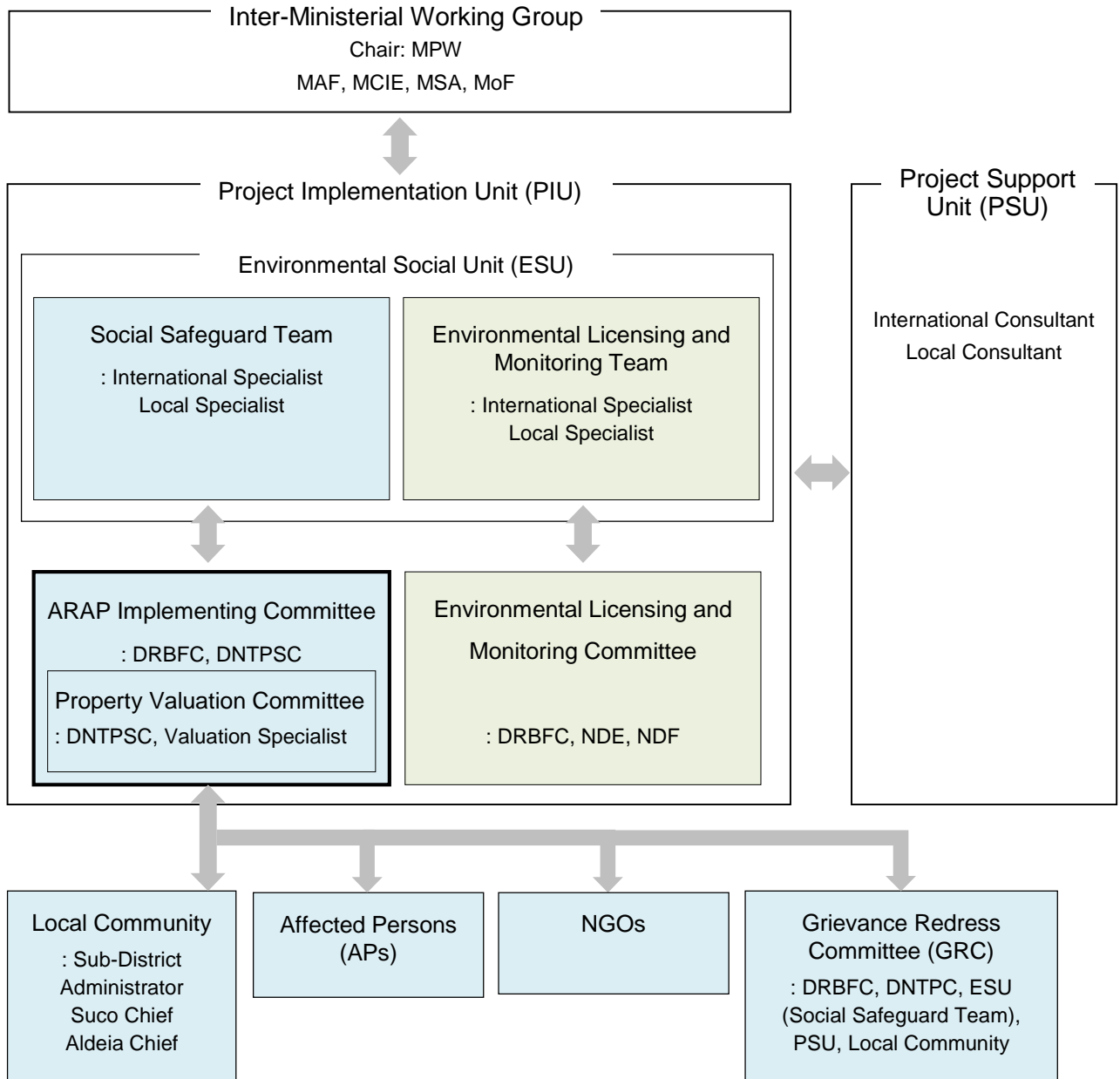
Source: Survey Team

These costs need to be secured by MPW similar to the environmental monitoring costs. MPW is supposed to apply for the Ministry of Finance (MOF) in advance to secure the budget. As is indicated in the schedule (draft) shown in Table 1-3-3, it needs to be incorporated into the budget for fiscal year of 2014 to implement the land acquisition and resettlement in 2014. According to MPW, the budget of approximately 2.5 million USD has already been secured for the Project.

(6) Relevant Agencies, their Roles and Implementation Framework (Draft)

It is desirable that the land acquisition and the involuntary resettlement are implemented by the initiative of ARAP Implementing Committee consists of the Project implementer (DRBFC) and DNTPSC based on the collaboration with the local communities and the social safeguard team. ARAP Implementing Committee includes the Land and Property Valuation Committee composed of DNTPSC and the valuation expert.

Figure 1-3-9 shows the framework of the implementation of environmental and social considerations for the Project. Table 1-3-24 indicates the roles of the units and groups for the land acquisition and the involuntary resettlement.



MPW: Ministry of Public Works
MAF: Ministry of Agriculture and Fisheries
MCIE: Ministry of Commerce, Industry and Environment
MSA: Ministry of State Administration
MoF: Ministry of Finance
ARAP: Abbreviated Resettlement Action Plan
DRBFC: Directorate of Road, Bridge and Flood Control
DNTPSC: National Directorate of Land, Property and Cadastral Services
NDE: National Directorate of Environment
NDF: National Directorate of Forestry

Source: Survey Team

Figure 1-3-9 Implementation Structure for Environmental and Social Consideration (Draft)

Table 1-3-24 Parties in charge of land acquisition and involuntary resettlement and their roles

Name of Unit/Group	Key Members	Role
Inter-Ministerial Working Group	MPW, MAF, MCIE, MSA	Inter-Ministerial support through information sharing at stakeholder meeting etc.
Project Implementation Unit (PIU)	DBRFC, DNTPSC	<ul style="list-style-type: none"> • Final Socio-Economic Status Survey (joint implementation with PSU) • Preparation of ARAP based on the draft prepared by PSU • Implementation and management of land acquisition and involuntary resettlement through the collaboration with ESU • Budget allocation for compensation and payment for compensation • Establishment of ARAP Implementing Committee • Coordination and collaboration with PSU • Implementation of public consultation and stakeholder meetings including information disclosure and preparation of informational reference materials • Consultation for reacquisition price and determination for the unit price for compensation items • Coordination and collaboration with local community and NGOs • Implementation of monitoring for land acquisition and involuntary resettlement • Response to the complaints from Affected Persons (APs) and hosting the GRC as necessary
Project Support Unit (PSU)	Consultant Team	<ul style="list-style-type: none"> • Final Socio-Economic Status Survey (joint implementation with PIU) • Support for the preparation of APAP • Support for land acquisition and involuntary resettlement • Support for public consultation and stakeholder meeting • Support for information disclosure • Support for consultation on replacement cost • Support for monitoring • Support for GRC
Grievance Redress Committee (GRC)	DBRFC, DNTPSC, PSU, Local Community	<ul style="list-style-type: none"> • Response to the grievance by APs • Support for arbitration <p>(Details are indicated in (7))</p>

(7) Grievance Redress Mechanism

It is important to establish a system to address the grievances by affected persons (APs) in the process of the land acquisition and the involuntary resettlement in Timor-Leste since the land expropriation law is still being drafted and has not yet been enforced. The local residents will be informed for their rights to address grievances to GRC regarding the compensation by the Project

through the public consultation scheduled in the detailed design.

Since the mediation on land has traditionally been resolved at the Suco level by the initiative of the village leaders, the village leaders will be the contact persons and respond to the grievances as GRC members. If the grievances of APs are not resolved, ARAP Committee will mediate. In the case of failure for the resolution, the petition will be made to the secretary general of MPW and the grievance will finally be resolved at a court of law. GRC will support APs and coordinate with relevant agencies to ensure that grievances are appropriately dealt with through this process. Table 1-3-25 shows the draft grievance redress process.

Table 1-3-25 Grievance Redress Process (Draft)

		Process	Duration
1 st Phase	1	AP submits the document of grievance to the Village Chief (Xefe de Suco). The Village Chief shares the documents with ARAP implementation committee in PIU.	1 Week
	2	The Village Chief consults with ARAP implementation committee and reports the results of consultation to AP.	
In case for the failure of dispute mediation			
2 nd Phase	3	The Village Chief (member of GRC) submits the document of grievance to GRC members in ARAP implementation committee.	within a week from failure of mediation
	4	GRC members in ARAP implementation committee convene all GRC members to consult for their response.	1 Week
	5	GRC member reports the results of consultation to AP.	5 days
In case for the failure of dispute mediation			
3 rd Phase	6	AP and the Village Chief submit the document of grievance to MPW Secretary of State.	within a week from failure of mediation
	7	The Secretary of State convenes the committee in MPW to consult for the response according to the coordination with DNTPSC.	1 Week
	8	The Secretary of State reports the results of consultation to AP and the Village Chief.	5 days
In case for the failure of dispute mediation			
4 th Phase	9	AP and/or the Village Chief take the grievance to the court.	According to the judicial process

The provisional GRC members (draft) are as follows:

- Representative of APs
- Sub-District Administrator
- Village chief, Chiefs of Aldeias
- Members of DRBFC in ARAP Implementing Committee

- Members of DNTPSC in ARAP Implementing Committee
- Members of ESU and PSU

The members of the committee and the units as well as the grievance redress process will be reviewed, discussed and revised as needed based on the consultation with the relevant agencies. The system needs to be established prior to the commencement of the land acquisition and the involuntary resettlement.

(8) Monitoring Form

The ARAP Implementing Committee will prepare the monitoring form with support from ESU. The ARAP Implementing Committee will confirm the progress on monthly basis and ESU will support as needed according to the progress. Monitoring will be continuously implemented from the commencement of the tasks of ESU to the completion of the land acquisition and the involuntary resettlement. The example of the ARAP monitoring form is included in Appendix 4.

(9) Entitlement Matrix

Table 1-3-26 shows the types of losses, the recipients of compensation, the contents and policy of compensation, and the responsible implementing agencies associated with the land acquisition and the involuntary resettlement.

Table 1-3-26 Entitlement Matrix

Type of Loss	Entitlement	Details of Entitlements / Guideline of Entitlements	Responsible Agency / Team
Permanent loss of homestead and agricultural land	Land owner	Compensation based on the replacement cost / Property Valuation Committee in ARP implementing Committee sets the proposed unit price for land acquisition with the support by ESU. The replacement cost is finalized according to the consultation with the owners.	DRBFC DNTPSC Valuation Specialist ESU (Social Safeguard Team)
Permanent loss of structure (residence, kitchen etc.)	Claimant of the affected structure (including squatters and informal settlers)	Compensation based on the replacement cost / Property Valuation Committee in ARP implementing Committee sets the proposed unit price with the support by ESU. The replacement cost is finalized according to the consultation with the owners.	DRBFC DNTPSC Valuation Specialist ESU (Social Safeguard Team)
Commercial crops and plants	Claimant of the affected crops and plants	Compensation based on the replacement cost / ARP implementing Committee sets the proposed unit price based on the data from MAF with the support by ESU. The replacement cost is finalized according to the consultation with the owners.	DRBFC ESU (Social Safeguard Team)
Temporal or	People engaged in	Compensation for the suspension period of	DRBFC

permanent loss of livelihood activities	gravel extraction at the proposed bridge location Street vender Owner of shops attached to the residence	livelihood activities / ARP implementing Committee sets the proposed unit price based on the unit labor rate with the support by ESU. The compensation cost is finalized according to the consultation with the owners.	ESU (Social Safeguard Team)
Impact on the religious facility	Owner of Ave Maria	Relocation of the structure/ In the case of the relocation of the entrance gate is required, it is supposed to be completed prior to the construction.	DRBFC ESU (Social Safeguard Team)

(10) Implementation Schedule and Matters for Consideration

Project Implementation Unit (PIU) needs to be established at the early stage by the initiative of DRBFC since the period that the Project Support Unit (PSU) can support PIU is limited. DRBFC needs to assign the members in PIU and recruit the local and international experts to establish the system for the implementation of the public consultation, the land acquisition, and the involuntary resettlement by the initiative of the government of Timor-Leste. PIU needs to be established and start its operation at the commencement of the detailed design since the period for the land acquisition and the involuntary resettlement is currently estimated less than six months.

CHAPTER 2

COTENTS OF THE PROJECT

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

(1) Overall Goal and Purpose of the Project

The new bridge and access road to be constructed by the Project aim to provide an alternative route to mitigate traffic congestion in east-west axis and contribute to the economic development of Dili District. The Project purpose and overall goal of the Project are as follows;

- Overall Goal

Promote economic activities in the capital city, Dili

- Project Purpose

Maintain smooth and stable traffic in east-west direction in Dili urban area

(2) Project Outline

In order to achieve the said goal and purpose, the Project intends to utilize Japan's Grant Aid to construct a new bridge of approximately 250 meters in length upstream of the existing Comoro Bridge, and also to construct the access road of approximately 3 km connecting the new bridge and existing trunk road.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

In view of the background of the Project, conditions around the target area and the relevance and necessity of the Project ascertained in the field surveys, the basic policy of bridge and access road design in the Project is described below.

- To run parallel to National Route A03 and connect with the existing four-lane Banana Road and National Route A03 as an alternative to National Road A03.
- To be a smooth road alignment as a primary route for physical distribution and public transport.
- To improve accessibility between the Project target area and port, airport and public facilities.
- To minimize the social impacts of resettlement and land acquisition.
- Not to affect control points such as the logistics facilities, sacred religious sites, schools, hospitals and other public facilities on the left bank of the bridge.
- To protect the abutments and piers of the new bridge from scouring at times of flooding in consideration of the flow characteristics of Comoro River.
- To take into account the landscape and technology transfer desired by the Government of Timor-Leste as well as economy, ease of maintenance and relevance of the work schedule, when selecting the type of bridge.

(2) Scope and Scale of Project

1) Scope of the Project

1-1) Bridge Location and Optimum Route of the Access Road

As a result of examining and comparing the bridge location and access road alternatives indicated in Figure 2-2-1 based on the above basic policy, Alternative route 2 was selected as the most appropriate route.



Source: Google Earth

Alternative route	Features	Evaluation	
Alternative route 1	This route passes through existing road along residential area on the north side	<ul style="list-style-type: none"> As the existing road is narrow, in order to secure the necessary road width, large-scale resettlement, land acquisition and tree cutting will be necessary (approximately 90 houses and 170 trees will have to be relocated and removed to build two lanes). Horizontal alignment and vertical alignment below Ave Maria are too extreme to satisfy the minimum requirement of design speed. 	×
Alternative route 2	This route is a new road that passes through banana fields and connects to the existing road running along hilly ground.	<ul style="list-style-type: none"> Smooth alignment can be secured on the new stretch of road through the banana fields. Out of the three alternatives, this has the smallest impact on existing houses (approximately 53 houses will have to be relocated to build two lanes, but approximately 185 trees will need to be cut). 	◎
Alternative route 3	This route passes through the existing road running along hilly ground.	<ul style="list-style-type: none"> As the existing road is narrow, in order to secure the necessary road width, more extensive resettlement and land acquisition than in Alternative route 2 will be necessary (approximately 60 houses and 210 trees will have to be relocated and removed to build two lanes). There is concern over negative impacts on the important bird area located on the south side. 	△

◎: Superior, ○: Good, △: Inferior

Figure 2-2-1 Comparison of Alternative Bridge Positions and Access Road Routes

1-2) Scope of Access Road

Development of the access road on the left bank, which is currently undeveloped, is essential for supporting east-west traffic which is expected to increase in future. Concerning the scope of development of the access road, broadly speaking, one plan is to construct the entire section indicated in Figure 2-1-1, and the other is to secure minimum access up to the airport. For the following reasons, the plan to develop the entire route is selected:

Reason 1: Securing of functions as an alternative route to National Road A03

In line with the increase in traffic volume, there is a concern about traffic congestion at the roundabout in front of the airport. In order to fulfill the function as an alternative to National Road A03, the route should be planned to connect to National Route A03 west of the airport roundabout, where traffic is relatively light.

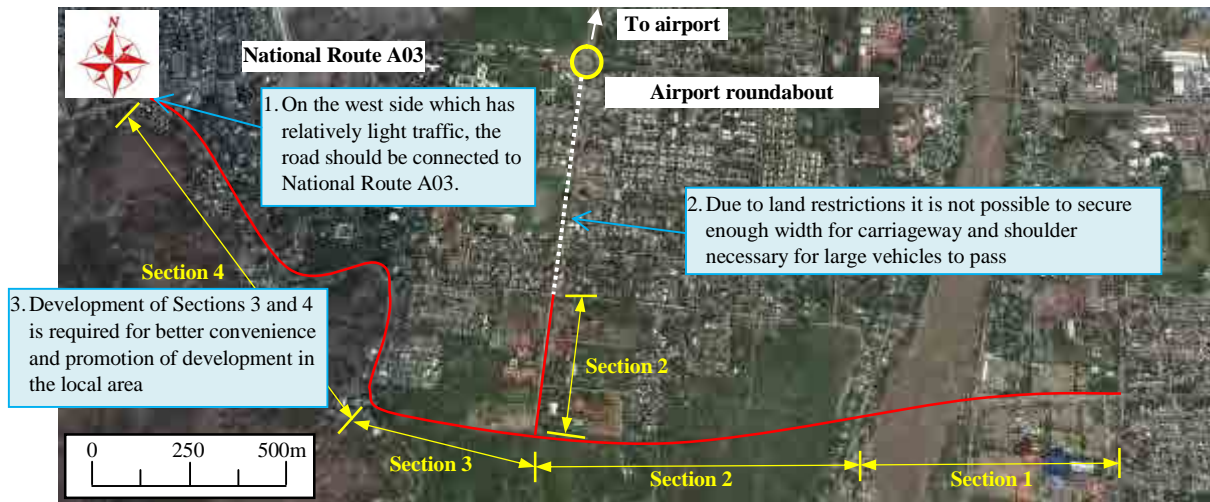
Reason 2: Securing of functions as a logistics route

Although constructing a road from the airport roundabout to the main access road is effective for improving the accessibility of passenger to the airport, it is not possible to secure enough width for carriageway and shoulder necessary for large vehicles to pass due to the limited land. In order to serve as a logistics route, there is a high need to construct the entire route.

Reason 3: Contribution to urban traffic network and spatial formation in built-up areas of Dili

The access road and bridge to be constructed in the Project will have a significant role on the urban transport network and future spatial planning envisaged in the Dili Urban Master Plan. To develop access road to be the trunk route on the west side of Dili where development has been particularly delay, this will contribute to improving convenience, promoting development and thus forming the urban transport network and space in the future.

In the Survey, the target route will be divided into four sections in consideration of site conditions and ease of connections and the target scope of Grant Aid will be compared and examined from the viewpoint of project cost through calculating the preliminary cost along each section. Figure 2-2-2 shows an outline and rough project cost on each section at the present time.



Section	Scope	Preliminary Cost Estimate
Section 1	A unpaved section of the existing road on the right bank	This part is concealed for confidentiality
Section 2	Section connecting to existing road going towards the airport roundabout	
Section 3	Section up to the connection with the existing road running alongside hills	
Section 4	Section derived by tracing the alignment of the existing road and connecting with National Road A03	

Figure 2-2-2 Sections and Preliminary Project Cost of Access Road

2) Scale of the Project

In the minutes of discussions (M/D) that were signed with the Government of Timor-Leste in the field survey, it was agreed that the bridge to be constructed under the Japan’s Grant Aid will have two lanes, i.e. one lane in each direction.

Meanwhile, in discussions with the Government of Timor-Leste, the Survey Team confirmed that the local side hopes to widen the target bridge and access road to four lanes in the future. Moreover, after the field survey, the Government of Timor-Leste made a written request to the Government of Japan for detailed design on four lanes while recognizing that the bridge and access road in the Project will have two lanes.

In response to this request, upon considering the future traffic demand and impacts on environmental and social considerations described later, it has been decided to provisionally construct a two-lane bridge and access road in the Project which will be able to expand to four lanes in the future.

(3) Future Traffic Demand Forecast on the Target Bridge and Road

In order to examine the Project necessity and scale of construction of the target bridge and access road, the future traffic demand on the new bridge and access road was estimated. In conducting the future traffic demand forecast, not only the average daily traffic volume based on the results of traffic survey on the existing bridge but also diverted traffic from National Road A03 to the target route, traffic growth rate, induced traffic accompanying construction of

the new bridge, and increase in the physical distribution demand accompanying the opening of New Tibar Port are estimated. Figure 2-2-3 shows the flow of future traffic demand forecast.

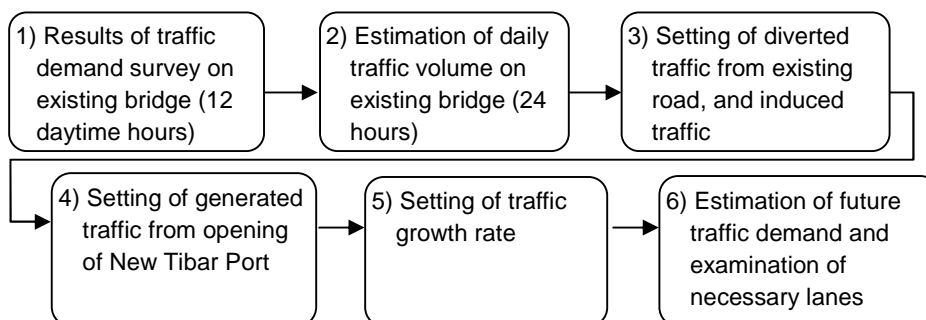


Figure 2-2-3 Flow of Future Traffic Demand Forecast

1) Results of traffic survey on the existing bridge

Traffic count survey by direction and by vehicle type (motorcycle, passenger car, bus, truck, trailer) passing through the existing bridge was carried out on July 4 (Thursday), 2013 from 07:00 to 19:00 (12 hours). Table 2-1-1 shows the total traffic volume by direction and vehicle type, and Figure 2-1-4 shows the hourly traffic volume by vehicle type.

Table 2-2-1 Total Traffic Volume by Direction (vehicles/12 hours)

Direction	Vehicle type					Total
	Motorcycle	Passenger car	Bus	Truck	Trailer	
East→West	14,572	2,265	1,196	1,089	43	19,165
West→East	10,570	7,577	1,492	1,087	38	20,764
Total	25,142	9,842	2,688	2,176	81	39,929

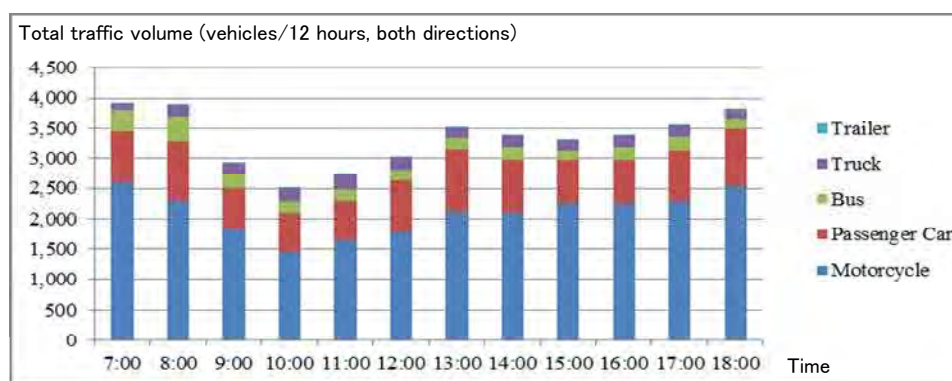


Figure 2-2-4 Hourly Traffic Volume by Vehicle Type

2) Estimation of average daily traffic on existing bridge

Daily traffic volume was estimated by multiplying the 12-hour traffic volume measured in the field survey by the ratio of daily to daytime traffic. For the ratio of daily to daytime traffic, the figure stated in the ADB road M/P report (ADB TA7100) was adopted. Table 2-2-2 shows the 12-hour traffic volume and daily traffic volume by vehicle type.

Table 2-2-2 Twelve-hour Traffic Volume and Daily Traffic Volume

	Motorcycle	Passenger Car & Taxi	Bus	Truck	Trailer	Total
a:Traffic volume survey results (units/12 hours)	25,142	9,842	2,688	2,176	81	39,929
b: ratio of daily to daytime traffic	1.18	1.29	1.21	1.49	1.49	-
Daily traffic volume (a*b)	29,668	12,696	3,252	3,242	121	48,979

3) Setting of diverted traffic from existing road and induced traffic

Following construction of the new bridge and access road, it is forecast that traffic will be diverted from the existing National Road A03. Concerning this diverted traffic, the diversion rate was assumed to be 28%, which is the ratio of population in the area targeted by the new bridge compared to the entire population of Dili.

Also, the induced traffic resulting from opening of the new bridge is set as 3%.

4) Setting of generated traffic from opening of New Tibar Port

According to materials of the IFC (International Finance Corporation), whereas Dili Port currently handles 40,000 TEU of freight per year, it is forecast that the New Tibar Port will handle 100,000 TEU per year, meaning that the combined total of the two ports will be 3.5 times the current value. Assuming that New Tibar Port will be opened in 2017, it is assumed that trailer traffic volume will increase 3.5 times over the 2016 level in 2017.

5) Setting of traffic growth rate

Traffic growth rate by vehicle type have been set in ADB TA7100. Moreover, because it is forecast that traffic of container trailer will increase after the opening of New Tibar Port assumed in 2017, the trailer growth rate from that year onwards has been set at 5% per year. Table 2-2-3 shows the traffic growth rate by vehicle type.

Table 2-2-3 Traffic Growth Rate by Vehicle Type

Year	Motorcycle	Car	Bus	Truck	Trailer
-2013	20.0%	15.0%	10.0%	5.0%	5.0%
2014-2016	10.0%	10.0%	7.5%	4.0%	4.0%
2017-	2.5%	5.0%	5.0%	3.0%	5.0%

6) Forecast of future traffic demand and examination of necessary lanes

Based on the above conditions, Table 2-2-4 shows the future traffic demand forecast for 20 years after the opening of the new bridge in 2017.

Because the targeted new bridge and access road constitute a district trunk road, according to the Road Geometric Design Standard in Timor-Leste, the design target year for

the route will be 10 years. Future traffic demand on the new bridge in 2030, 14 years after the opening of the bridge, is forecast to be less than 20,000 pcu per day for both directions which is the traffic capacity for the planned bridge (considering the new bridge width and roadside conditions). In consideration of the above points, two lanes will be appropriate regarding the design scale of the new bridge and access road in the Project.

Table 2-2-4 Future Traffic Demand Forecast on the New Bridge

Year		Forecasted Traffic Volume(AADT)						Total (pcu/day)
		Motorcycle	Passenger	Bus	Truck	Trailer	(veh./day)	
1	2017	10,440	4,300	890	760	140	16,530	12,210
2	2018	10,700	4,520	930	780	150	17,080	12,660
3	2019	10,970	4,750	980	800	160	17,660	13,135
4	2020	11,240	4,990	1,030	820	170	18,250	13,620
5	2021	11,520	5,240	1,080	840	180	18,860	14,120
6	2022	11,810	5,500	1,130	870	190	19,500	14,655
7	2023	12,110	5,780	1,190	900	200	20,180	15,225
8	2024	12,410	6,070	1,250	930	210	20,870	15,805
9	2025	12,720	6,370	1,310	960	220	21,580	16,400
10	2026	13,040	6,690	1,380	990	230	22,330	17,030
11	2027	13,370	7,020	1,450	1,020	240	23,100	17,675
12	2028	13,700	7,370	1,520	1,050	250	23,890	18,340
13	2029	14,040	7,740	1,600	1,080	260	24,720	19,040
14	2030	14,390	8,130	1,680	1,110	270	25,580	19,765
15	2031	14,750	8,540	1,760	1,140	280	26,470	20,515
16	2032	15,120	8,970	1,850	1,170	290	27,400	21,300
17	2033	15,500	9,420	1,940	1,210	300	28,370	22,130
18	2034	15,890	9,890	2,040	1,250	320	29,390	23,015
19	2035	16,290	10,380	2,140	1,290	340	30,440	23,925
20	2036	16,700	10,900	2,250	1,330	360	31,540	24,880

Meanwhile, Table 2-2-5 shows the future traffic demand forecast for 20 years on the existing bridge from 2013. By 2026, 10 years after the opening of the new bridge, it is forecast that traffic capacity on the existing bridge will be less than the four-lane traffic volume of 55,000 pcu per day in both directions (considering the existing bridge width and roadside conditions).

Table 2-2-5 Future Traffic Demand Forecast on the Existing Bridge

Year		Forecasted Traffic Volume(AADT)						Total (pcu/day)
		Motorcycle	Passenger	Bus	Truck	Trailer	(veh./day)	
	2013	29,668	12,696	3,252	3,242	121	48,979	37,508
	2014	32,635	13,966	3,496	3,372	126	53,594	40,774
	2015	35,898	15,362	3,758	3,507	131	58,656	44,344
	2016	39,488	16,898	4,040	3,647	136	64,209	48,248
1	2017	30,036	13,442	3,348	2,994	339	50,159	38,474
2	2018	30,787	14,114	3,515	3,084	356	51,856	39,903
3	2019	31,556	14,820	3,691	3,177	374	53,617	41,390
4	2020	32,345	15,561	3,876	3,272	392	55,446	42,938
5	2021	33,154	16,339	4,069	3,370	412	57,344	44,549
6	2022	33,983	17,155	4,273	3,471	433	59,315	46,228
7	2023	34,832	18,013	4,487	3,575	454	61,362	47,975
8	2024	35,703	18,914	4,711	3,683	477	63,488	49,796
9	2025	36,596	19,860	4,946	3,793	501	65,696	51,692
10	2026	37,511	20,853	5,194	3,907	526	67,990	53,667
11	2027	38,448	21,895	5,453	4,024	552	70,373	55,726
12	2028	39,410	22,990	5,726	4,145	580	72,850	57,870
13	2029	40,395	24,139	6,012	4,269	609	75,425	60,105
14	2030	41,405	25,346	6,313	4,397	639	78,101	62,435
15	2031	42,440	26,614	6,629	4,529	671	80,883	64,863
16	2032	43,501	27,944	6,960	4,665	705	83,775	67,395
17	2033	44,588	29,342	7,308	4,805	740	86,783	70,034
18	2034	45,703	30,809	7,674	4,949	777	89,912	72,786
19	2035	46,846	32,349	8,057	5,098	816	93,166	75,656
20	2036	48,017	33,967	8,460	5,251	857	96,551	78,650

(4) Design Standards

1) Applicable standards

In the Project, it is intended to comply with the following standards of Timor-Leste that were gathered in the field survey.

Bridge Design: Bridge Design Manual (Draft)

Road Design: Road Geometric Design Standard (Draft)

Pavement Design: Pavement Design Manual 2008 (Draft)

Concerning any items not covered by the above standards, AASHTO, Japanese standards and Indonesian standards will be applied upon comparing each other.

2) Design standards

Table 2-2-6 shows the main design standards that will be applied to the Project road in accordance with the Technical Note agreed with Timor-Leste side in the field survey.

Table 2-2-6 Principal Design Standard to be used in the Project

Description		Units	Value
Access Road			
Design Forecast Year		-	10 years
Design Speed		Km/hr	60 (Partially 40)
No. of Lanes		No.	2 (Provisional)
Carriageway Width		m	3.5 / direction
Shoulder Width		m	0.5~1.0
Footpath Width		m	1.0~2.0 (depend on other facilities)
Cross Slope on Carriageway		%	2.5
Maximum Superelevation		%	8
Maximum Longitudinal Gradient		%	5 (Partially 11)
Minimum Longitudinal Gradient		%	0.5
Minimum Radius of Horizontal Curve		m	113 (Partially 43)
Parameter for Crest Vertical Curve		K-value	11 (Partially 4)
Parameter for Sag Vertical Curve		K-value	18 (Partially 9)
Fill Slope	Granular soil	Angle	1:1.5~2.0 (depend on soil type)
Cut Slope	Hard Rock	Angle	1:0.2~0.5
	Other than Rock	Angle	1:1.0~1.5 (depend on soil type)
Pavement Design Life		-	10 years
Pavement Type (Carriageway)		-	Asphaltic Concrete Surface
Upriver Comoro Bridge			
Design Forecast Year		-	50 years
Live Load		-	HS20-44+25% (Alias HS25)
Peak Base Acceleration		-	0.25g
Carriageway Width		m	3.5 / direction
Shoulder Width		m	0.5
Footpath Width		m	0.75~2.0

2-2-2 Basic Plan

2-2-2-1 River Plan

Upon taking into account the natural conditions of the Project target area and flow characteristics of Comoro River as confirmed in the field surveys and collected data, the river plan provides the

basic conditions for bridge design (rainfall, design high water level, design river channel, etc.) is described below.

(1) Rainfall Analysis

Annual maximum daily rainfall of Dili station is summarized in “Report on Preparatory Survey for the Project of River Training for the Protection of Mola Bridge (2013), JICA”. This data is updated adding latest rainfall data, which are collected through this study, as shown in the Table 2-2-7. In this table, annual maximum daily rainfall of Comoro River basin is calculated by multiplying rainfall of Dili station by correction factor 1.7

Table 2-2-7 Annual Maximum Daily Rainfall of Dili Station and Comoro River Basin

Date	Daily Rainfall [Dili Station] (mm)	Daily Rainfall [Comoro R. Basin] (mm)	Date	Daily Rainfall [Dili Station] (mm)	Daily Rainfall [Comoro R. Basin] (mm)
1978/3/28	110.0	187.0	1996/2/6	92.8	157.8
1979/4/16	60.0	102.0	1997/1/2	84.6	143.8
1980/1/29	85.0	144.5	1998/11/13	116.8	198.6
1981/11/25	80.0	136.0	1999/1/11	121.0	205.7
1982/1/12	58.0	98.6	2000	-	-
1983/2/13	77.0	130.9	2001	-	-
-	-	-	2002	-	-
-	-	-	2003/2/9	54.2	92.1
1986	109.0	185.3	2004/2/6	126.7	215.4
1987	136.6	232.2	2005/3/29	113.4	192.8
1988	95.2	161.8	2006/12/21	69.4	118.0
1989/3/6	57.0	96.9	2007/11/22	69.4	118.0
1990/3/5	91.0	154.7	2008/2/20	81.6	138.7
1991/4/8	74.0	125.8	2009/1/23	34.6	58.8
1992	67.6	114.9	2010/12/3	140.0	238.0
1993/1/21	158.0	268.6	2011/2/5	84.6	143.8
1994/1/9	73.0	124.1	2012/4/26	55.5	94.4
1995/3/28	99.0	168.3	Average	89.2	151.6

Probable daily rainfall of Dili station and Comoro River basin are calculated based on annual maximum daily rainfall in Table 2-2-7 by Gumbel method and the result is tabulated in Table 2-2-8.

Table 2-2-8 Probable Daily Rainfall of Dili Station and Comoro River Basin

Return Period	Daily Rainfall (mm) [Dili Station]	Daily Rainfall (mm) [Comoro River Basin]
2-year	84.8	144.2
3-year	98.6	167.6
5-year	114.0	193.8
10-year	133.3	226.6
30-year	162.5	276.3
50-year	175.8	298.9
100-year	193.8	329.5

(2) Runoff Analysis

Probable runoff is estimated using the Rational Formula method. The Rational Formula is expressed in the following equation.

$$Q = \frac{1}{3.6} fRA$$

Where, Q is runoff volume (m³/s), f is runoff coefficient, R is rainfall intensity within the time of flood concentration (mm/hr), and A is catchment area (km²).

1) Runoff Coefficient

Runoff coefficient of Comoro River basin is determined to be 0.9 based on standard values in “Manual for River Works in Japan, Technical Criteria for River Works” that is 0.75-0.9 for steep mountainous region and 0.75-0.85 for rivers in mountainous regions shown below.

Table 2-2-9 Runoff Coefficients of Rivers in Japan

Steep mountainous region	0.75~0.90
Mountains of Tertiary strata	0.70~0.80
Rugged land and forests	0.50~0.75
Flat arable land	0.45~0.60
Irrigated paddy fields	0.70~0.80
Rivers in mountainous regions	0.75~0.85
Small rivers in level land	0.45~0.75
Large rivers in flat land	0.50~0.75

Source: Manual for River Works in Japan, Technical Criteria for River Works

2) Flood Concentration Time

Flood concentration time is expressed using Kraven’s Formula as follows.

$$T = L/W$$

Where, T is flood concentration time (hr), L is watercourse length (m), W is flood flow velocity (m/s) shown in below.

I : Watercourse slope	over 1/100	1/100~1/200	below 1/200
W : Flood runoff velocity	3.5 m/s	3.0 m/s	2.1 m/s

Watercourse length from the farthest point in basin to the calculation point is 34.01 km and difference of elevation between those 2 points is 1,140 m (= EL 1,200m–EL 60m). Therefore, watercourse slope is 1/30, and so flood runoff velocity is 3.5m/s. Flood concentration time is calculated using these values as follows.

$$T = L/W = 34,010 \text{ (m)} / 3.5 \text{ (m/s)} = 2.6 \text{ (hr)}$$

3) Rainfall Intensity

Rainfall intensity is calculated by the following Mononobe’s Formula based on probable daily rainfall shown in “(1) Rainfall Analysis”.

$$R = \frac{R_{24}}{24} \left(\frac{24}{T} \right)^{0.6}$$

Where, R is rainfall intensity within flood concentration time (mm/hr), R₂₄ is probable 24-hour rainfall (mm), and T is flood concentration time. Rainfall intensity for each return period calculated using above formula is shown in Table 2-2-10.

Table 2-2-10 Rainfall Intensity

Return Period	Daily Rainfall (mm)	Rainfall Intensity (mm/hr)
2-year	144.2	22.8
5-year	193.8	30.6
10-year	226.6	35.8
30-year	276.3	43.7
50-year	298.9	47.3
100-year	329.5	52.1

4) Runoff

Probable runoff is calculated based on the values mentioned above using Rational Formula. Calculated probable discharge and specific discharge are shown in Table 2-2-11.

Table 2-2-11 Probable Runoff and Specific Discharge

Return Period	Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
2-year	1,200 (1,181)	5.7
5-year	1,600 (1,585)	7.7
10-year	1,900 (1,854)	9.0
30-year	2,300 (2,263)	10.9
50-year	2,500 (2,449)	11.8
100-year	2,700 (2,698)	13.0

5) Design Discharge

Comoro River runs in Dili City, the capital of Timor-Leste and its riparian area is predicted to be developed in the future, and so 50-year return period is applied as design scale for river planning. Therefore design flood discharge is 2,500 m³/s according to Table 2-2-11.

Design Flood Discharge of Comoro River : 2,500m³/s (50-year return period)

(3) Carrying Capacity of Existing River Channel

Bank-full carrying capacities are estimated by means of non-uniform flow calculation. For the calculation, 0.04 is applied as roughness coefficient because riverbed material consists of gravels and boulders. Water levels of non-uniform flow are calculated for 7 cases (Q = 500 m³/s - 4,000 m³/s). The result of calculation and longitudinal profile of water level are shown in Table 2-2-12 and Figure 2-2-5, respectively. According to Figure 2-2-5, water levels rise up at the stretch from ground sill (1.6 km) to existing 1st/2nd Comoro bridges (1.8km), which has narrow width, and its backwater affects to 2.4 km. Cross-sections upstream from planned Comoro Bridge (2.6 km) are large enough to convey substantial discharge within existing river channel.

Carrying capacity for each cross-section is estimated based on the result of the above non-uniform flow calculations as shown in Figure 2-2-6. Estimation level for carrying capacity is the lower elevation of right and left banks. Most of carrying capacities from the river mouth (0 km) to the existing Comoro Bridge (1.8km) are over 1,200m³/s, which are equivalent to 2-year probable discharge shown in Table 2-2-11. On the other hand, carrying capacities from 2.1 km to 2.3 km are quite low (460 m³/s – 810 m³/s), that are much lower than 2-year probable discharge (1,200 m³/s). But this estimation does not correspond with the interview survey result that

overflow flood seldom occurs around this area. The cause is thought to be that overmuch backfill on riverbed after construction of 2nd Comoro Bridge in 2013 reduces flow section and carrying capacity for this reach.

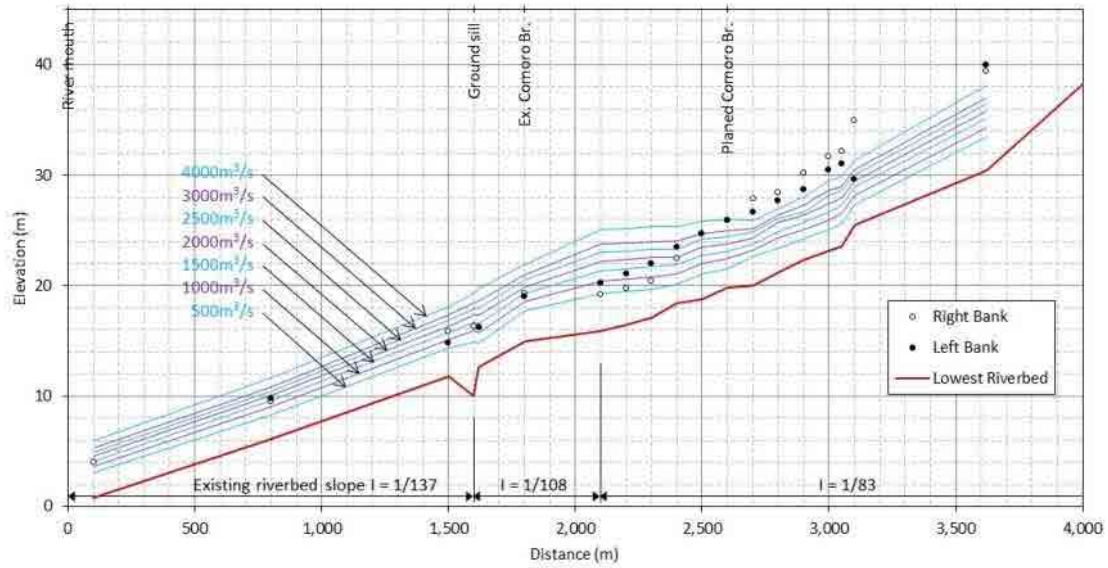


Figure 2-2-5 Longitudinal Profile of Water Level of Existing River Channel

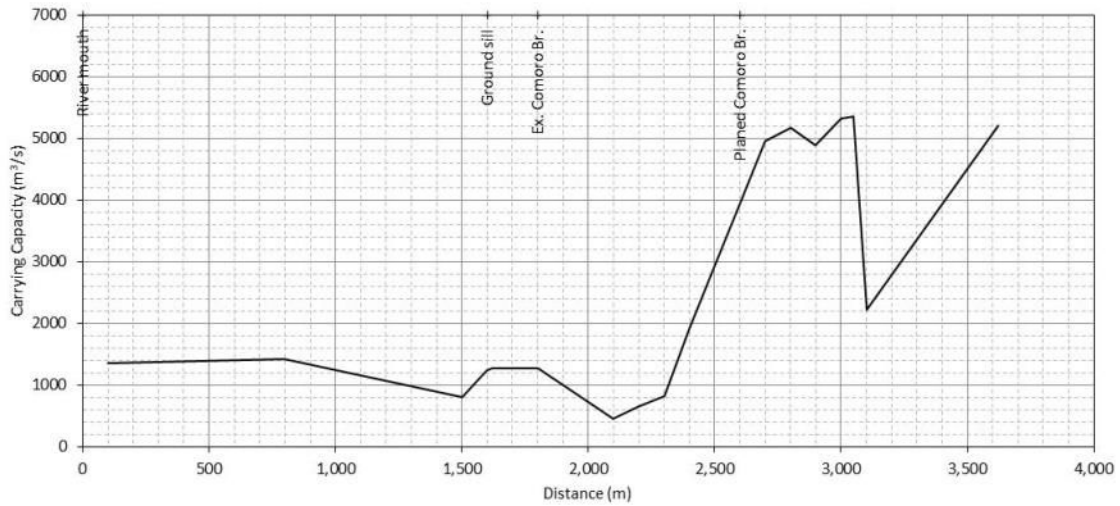


Figure 2-2-6 Carrying Capacity of Existing River Channel

Table 2-2-12 Water Level and Carrying Capacity of Existing River Channel

Station	Distance (m)	Lowest riverbed (EL.m)	Left Bank (EL.m)	Right Bank (EL.m)	Water Levels of Non-uniform Flow							Carrying Capacity (m ³ /s)
					500m ³ /s (EL.m)	1000m ³ /s (EL.m)	1500m ³ /s (EL.m)	2000m ³ /s (EL.m)	2500m ³ /s (EL.m)	3000m ³ /s (EL.m)	4000m ³ /s (EL.m)	
Sec01	100	0.76		4.00	3.05	3.66	4.15	4.58	4.97	5.34	5.99	1,346
Sec02	800	6.15	9.75	9.47	8.29	9.00	9.56	10.03	10.44	10.81	11.64	1,419
Sec03	1,500	11.78	14.84	15.83	14.37	15.13	15.76	16.32	16.84	17.34	18.10	809
Sec04	1,600	9.98		16.27	14.92	15.91	16.69	17.35	17.92	18.44	19.34	1,230
Sec05	1,620	12.60	16.26	16.23	14.79	15.79	16.61	17.32	17.99	18.61	19.75	1,268
Sec06	1,800	14.96	18.98	19.27	17.70	18.59	19.30	19.90	20.47	20.97	21.95	1,274
0+000	2,100	15.85	20.21	19.19	19.28	20.44	21.38	22.22	23.00	23.73	25.07	461
0+100	2,200	16.49	21.11	19.79	19.44	20.58	21.51	22.34	23.10	23.83	25.17	653
0+200	2,300	17.13	21.96	20.42	19.71	20.83	21.73	22.53	23.28	24.00	25.33	816
0+300	2,400	18.37	23.51	22.45	20.16	21.08	21.91	22.58	23.35	24.06	25.38	1,902
0+400	2,500	18.81	24.66	24.73	21.03	22.01	22.79	23.50	24.21	24.72	25.84	2,941
0+500	2,600	19.81	25.91	25.96	21.51	22.43	23.13	23.78	24.44	24.94	26.00	3,915
0+600	2,700	19.98	26.66	27.84	22.66	23.23	23.79	24.34	24.87	25.21	25.95	4,959
0+700	2,800	21.21	27.68	28.45	23.44	24.36	24.87	25.70	26.08	26.38	26.98	5,166
0+800	2,900	22.29	28.74	30.24	24.22	25.09	25.77	26.40	26.68	27.31	28.07	4,881
0+900	3,000	23.13	30.45	31.72	25.10	25.95	26.68	27.37	28.18	28.66	29.43	5,324
0+950	3,050	23.53	31.09	32.12	25.66	26.55	27.28	28.01	28.59	29.04	29.91	5,356
Sec10	3,100	25.53	29.68	34.95	27.35	28.19	28.86	29.43	29.99	30.48	31.30	2,223
Sec11	3,620	30.45	39.95	39.40	33.46	34.34	35.13	35.84	36.46	37.04	38.11	5,205

(4) Design of River Channel

Japan’s grant aid project, which is expected to commence after this preparatory survey, does not include a river improvement component. However, design river channel is studied here in order to avoid reconstructing Upriver Comoro Bridge when Comoro River needs to be improved in the future. Also, Upriver Comoro Bridge is designed in accordance with the design river channel.

1) Basic Concept of Design River Channel

River channel is designed as follows:

Design Scale: Design scale of the river is determined to be 50-year return period for the reason of that Comoro River flows in Dili, the capital of Timor-Leste, and also flows between the international airport and the inner city. So design discharge for 50-year return period is 2,500m³/s.

Design Longitudinal Slope: If longitudinal riverbed slope is changed artificially, it will return back to original slope by sedimentation or scouring during flood. Therefore, design longitudinal slope is determined considering existing riverbed slope. However, existing riverbed slope on the alluvial fan is affected by large-scale gravel extraction for the upper reach of planned Upriver Comoro Bridge (2.6 km), so that it is not formed by balance between water flow and riverbed material. In order to determine design longitudinal riverbed slope, topographic map prepared in 2000, which is output of “Digital topographic map revision and database operation manual for the study on urgent establishment of topographic mapping in Timor-Leste (2000), JICA”, is utilized because gravel extraction was not conducted on so large scale and an impact upon riverbed slope was less.

Design High Water Level (H.W.L): Design high water level is determined in consideration of existing dike elevation for the stretch downstream of the ground sill (1.6 km) and existing riverbank elevation for the stretch upstream of that. For the upper reach of planed new

bridge (2.6 km), design high water level is determined as it does not require dike construction because flow section area is quite large due to massive gravel extraction.

Dike Alignment: Comoro River on the alluvial fan shows linear channel alignment. Design alignment of dike is set parallel to the existing channel alignment. For the stretch downstream of 2.3 km with less carrying capacity, design dike alignment is determined considering channel widening. For the stretch not requiring channel widening, design dike alignment is set based on existing riverbank alignment.

2) Design River Channel

Design river channel is drawn up based on basic concept mentioned above. Design longitudinal profile, design dike alignment, design cross-section and longitudinal parameter are shown in Figures 2-2-7, 2-2-8, 2-2-9 and Table 2-2-13. In order to convey design discharge (2,500 m³/s), embankment and widening are needed from 0.0 km to 2.4 km, and embankment is partly needed for upper reach of 2.4 km. Figure 2-2-7 (design longitudinal profile) shows calculated water level for design discharge (2,500 m³/s). Uniform flow calculation is applied for the stretch from 0.0 km to 1.6 km with same cross-section and same reverbed slope while non-uniform flow calculation is applied for the stretch upstream of 1.6km with various cross-sections. For non-uniform flow calculation, the starting water level at 1.6 km is set to be uniform flow depth and roughness coefficient is set to be 0.04 because riverbed consists of gravels and boulders. The existing cross-section of planned new bridge (2.6 km) can convey design discharge (2,500 m³/s) under the design high water level so that it needs neither to be excavated nor widen.

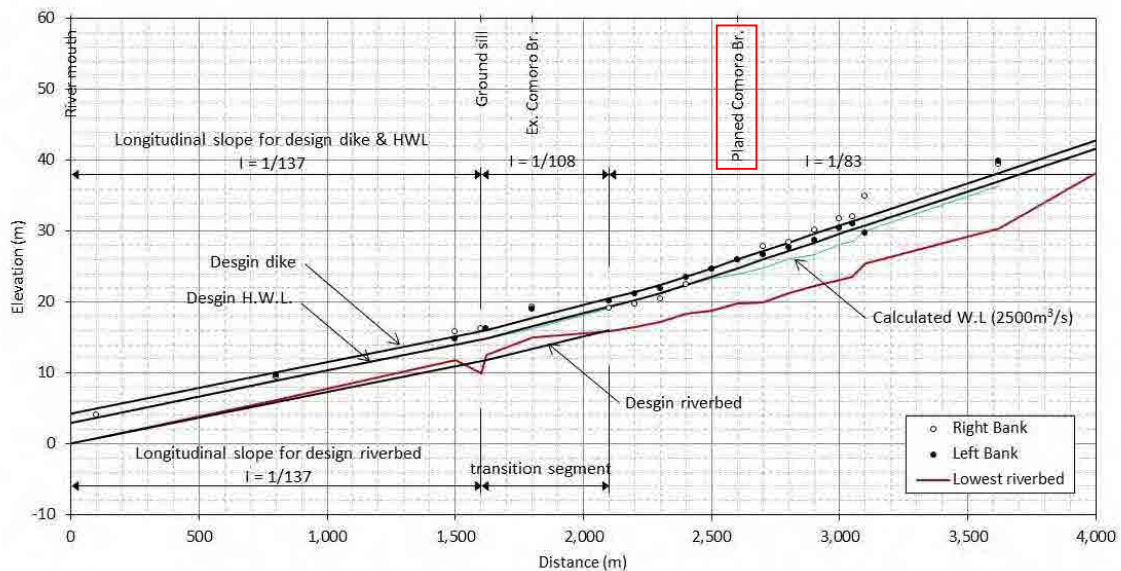
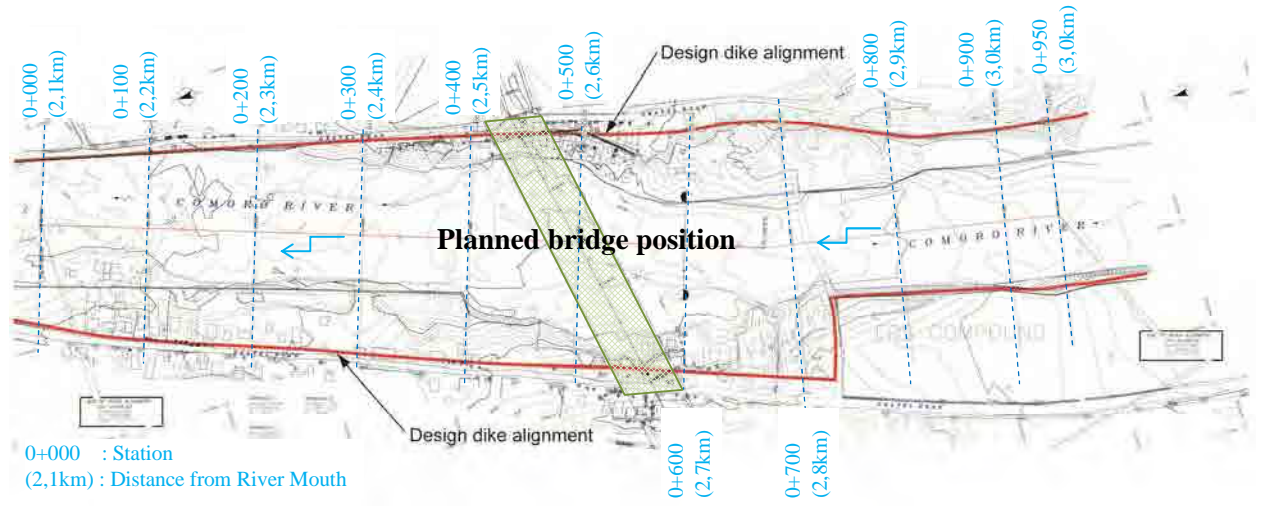


Figure 2-2-7 Design Longitudinal Profile of Comoro River



Source: Survey Team

Figure 2-2-8 Design Dike Alignment of Comoro River

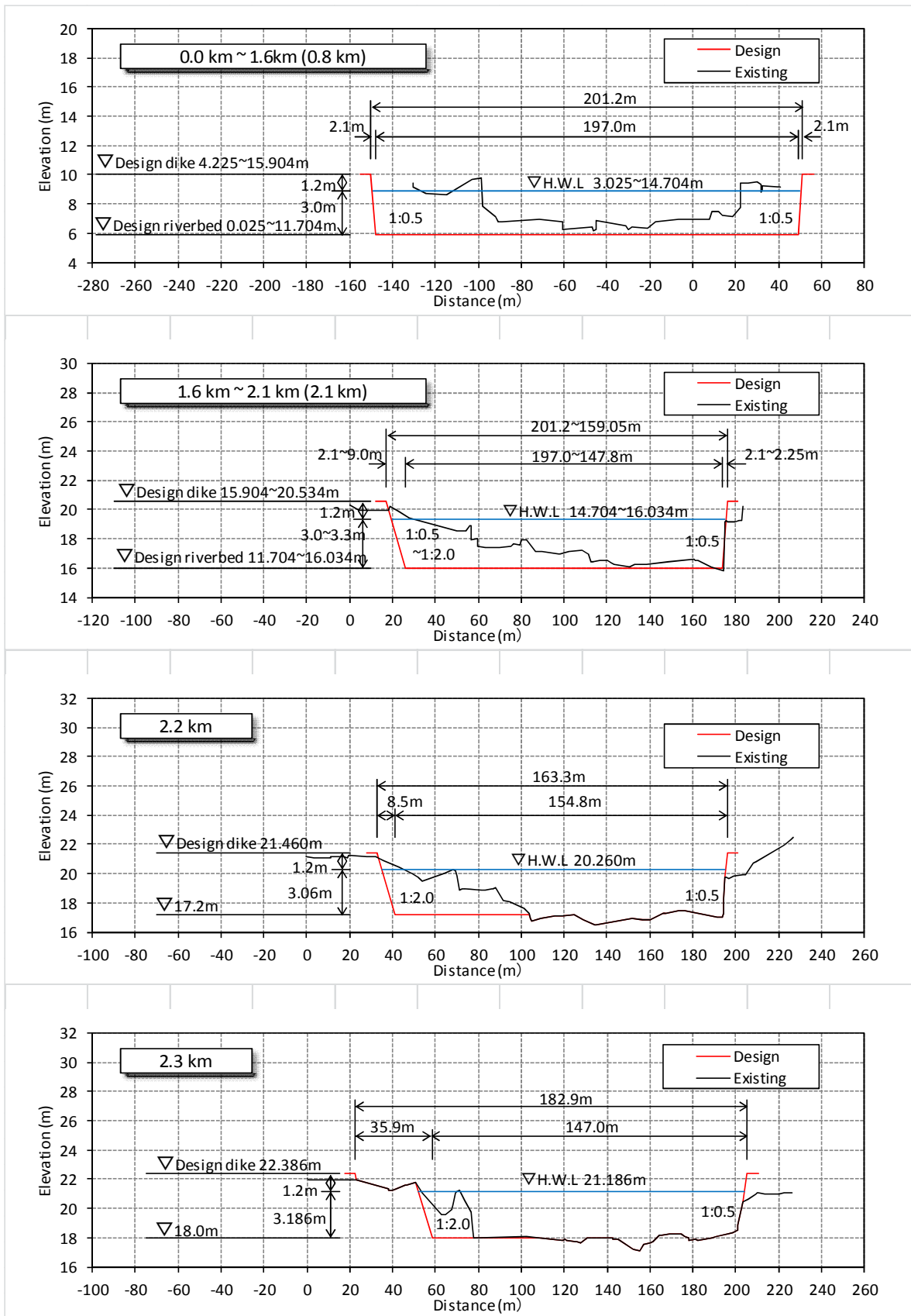


Figure 2-2-9 Design Cross-section of Comoro River (1/2)

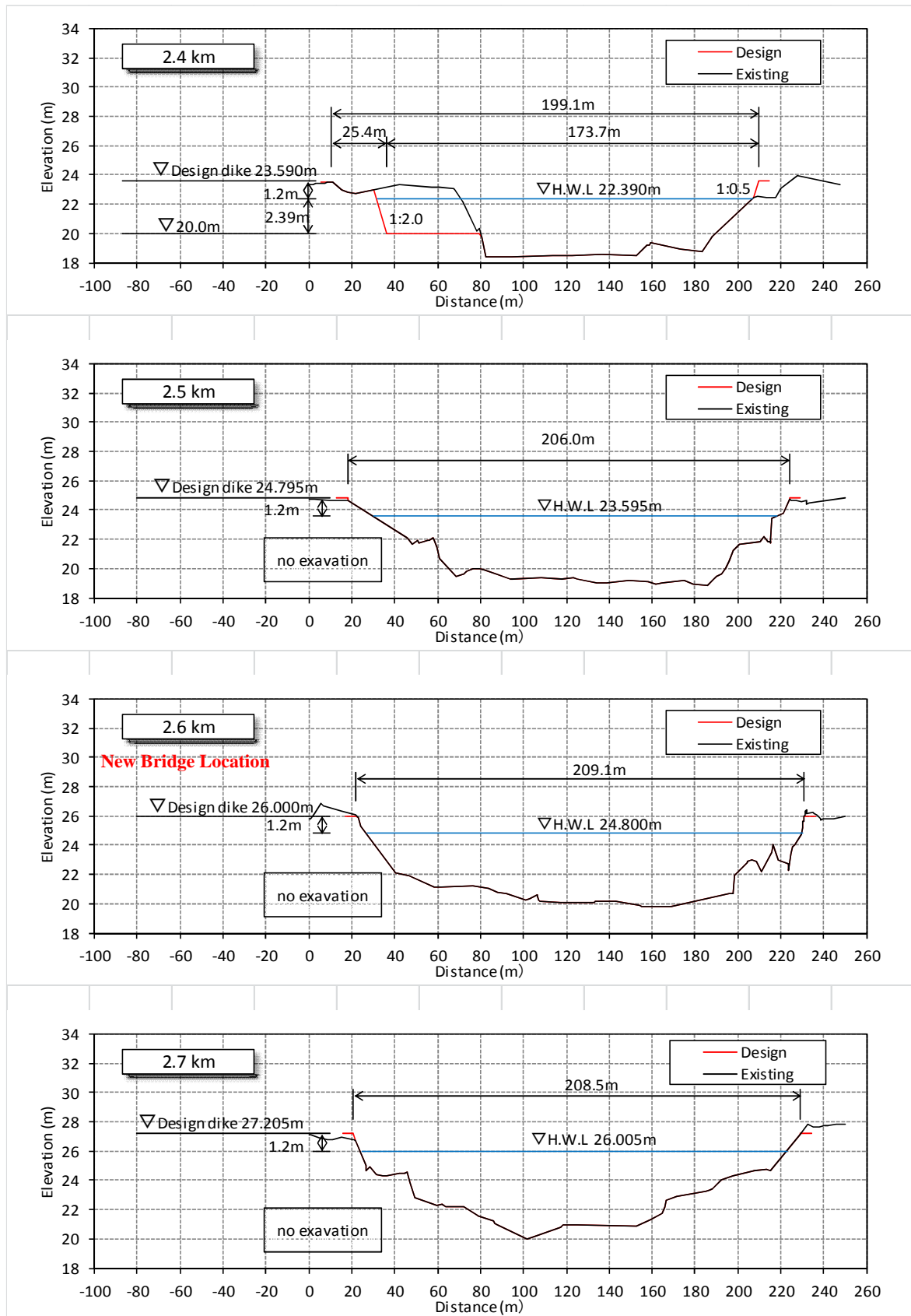


Figure 2-2-9 Design Cross-section of Comoro River (2/2)

Table 2-2-13 Longitudinal Parameter of Comoro River

Station	Distance (m)	Lowest riverbed (EL.m)	Left Bank (EL.m)	Right Bank (EL.m)	Calculated WL (EL.m)	Design Dike (EL.m)	Design HWL (EL.m)	Design Riverbed (EL.m)
	0				2.953	4.225	3.025	0.025
Sec01	100	0.76		4.00	3.683	4.955	3.755	0.755
Sec02	800	6.15	9.75	9.47	8.793	10.065	8.865	5.865
Sec03	1,500	11.78	14.84	15.83	13.902	15.174	13.974	10.974
Sec04	1,600	9.98		16.27	14.640	15.904	14.704	11.704
Sec05	1,620	12.60	16.26	16.23	14.805	16.090	14.890	11.877
Sec06	1,800	14.96	18.98	19.27	16.290	17.756	16.556	13.436
0+000	2,100	15.85	20.21	19.19	19.160	20.534	19.334	16.034
0+100	2,200	16.49	21.11	19.79	20.240	21.460	20.260	
0+200	2,300	17.13	21.96	20.42	21.130	22.386	21.186	
0+300	2,400	18.37	23.51	22.45	22.370	23.590	22.390	
0+400	2,500	18.81	24.66	24.73	23.320	24.795	23.595	
0+500	2,600	19.81	25.91	25.96	23.900	26.000	24.800	
0+600	2,700	19.98	26.66	27.84	24.870	27.205	26.005	
0+700	2,800	21.21	27.68	28.45	26.080	28.410	27.210	
0+800	2,900	22.29	28.74	30.24	26.680	29.614	28.414	
0+900	3,000	23.13	30.45	31.72	28.180	30.819	29.619	
0+950	3,050	23.53	31.09	32.12	28.590	31.422	30.222	
Sec10	3,100	25.53	29.68	34.95	30.000	32.024	30.824	
Sec11	3,620	30.45	39.95	39.40	36.460	38.289	37.089	

3) Determination of Design Riverbed Level

Because design riverbed level is not fixed for the stretch upstream of 2.5 km (as shown in Figure 2-2-7) as mentioned in “(4) Design River Channel”, the deepest riverbed is defined as riverbed level for structure design such as pier, abutment, etc. But, the deepest riverbed level obtained from river survey result is not adequate to be used as riverbed level for structure design because the deepest riverbed level and position are unstable due to scour and sedimentation during flood. Therefore, riverbed level for structure design is determined by drawing the line lower than the deepest riverbed levels for about 1km in length centering Upriver Comoro Bridge (2.6 km) as shown in Figure 2-2-10. The result is that the riverbed level for structure design at new bridge site (2.6 km) is EL. 18.97 m.

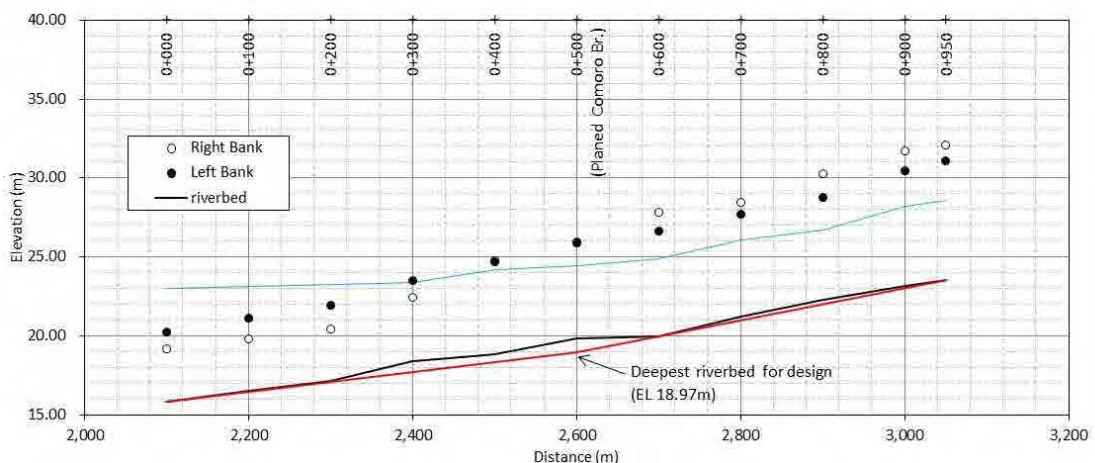


Figure 2-2-10 Longitudinal Profile of Deepest Riverbed Height

2-2-2-2 Bridge Plan and Design

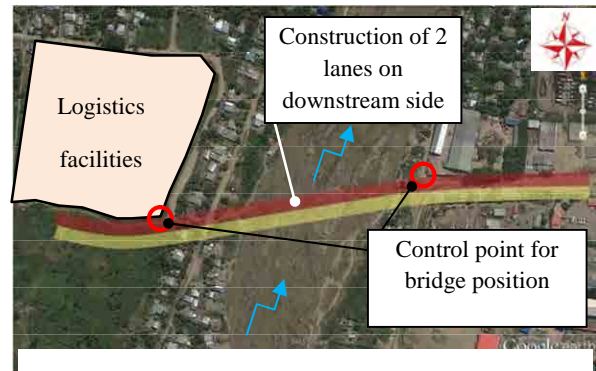
(1) Design Standard

In Timor-Leste there is a Draft Bridge Design Manual prepared by ADB, although it is still unfinished. In this standard it is stated that AASHTO should be adopted for the bridge design. For this project, too, the standard of this country will be followed but at the same time, the design method will be compared with the Japanese Standard.

(2) Determination of Abutment Positions and Bridge Length

1) Determination of Bridge Positions in consideration of Road Alignment

The abutment positions are examined based on the road alignment decided in “2-1 Design Policy, Selection of Bridge Position and Access Road Routes”. Moreover, considering the desire of the Government of Timor-Leste to build a four-lane road in future, it is planned to construct two out of four lanes in the Project. Concerning the bridge position, there are two options in the Project, i.e. either construct it on the upstream side or on the downstream side.



Source: Google Earth

Figure 2-2-11 Bridge Location Diagram

As a result of comparison, it is deemed better to construct the bridge on the downstream side as shown in Figure 2-2-11 because 1) fewer houses will be affected considering the area of abutment protection and riverbank works, and 2) there is no need to leave space for an additional two lanes in the area between the logistics facilities on the left bank side. Moreover, concerning the horizontal alignment of the road around the bridge, because there are logistics facilities on the left bank and factories on the right bank, the bridge has been designed as far downstream as possible in order to secure land for future widening to four lanes without impeding these facilities.

Moreover, when the Timor-Leste widens to four-lane in future, it is anticipated that a new bridge will be constructed further upstream rather than widen the bridge constructed in the Project.

2) Determination of Abutment Positions and Bridge Length in consideration of River Condition

The abutment positions are determined so as to place the abutment vertical face behind the shoulder line of the bank, based on the dike alignment specified in 2-2-2 Basic Design 2-2-2-1 River Plan.

As a result, the bridge length becomes 249m. The dike alignment and the bridge section are shown in Figure 2-2-8.

(3) Estimated H.W.L and Free Board under Bridge Girder

Based on the river channel plan shown in “2-2 Basic Design (3) River Plan”, the estimated H.W.L is determined by subtracting freeboard from the planned bank height. The freeboard for the

planned discharge of 2,500 m³/s is decided as 1.2m based on “Manual for River Works in Japan, Technical Criteria for River Works” and “Bridge Design Manual (Draft)” of Timor-Leste. The freeboard based on these two standards is shown in Table 2-2-14.

Based on the topographic site survey of the river cross section at 0+500, the base height of both banks are decided as 26.0m and the bank gradient is decided as 1/83 which is the same value as the river bed gradient.

Based on the above conditions, the planned bank heights and the estimated H.W.L at both banks are listed in Table 2-2-15 and shown in Figure 2-2-12. The vertical clearance of the planned bridge is decided to be equal to or higher than the planned bank height, which is the height adding the freeboard to the estimated H.W.L.

Table 2-2-14 Design Discharge and Freeboard

Technical Criteria for River Works		Draft Bridge Design Manual	
Design discharge	Freeboard	Design discharge	Freeboard
~ 200 m ³ /s	0.6 m	~ 0.3 m ³ /s	0.15 m
200 ~ 500 m ³ /s	0.8 m	0.3 ~ 3.0 m ³ /s	0.45 m
500 ~ 2,000 m ³ /s	1.0 m	3.1 ~ 30.0 m ³ /s	0.6 m
2,000 ~ 5,000 m³/s	1.2 m	31.0 ~ 300 m ³ /s	0.9 m
5,000 ~ 10,000 m ³ /s	1.5 m	301.0 ~ 3,000 m³/s	1.2 m
10,000 m ³ /s ~	2.0 m	3,000 m ³ /s ~	1.5 m

Table 2-2-15 Planned Bank Height and Estimated H.W.L at Bridge Site

	Left Bank	Right Bank
Abutment Position	64.2m upstream from Base Point of Embankment Height at 0+500.	51.7m downstream from Base Point of Embankment Height at 0+500.
Planned Bank Height	26.77m(=26.0+64.2/83)	25.38m(=26.0-51.7/83)
Estimated H.W.L	25.57m(=26.77-1.2)	24.18m(=25.38-1.2)

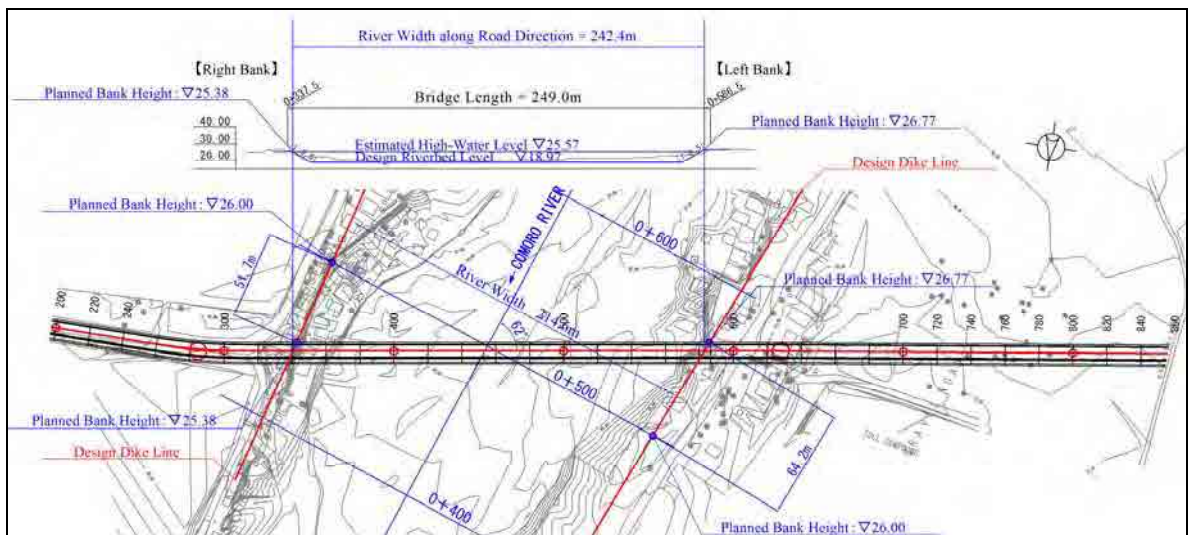


Figure 2-2-12 Bridge Length, Planned Bank Height & River Condition

(4) Span Length

Based on the design discharge 2500m³/s, the standard span length can be calculated as follows.

$$L \text{ (Standard Span Length)} = 20 + 0.005 \times Q \text{ (Design Discharge)}$$

$$= 32.5 \text{ (m)}$$

Considering the above standard span length and bridge length, the span length of the new bridge is set as 33.70m+4@45.00m+33.70m (straight bridge conversion: 32.42m^{※)}+4@42.29m+32.42m^{※)}).

Note) The standard side span length is set at 25 meters based on application of the “Exceptions for Parts Away from the Flow Center” (“Government Ordinance for Structural Standard for River Administration Facilities in Japan”, etc., p. 310).

(5) Bridge Type

1) Concept of Selecting Bridge Types

This bridge will form one of the major routes inside of the Capital, Dili. Also this bridge can be a land mark of the city as this bridge is close to the airport. From this viewpoint, Timor-Leste side wants to have an unprecedented and aesthetically beautiful bridge. This fact was confirmed by the site survey.

Another fact is that there are several older long bridges in this country, which were constructed by the Indonesian Government and need to be replaced in the future. To prepare for the future replacement of these bridges, Timor-Leste side expects to learn the technology to construct longer span bridges.

In this project, the bridge type will be determined based on the intention and the desire of the Timor-Leste side, the necessity and the suitability of the project as a Japanese Grand Aid Scheme and the comparison of various bridge alternatives.

2) Initial Comparison of Various Bridge Types

Based on the bridge length and the standard span length calculated in (2) and (4), various bridge types are proposed. 5 alternatives are proposed for the 6 span bridge, 1 alternative for the 5 span bridge, 1 alternative for the 4 span bridge and 1 alternative for the 3 span bridge, are proposed. In total, 8 alternatives are compared for the economy, aesthetics, runnability and the maintenance works. The result is explained to the Timor-Leste side at the end of the site survey.

The comparison table which is utilized to explain to the Timor-Leste side is shown in Table 2-2-10. The rough construction cost estimates are calculated based on the examples in Japan. As the number of spans decreases and the each span length increases, it is expected that the total construction cost increases although the substructure construction cost will be decreased.

Based on the Table 2-2-16, the Survey Team suggested that two alternatives can be recommended. One is PCT Bridge, which is the cheapest option and the other is PC Box Girder Bridge, which is economic, aesthetically good and easily maintained and not yet introduced to Timor-Leste. As a result, Timor-Leste side wants to adopt 6 span continuous equal-sectioned PC Box Girder Bridge.

Table 2-2-16 Initial Comparison of Bridge Type

Number of Spans	Bridge Type	Const. Cost (100mil.yen)			Aesthetics	Runnability (Number of joints)	Maintenance	Comment	Evaluation
		Superstructure	Substructure	Difference from Cheapest option					
6 spans	PC T Girder Bridge	7.73	4.89	12.62 (0)	Δ	⊙, (2)	⊙	The most economic among 8 alternatives. Less aesthetic.	⊙
	Steel Plate Girder Bridge	9.08	3.65	12.73 (+0.11)	Δ	⊙ (2)	Δ	Second most economic alternative. Less aesthetic.	Δ
	Equal Sectioned PC Box Girder Bridge	8.74	4.89	13.63 (+1.01)	⊙	⊙ (2)	⊙	Economic, aesthetically good and maintenance is easy.	⊙
	Small Scale One Tower Extradosed Bridge +PCT Girder Bridge	9.06	5.19	14.25 (+1.63)	○	○ (3)	○	Moderately economic, aesthetically moderately good. Maintenance of cables is needed.	○
	Medium Scale One Tower Extradosed Bridge +PCT Girder Bridge	11.05	4.91	15.96 (+3.34)	⊙	Δ (4)	○	Aesthetically good but runnability is not good. Maintenance of cables is needed.	○
5 spans	Equal Sectioned PC Box Girder Bridge	11.28	4.73	16.01 (+3.39)	⊙	⊙ (2)	⊙	Aesthetically good. But higher construction cost.	○
4 spans	Variable Sectioned PC Box Girder Bridge	11.00	4.28	15.28 (+2.66)	⊙	⊙ (2)	⊙	Aesthetically good. But higher construction cost.	Δ
3 spans	Extradosed Bridge	14.10	4.34	18.84 (+6.22)	⊙	⊙ (2)	Δ	Aesthetically good. Maintenance of cables is needed.	○

⊙:Superior, ○:Good, Δ: Inferior





3) Selection of Bridge Type through the Second Comparison

The most economic PCT Girder Bridge and the PC Box Girder Bridge, which the Timor-Leste side would like to have in Dili, are compared more precisely and the result is shown in Table 2-2-17.

The PC Box Girder Bridge, which Timor-Leste side requested, has a visibly slender impression and is aesthetically superior to the PCT Girder Bridge. The steel truss bridges, which were often adopted and constructed during the Indonesian Era to cross longer spans, begin to be replaced, as shown by the Comoro 1 Bridge example. Timor-Leste side is now searching for new types of bridge which can cross longer spans and replace steel truss bridges. Moreover, as this country is surrounded by the sea, the bridges are prone to suffer salt damages. Therefore a smaller surface of the girder and easy maintenance are preferred. The PC Box Girder Bridge for this project should be the best alternative, as this type of bridge has easy maintenance and an aesthetically good appearance. At the same time, this type of bridge is preferred by Timor-Leste side and can achieve the good technical transfer.

The construction cost per square meter of PC Box Girder Bridge by the fixed scaffolding method is less than that of the Comoro 2 Bridge. The cost difference between this type of bridge and PCT Girder Bridge is not so large that this type of bridge can be also considered as economically feasible.

Table 2-2-17 Detailed Comparison of Bridge Types

Evaluation Criteria	Reference : PC I Girder (Comoro 2 Bridge)	A : PC T Girder	B : PC Box Girder				
							
	Erection Girder	Erection Girder	B1 : Fixed Scaffolding		B2 : Incremental Launching Method		
① Economy							
Bridge Area (m ²)	1,440	2,676	2,676		2,676		
Cost Estimate	Refer to 1)	Cost in Japan	Cost in Japan		Cost in Japan		
Superstructure (Mil.US\$)		7.09	8.04		12.41		
Substructure (Mil.US\$)		4.89	4.89		4.89		
Total (Mil.US\$)	8.32	11.98	12.93		17.30		
Cost/m ²	\$5,140/m ²	\$4,475/m ²	◎	\$4,833/m ²	○	\$6,135/m ²	
② Maintenance	Same as the right	Due to multiple girders, inside girders are difficult to be inspected. As surface area is large, it is prone to suffer salt damages.	△	Inside of box girder can be inspected. Surface area is smaller and it is difficult to suffer salt damages.	◎	Same as the left	◎
③ Construction method and duration	Scaffoldings were used partially, although this method does not need the use of river bed.	River bed is not utilized and the water increase will not affect the construction. Duration is about 12 months	◎	Scaffoldings which are difficult to be affected by the increased water, need to be planned. Duration is 12 to 13 months.	○	River bed is not utilized and the water increase will not affect the construction. Duration is about 12 months	◎
④ Aesthetics	Same as the right	Multi girders are visible and it is aesthetically inferior.	△	The bridge has a smooth surface and is aesthetically good. Timor-Leste side would like to adopt this type.	◎	Same as the left	◎
⑤ Runnability & safety	Bad girder continuity.	The continuity can be assured by the adoption of	◎	The Girder and the deck consist of one PC structure so that	◎	Same as the left	◎

		the continuous concrete bridge deck.		they are completely continuous.			
⑥	Versatile applicability and further evolution of Applicability of this bridge technique	This technique already exists in Timor-Leste and other nearby countries. Further evolution cannot be expected.	△	First application of this technique in Timor-Leste. It can be applied to other replacement bridges in the future.	◎	Same as the left	◎
	Evaluation	Economic but aesthetically inferior. Maintenance ability is inferior as well.	○	Ease of maintenance and aesthetics of B alternatives are better. This is economically better alternative.	◎	Economically this is inferior to alternative B1.	○

◎: Superior, ○: Good, △: Inferior

Note) Because the Comoro 2 Bridge was designed and constructed under the design-build approach, the construction cost was estimated assuming around 5% for the construction supervision expenses deducted from the total amount. Moreover, because the main girders for this bridge were manufactured in Indonesia and transported to Dili, the transportation cost was expensive and contributed to the high unit cost per meter.

(6) Geometric Structure of the Bridge Section

1) Horizontal Alignment

Based on the bridge position that was indicated in (2) Determination of Abutment Positions and Bridge Length, the bridge horizontal alignment was designed as a straight line ($R=\infty$) with curves before and after the bridge section. Moreover, through avoiding control points before and after the bridge, the angle of skew between the bridge center line and center line of stream of Comoro River becomes 62 degrees.

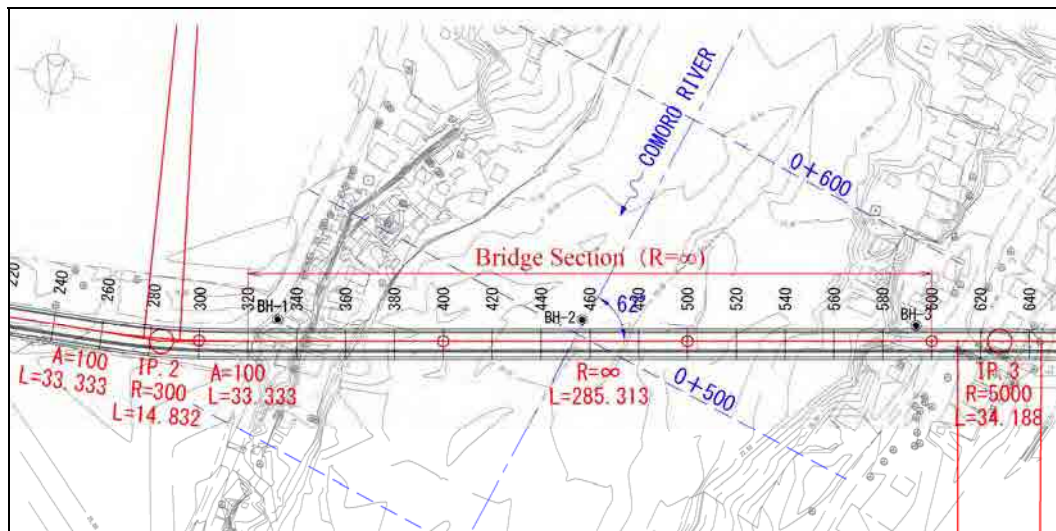


Figure 2-2-13 Horizontal Alignment around the Bridge Section

2) Vertical Alignment

Based on (3) Estimated H.W.L and Freeboard under Bridge Girder, the freeboard under the

bridge girder was set to be at least as high as the design bank height. As was described in 1), because the planned bridge has a skew to the river and the bridge is higher on the left bank, the longitudinal gradient displays a 0.5% slope from the left bank to the right bank and a vertical curve has been adopted before and after the bridge section.

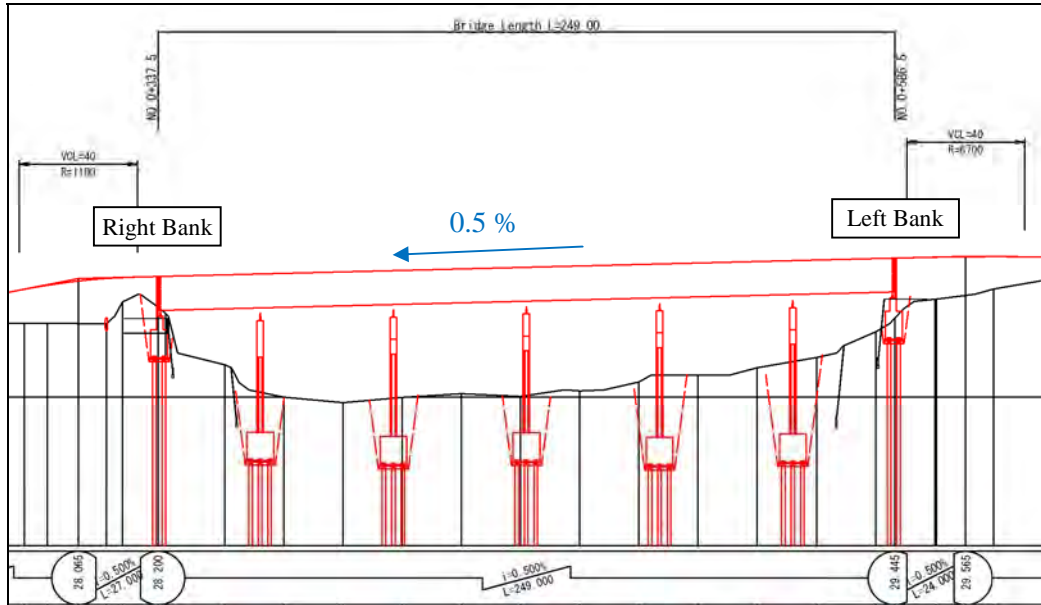


Figure 2-2-14 Vertical Alignment around the Bridge Section

3) Cross-sectional Composition

The lateral profile of the bridge is shown in Figure 2-2-15, and each component is indicated below.

Carriageway width: Since the target route including bridge will serve as a bypass for the current national road, it will have the same carriageway width, i.e. 3.5m/lane, as the national road.

Footpath width: Considering the expansion to four lanes in future, the footpath will have 2.0m width on the north side and 0.75m width on the south side. The footpath will be the flat type separated by the kerb of 20cm width.

Cross slope: Considering the expansion to four lanes in future, superelevation of 2.0% to the north side will be applied. Drainage facilities will be installed on the north side, and the footpath on the north side will have superelevation of 2.0% to the carriageway side.

Pavement composition: Carriageway will have two-layer asphalt concrete of 7cm (binder 4cm+ wearing 3cm), and footpaths will be single layer asphalt concrete of 3cm. On the north side, adjusting concrete will be placed under the footpath pavement in order to secure gradient.

Bridge railing: A beam safety barrier will be adopted in consideration of view for bridge users, landscape and driver visibility.

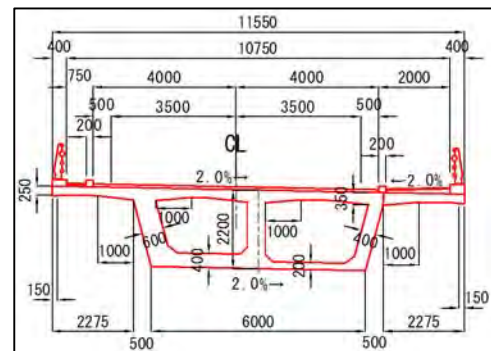


Figure 2-2-15 Bridge Cross Section

Also, in order to prevent vehicles from falling off the bridge in case of accident and so on, the structure will have sufficient strength to withstand collisions.

(7) Live Load

It is agreed with Timor-Leste side to adopt HS20-44+25% (alias HS25). HS20-44 is defined in “Standard Specifications for Highway Bridges” of AASHTO.

AASHTO “LRFD Bridge Design Specifications” and the Standard Specification of Road Bridges in Japan are compared for the method of live load arrangement, the impact coefficients, the pedestrian live loading, the combination of live loads and the method of safety check. As a result of comparison, the live load of HS25 is larger and produces larger sectional stresses.

Hence HS25 is adopted for the design. For the combination of live loads and the method of safety check, the Standard Specification of Japan proposes a safer side investigation method and it is decided to follow this standard for this project. Live load per lane to be used in this Project is shown in Figure 2-2-16.

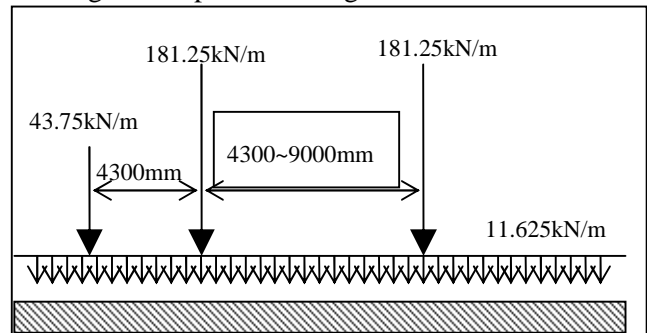
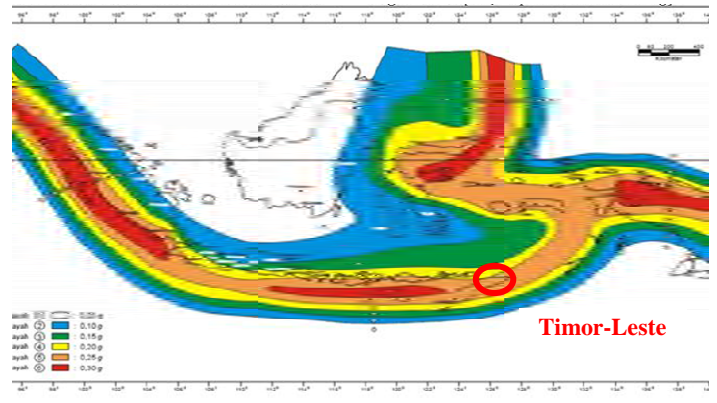


Figure 2-2-16 Live Load per One Lane

(8) Earthquake Load

There are no standards regarding the earthquake loading in Timor-Leste, therefore the Indonesian Standard is adopted. According to this standard shown in Figure 2-2-17, the design earthquake load in Timor-Leste is 0.25g.



Source: Earthquake Hazard Map by Department of Public Works,
Indonesia, SNI 03-1726-2002

Figure 2-2-17 Earthquake Load according to Indonesian Standard

(9) Substructure and Foundation

1) Foundation

Based on the boring data at the site, pile foundations are needed for abutments and piers. There are two types of pile foundations, one is the driven piles and the other, the bored piles.

To avoid the negative impacts, such as noise and vibrations, to the nearby houses, the bored pile foundations constructed by the all-casing method will be adopted. Six piles will be installed for each abutment and 12 piles be installed for each pier, whose diameter is 1.2m, pile length is from 8.5m to 15m.

2) Pier

It would be reasonable to adopt a wall type pier whose longer width coincides with the

bottom width of the box girder, as this is aesthetically beautiful, too.

The pier cross section inside the river is decided so as to satisfy the condition that the impediment ratio of river flow is below 5% in accordance with “Government Ordinance for Structural Standard for River Administration Facilities in Japan”. The width of the pier is decided as 2m thick and the oval cross section, which can reduce the occurrence of eddies, is adopted. The calculation results are shown below.

$$5 \text{ piers} \times \text{pier width} / 214.6\text{m (River width)} \leq 5\% \Rightarrow \underline{\text{Pier width}} \leq 2.146\text{m}$$

The major axis direction of the oval shape should align with the flow direction of the river so as not to disturb the flow line at the time of flooding.

Concerning the pier foundations, embedding of at least 2m from the design riverbed height determined in 2-2-1 River Plan has been secured.

3) Abutment

To reduce the abutment height and weight of the planned bridge, a reversed T shaped abutment is adopted.

The abutment positions are determined so as to place the abutment vertical face behind the shoulder line of the bank (out of river area), based on the dike alignment specified in 2-2-1 River Plan. Both abutments should be constructed in parallel with the dike alignment.

(10) Protection of Bank and Riverbed

1) Revetment

Revetment will be implemented around the abutments. Since there are some informal residents in the area, block masonry revetment (gradient: 1: 0.5) will be adopted for a smaller impact. Moreover, because the river around the bridge position is divided into the flood channel and low-flow channel, revetment of 4~5m will be installed with respect to both channels. The revetment in flood channel will have embedding of at least 1m from the height of current flood channel, while the low-flow channel will have embedding of at least 1m from the design river bed height. Moreover, foot protection blocks will be placed in front of the low-flow revetment in order to prevent scouring. Figure 2-2-18 shows the profile of revetment.

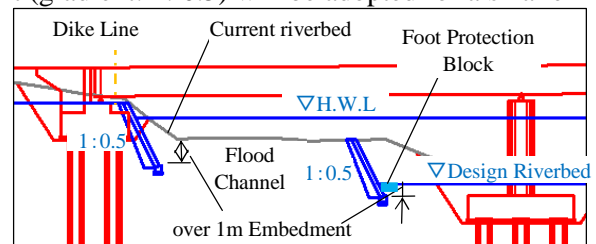


Figure 2-2-18 Profile of Revetment

Moreover, foot protection blocks will be placed in front of the low-flow revetment in order to prevent scouring. Figure 2-2-18 shows the profile of revetment.

Revetment area is shown in Figure 2-2-19 based on the “Government Ordinance for Structural Standard for River Administration Facilities in Japan”.

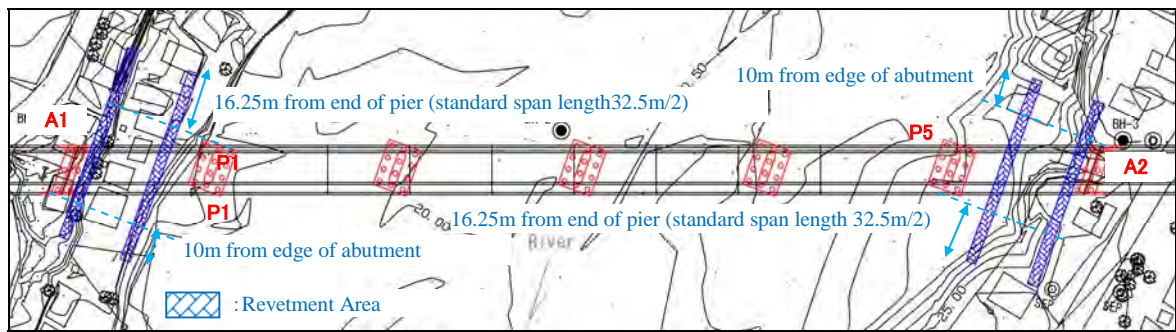


Figure 2-2-19 Revetment Area

2) River Bed Protection

2-1) Estimation of Local Scouring

In order to examine measures for prevent local scouring around piers, the local scouring depth was estimated using the following formula.

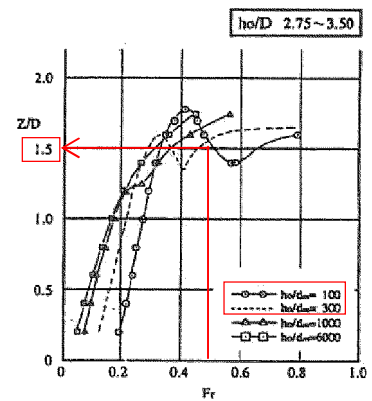
$$\frac{Z}{D} = f\left(\frac{h_0}{D}, \frac{h_0}{d_m}, Fr\right)$$

Source: Planning Manual for River Crossing Bridges (Draft), July 2009

Where, Z: scouring depth, D: width of piers, h_0 : water depth, d_m : mean particle size of river bed materials, Fr: Froude number

The examination conditions have been configured as follows based on the study in 2-2-1 River Plan.

- $h_0 = \text{H.W.L} - \text{design riverbed height}$
 $18.97 - 5.83\text{m}$
- $D = 2\text{m}$
- $d_m = 24.9\text{mm}$
- $Fr = 0.54$
- $h_0/D = 5.83/2 = 2.915$
- $h_0/d_m = 5.83/0.0249 = 234.1$
- Nn-dimensional scouring depth $Z/D = 1.5$ (from the relational graph on the right)



Relationship between $Fr \sim Z/D$ and $h_0 \sim d_n$ ($h_0/D = 2.75 \sim 3.50$)

Since the pier axis line runs parallel to the river flow and there are no adjoining bridges, if 1.0 is adopted as the correction factors K_α and K_d , the scouring depth Z is calculated as follows:

$$\text{Scouring depth } Z = (Z/D) \cdot D \cdot K_\alpha \cdot K_d = 1.5 \cdot 2 \cdot 1 \cdot 1 = 3.0\text{m}$$

2-2) Examination of Riverbed Protection Works

The pier foundations will be constructed to secure embedding of at least 2m from the design riverbed height (at least 3m from the current riverbed height). However, in

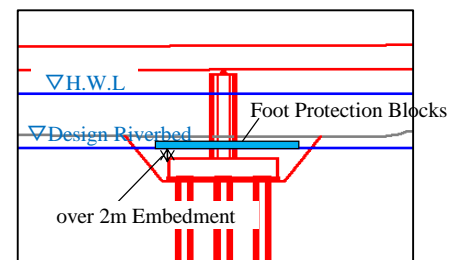


Figure 2-2-20 Layout of Riverbed Protection

consideration of the estimated local scouring depth, riverbed protection using foot protection blocks will be placed as shown in Figure 2-2-20 to protect the piers from scouring.

Moreover, in consideration of flow velocity in this area, the weight of foot protection blocks shall be at least 2 tons each.

(11) Outline of Bridge Plan

The design condition of the bridge shown above is summarized in Table 2-2-18.

Table 2-2-18 Outline of Bridge Plan

Items	Description
Bridge Type	6 Span Continuous PC Box Girder Bridge
Bridge Length	249.0m
Girder Length	248.4m
Spans	33.70m+4@45.00m+33.70m
Width	Total width 11.55m, Effective width 10.75m
Horizontal Alignment	$R = \infty$ (Straight)
Longitudinal Gradient	0.5%
Cross Slope	2.0%
Construction Method	Fixed Scaffolding
Foundation	Bored Piles, ϕ 1.2m
Abutment	Reversed T Shaped Abutment
Pier	Wall Type Pier (Oval Type)
Revetment	Concrete Block Type
River Bed Protection	Foot Protection Block

2-2-2-3 Access Road

(1) Basic Policy

Based on the design standard in Table 2-1-6 that were agreed with the Government of Timor-Leste, the access road has been designed as a district trunk road having a target year of 10 years and design speed of 60 km/h. Also, as with the bridge section, the road is provisionally designed with two lanes considering the expansion to four lanes in the future as requested by the Government of Timor-Leste. Concerning the design standards, these will adhere to the geometric structural standards of Timor-Leste but items not covered by them will be referred to Japanese Road Structure Ordinances and AASHTO.

(2) Road Geometric Structure

1) Horizontal and Vertical Alignment

Horizontal alignment

Because most of the target road is a newly constructed section, the horizontal alignment has been designed in accordance with the geometric structural standards of Timor-Leste to minimize social and environmental impacts, especially resettlement. The existing road has been traced as much as possible on sections where houses are densely located alongside the road and the ROW is limited.

Vertical alignment

The existing road has been traced as much as possible in consideration of access to roadside houses and facilities and connecting roads. However, concerning the newly constructed Sections 2 and 3, as it was confirmed in site survey and hearings with local residents that rain water often accumulates on the certain area during the rainy season and after rainfall, it has been decided to construct embankment and raise the planned road height around 1~1.5 m from the current ground level.

Figure 2-2-21 and Table 2-2-19 show the policy with respect to horizontal alignment and vertical alignment.

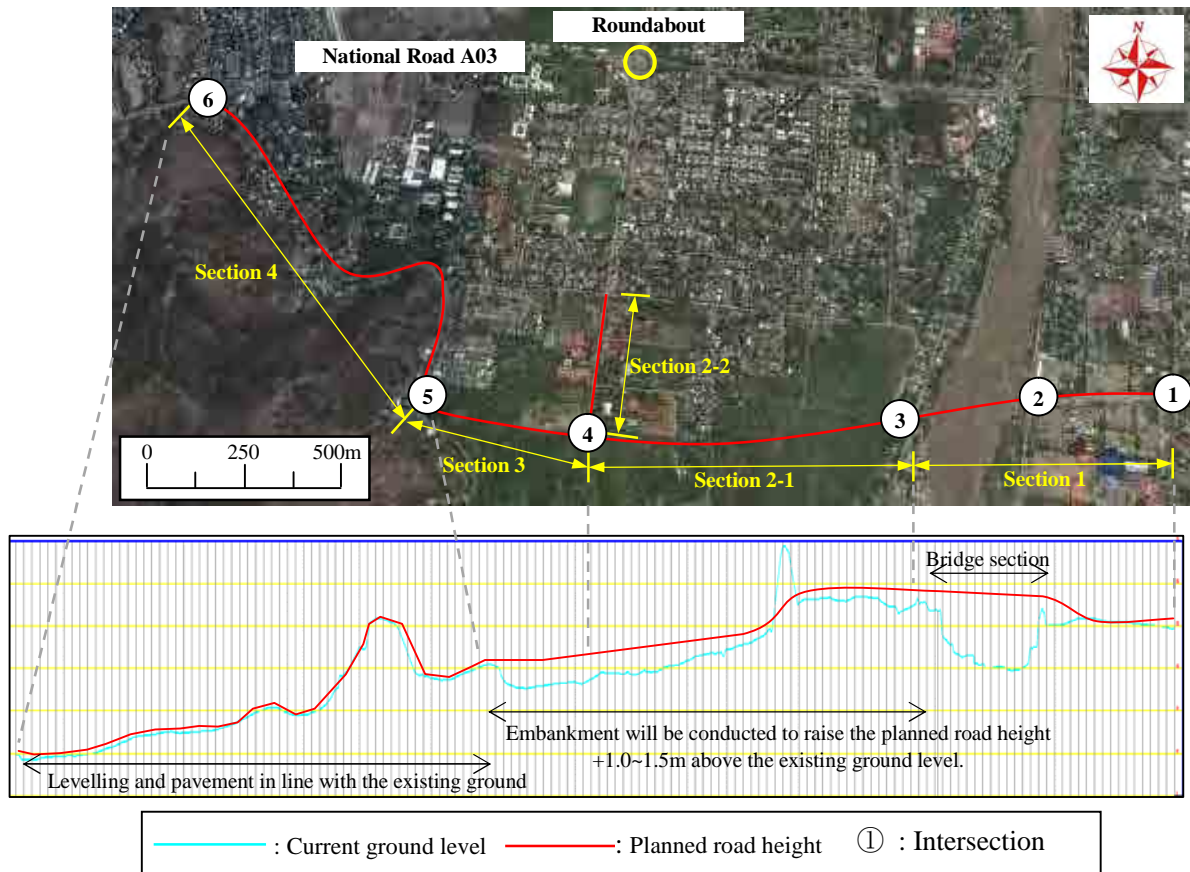


Figure 2-2-21 Horizontal and Vertical Alignment

Table 2-2-19 Design Concept of Horizontal and Vertical Alignment on Each Section

	Current Conditions	Design Concept of Horizontal Alignment	Design Concept of Vertical Alignment
Section 1	Unpaved road; factories exist on both sides; the ROW is approximately 35m.	Construct the planned road along the north edge of ROW to allow expansion to 4 lanes in future. Make the bridge section a straight line.	Fix the bridge height as the control point, smoothly coordinate with the existing road height.
Section 2-1	The area is banana fields with no existing road. Houses dot around.	Adopt a smooth alignment with minimum resettlement.	In order to protect the road when rain water accumulates on surrounding ground, raise the road height by embankment.

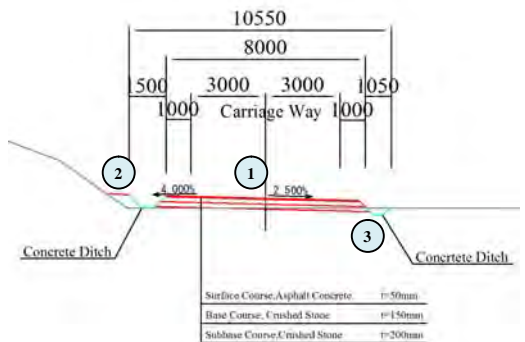
Section 2-2 (Branch to airport)	Unpaved road; houses exist on both sides; the ROW is approximately 13m.	Trace the existing road to avoid the resettlement and land acquisition	Adopt a one-way gradient going north in order to connect the planned main road and the existing intersection on the north side.
Section 3	The area is banana fields with no existing road. Houses dot around.	Adopt a smooth alignment with minimum relocation of houses.	In order to protect the road when water gathers on surrounding ground, raise the road height by embankment.
Section 4	Unpaved road; houses exist on both sides; the ROW is approximately 10~11m.	Trace the existing road to avoid the resettlement and land acquisition	Tracing the existing vertical alignment, level uneven ground and pave within existing ROW.

2) Standard Cross-Section

In accordance with the above horizontal and vertical plans, the cross-section differs on each section. Table 2-2-20 shows the cross-section concept for each section.

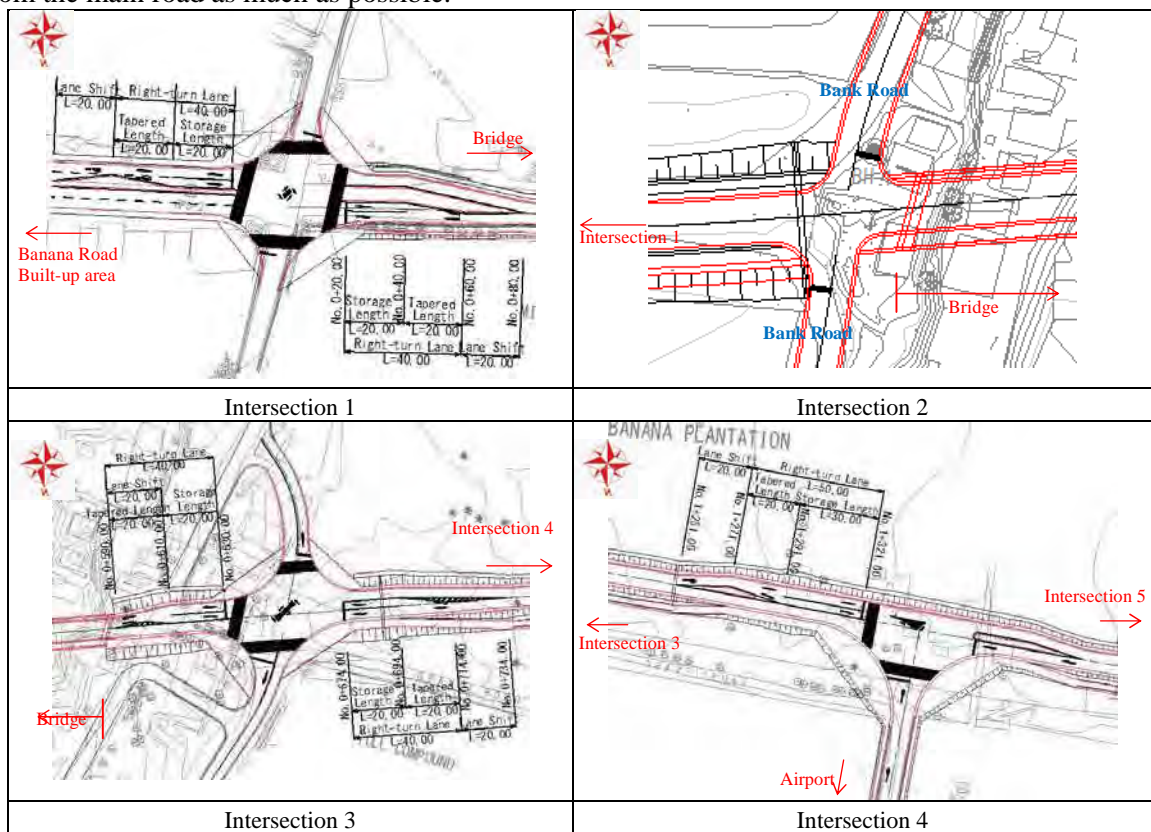
Table 2-2-20 Cross-Section Policy in Each Section

Section	Cross-Section Concept	Standard Cross-Section
Section 1 (flat section in left bank side)	<ol style="list-style-type: none"> 1. Considering expansion to four lanes in future, adopt superelevation towards the right in the figure. 2. Drain surface water via a U-shaped drain at the roadside. 3. Secure carriageway width of 3.5m in consideration of increased future traffic volume and freight traffic. 4. Secure utility space of approximately 1.0m on the right side of the road. 5. On the left side, install concrete lining ditch for collecting rain water from outside of the ROW. 	
Section 2-1 Section 3 (Embankment section)	<ol style="list-style-type: none"> 1. Considering expansion to four lanes in future, adopt superelevation towards the right in the figure. 2. Drain surface water via concrete lining ditch at the foot of the embankment on the right side. Install the right footpath outside of the side ditch separated from the carriageway. 3. Secure utility space of approximately 1.0m on the right side of the road. 4. On the left side, install concrete lining ditch at the foot of embankment for collecting rain water from outside of the ROW. 	
Section 2-2 (branch to airport)	<ol style="list-style-type: none"> 1. Adopt cross slope to both sides. 2. Drain surface water via U-shaped drains at the roadside. 	

<p>Section-4</p>	<ol style="list-style-type: none"> 1. Within the existing ROW, adopt road width of 3.0m unlike on the other sections. 2. Install concrete lining ditch on the mountain side in order to drain rain water running off the mountains. 3. Adopt superelevation to the right side, and in the case outside of the ROW is low, drain directly into the valley without installing a ditch. 	
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(3) Intersection Plan

Figure 2-2-22 shows the plans for the six intersections indicated in Figure 2-2-21. At grade intersections are adopted upon considering the future traffic volume and economy. As for the shape of intersections, upon comparing crisscross (or T-shaped) with roundabout types, the crisscross (or T-shaped) type has been adopted because it requires less land acquisition and resettlement. Moreover, for smooth traffic, it is planned to construct additional lanes peeling off from the main road as much as possible.



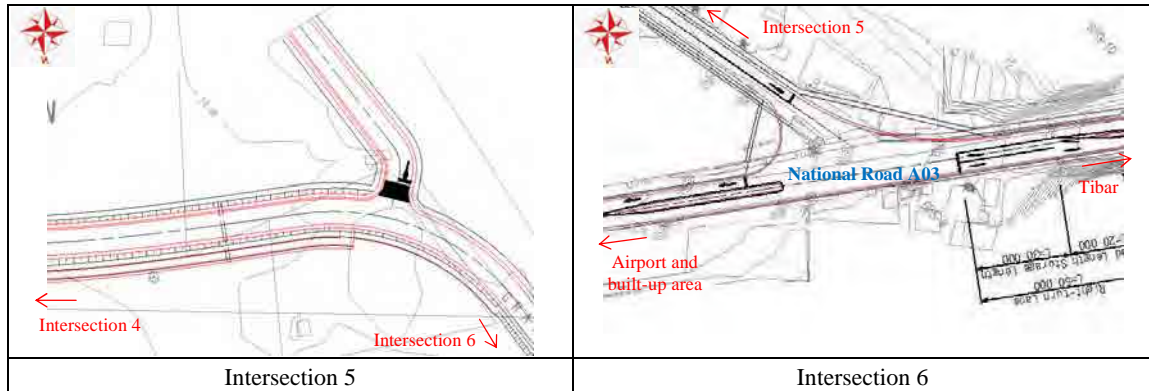


Figure 2-2-22 Intersection Plans

(4) Connecting Road and Access to Private Land

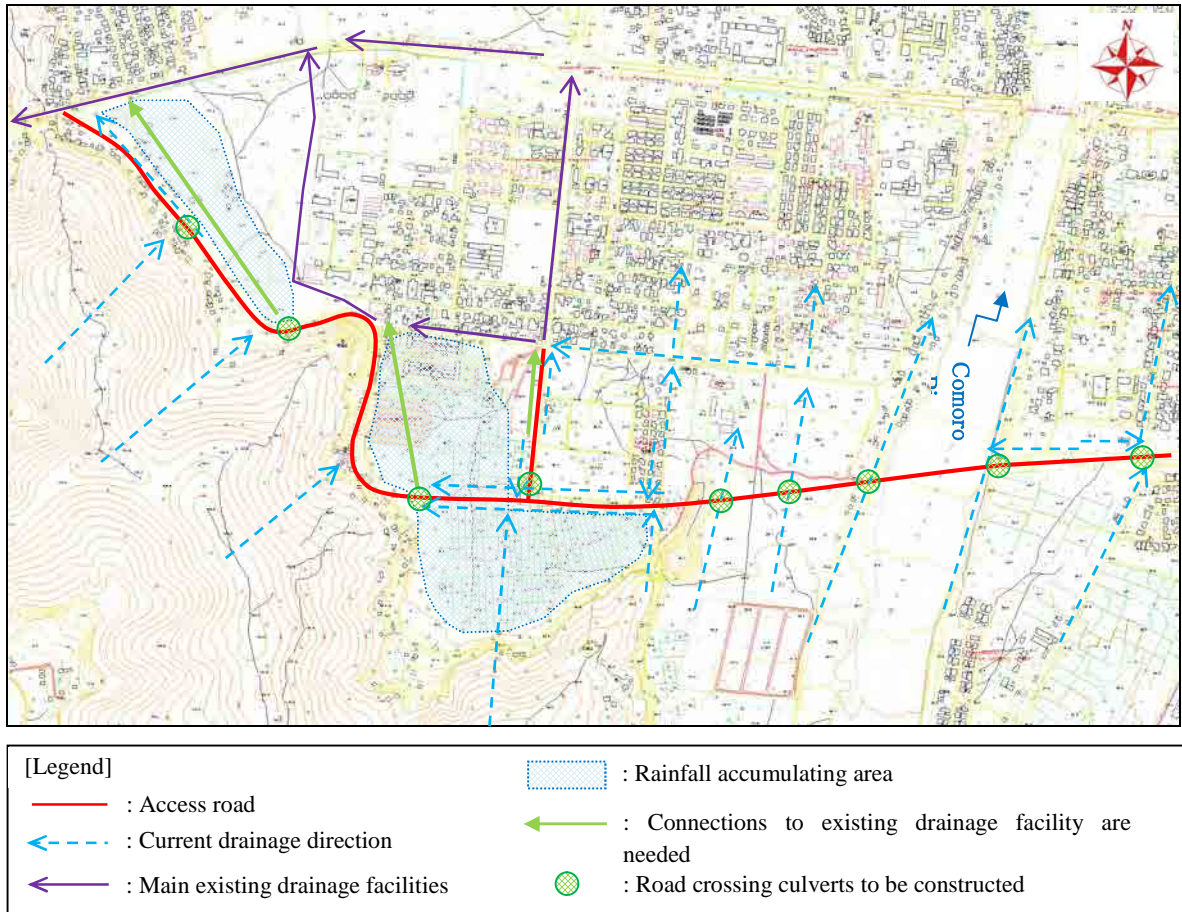
Asphalt pavement will be applied to the existing unpaved road that connects to the Project road for around 10~20m from the edge of the main road, while connections to roadside houses will also be asphalt-paved from the edge of the main road to the boundary of private land. Road crossing culverts on these access points, pipe culverts will be adopted in cases where sufficient earth covering can be secured, and concrete U-shaped drains with covers will be adopted in other cases.

(5) Drainage Plan

5-1) Current Drainage System and Drainage Plan

In the Project area, drainage facilities such as side ditches, etc. have been installed along the existing paved road, and rain water in this area is drained towards the low-lying National Road A03 and ocean side. However, because the area of access road is flatland comprising banana fields with no drainage facilities, rain water tends to accumulate on the certain area.

In view of these conditions, rain water accumulating on the road surface and surrounding area will be appropriately drained to the stream end, as drainage facilities such as road crossing culverts and side ditches will be constructed to maintain existing drainage systems in embankment sections. Figure 2-2-23 shows the current drainage system and drainage system in the Project.



Source: Prepared by the Survey Team from the outputs of the Study for Creation of a Database of Geographical Information for Emergency Recovery of Timor-Leste

Figure 2-2-23 Drainage System and Drainage Plan

5-2) Road Crossing Culverts

Currently there are no crossing culverts along the planned road, but box culverts or pipe culverts will be installed under the road to maintain the current drainage system. Road crossing culverts are planned based on the runoff analysis using the daily rainfall of 10-year return period in Dili indicated in Table 2-2-2. Table 2-2-21 shows an outline of the road crossing culverts to be installed in the Project.

Table 2-2-21 Outline of Road Crossing Culverts

Side Ditch Type	Size	Applicable Section
Pipe culvert	φ0.4m	Section 1
	φ0.6m	All sections
	φ0.9m	Section 2-2
Box culvert	W 0.6m × H 0.6m, 3 lines	Section 3
	W 1.0m × H 0.8m, 3 lines	Section 3

5-3) Side Ditches

Side ditches are planned based on the runoff analysis using the daily rainfall of 3-year return period in Dili indicated in Table 2-2-8. Concerning U-shaped drains, covers will be installed to withstand the weight of large vehicles. Moreover, in order to prevent water infiltration from side ditches to the main road body, the concrete lining ditches will be

installed alongside the planned road.

Table 2-2-22 Outline of Side Ditches

Side Ditches	Size	Applicable Section
U-shaped drains(with concrete covers)	300×300	Section 1 (valley side), Section 2-2 , part of Section 3
	400×400	Part of Section 3
	500×500	Part of Section 4
Concrete-lining ditch	Base width 350 Height 350	Section-1 (mountain side), Section-2~4 (valley side)
	Base width 400 Height 400	Part of Section-4
	Base width 500 Height 500	Section 2~4 (mountainside)
Earth ditch	Base width 400 Height 400	Water catch and discharge outside of the road ROW
	Base width 500 Height 500	Water catch and discharge outside of the road ROW

5-4) Retaining Walls

On embankment and cut sections, the retaining walls indicated in Table 2-2-23 will be installed at the area where slopes may affect private land or slope protection is necessary.

Table 2-2-23 Outline of Retaining Walls

Retaining Wall Type	Height	Applicable Section
Block masonry retaining wall	1m~5m	behind abutment , cut section
Gravity type retaining wall	1m~3m	Section 3, intersections 3, 4
L type retaining wall	1m~3m	Section 2-2 (branch to airport)
Gabion (Step type)	1m~7m	Cut section

5-5) Bus Stops

There are currently no bus stops along National Road A03 and Banana Road, however, there are areas where mini buses regularly stop to allow passengers on and off, and it is forecast that the planned road will serve as a bus route. Because stopping buses on the road shoulder disturb traffic flow and hinders safety, four bus stops will be installed along the road.

5-6) Street Lights

At the intersections of planned road, since vehicles from subsidiary roads have to stop temporarily before entering them, it will be necessary to secure visibility at nighttime around the intersections. Therefore, streetlights will be installed around the intersections and bridge. It is also expected to install power line conduits around the lighting facilities.

5-7) Others

- Because the inlet and outlet of road crossing culvert will be open, guard fences should be installed to prevent vehicles from falling in.
- On concrete lining ditch sections, concrete plates to allow pedestrian crossing will be installed.
- On embankment sections, steps and slopes will be appropriately installed in consideration of access from the roadside.

- Because the planned road will be a district road in the urban area, it is planned to plant trees on the footpaths for the landscape.

(6) Pavement Plan

Design standards in the pavement plan will mainly be determined based on the Draft Pavement Design Manual in Timor-Leste 2008, however, because this is still in the draft stage, the AASHTO Guide for Design of Pavement Structure 1993 (which provides the basis for the Timor-Leste standard) will be referred to. Also, pavement composition will be verified based on the Japanese T_A method. Assuming the design period to be 10 years after construction, the cumulative vehicle load over this period will be calculated upon converting to the equivalent single axle load. Based on these load conditions, pavement will be designed upon considering the bearing capacity of existing ground, local aquifer conditions and economy.

1) Traffic Load

Upon calculating the total load on the road by passing vehicles over the design period of 10 years as the standard axle load (8.2t converted single axle load, ESAL), ESAL was calculated to be 6,710,000 axles per lane considering the future traffic demand shown in Table 2-1-4 and the vehicle type-separate VDF (Vehicle Damage Factor) stated in Draft Pavement Design Manual 2008. Incidentally, the above calculation is performed upon 55% of ratio of one-direction traffic to total traffic demand stated in Table 2-1-4.

2) Design CBR

As a result of CBR tests for roadbed materials sampled in the field survey, the design CBR on each section was set as follows:

Section 1, Section 4: CBR 30

Section 2, Section 3: CBR 17

3) Design Conditions

Table 2-2-24 shows the design conditions used in the pavement design.

Table 2-2-24 Design Conditions in Pavement Design

Item	Conditions
Design period	10 years from 2017 to 2026
Design vehicle load	10 tons
Reliability (R)	90% (standard deviation ZR=-1.282, total standard deviation in traffic volume forecast S0=0.4)
Performance serviceability index (PSI)	Initial serviceability index P0=4.2 Terminal serviceability index Pt=2.5
Pavement layer coefficient	Asphalt concrete wearing and binder course : 0.42 Granular base course (mechanical stabilized stone): 0.14 Granular subbase course (crusher-run): 0.11
Drainage coefficient	1.0
Design CBR	Section 1, Section 4: CBR 30 Section 2, Section 3: CBR 17

4) Examination of Pavement Composition

The results of examination of the pavement composition based on the AASHTO standard

and verification based on the T_A method are shown in Table 2-2-25 for Sections 1 and 4 and Table 2-2-26 for Sections 2 and 3.

As for Sections 1 and 4, it is planned to have a 20cm sub-base course of crusher-run, 15cm base course of mechanical stabilized stone and a single layer of wearing course of asphalt concrete. As for Sections 2 and 3, it is planned to have a 20cm sub-base course of crusher-run, 20cm base course of mechanical stabilized stone and a dual layer of binder course (4cm) and wearing course (3cm) of asphalt concrete.

Table 2-2-25 Examination of Pavement Composition (Section 1, Section 4)

Layer	Materials	Thickness (cm)	AASHTO		T_A method	
			Layer coefficient	Structural number (SN)	Equivalent conversion coefficient	T_A value
Wearing and Binder Course	Asphalt concrete	5cm	0.42	0.827	1.00	5.00
Base Course	Mechanical stabilized stone	15cm	0.14	0.827	0.35	5.25
Sub-base Course	Crusher-run	20cm	0.11	0.866	0.2	4.00
Total			-	2.520	-	14.25
			Required SN	2.3	Required T_A	13
Evaluation			-	OK	-	OK

Table 2-2-26 Examination of Pavement Composition (Section 2, Section 3)

Layer	Materials	Thickness (cm)	AASHTO		T_A method	
			Layer coefficient	Structural number (SN)	Equivalent conversion coefficient	T_A value
Wearing and Binder Course	Asphalt concrete	7cm	0.42	1.157	1.00	7.00
Base Course	Mechanical stabilized stone	20cm	0.14	1.102	0.35	7.00
Sub-base Course	Crusher-run	20cm	0.11	0.866	0.2	4.00
Total			-	3.126	-	18.00
			Required SN	3.0	Required T_A	15
Evaluation			-	OK	-	OK

2-2-3 Outline Design Drawing

Outline design drawings prepared based on the above basic plan are attached in Appendix 6. Table 2-2-27 shows a list of the attached outline design drawings.

Table 2-2-27 List of Outline Design Drawings

No.	Title	Pages
OD-1~6	Plan (1)~(6)	6
OD-7~13	Profiles (1)~(7)	7
OD-14	Upriver Comoro Bridge – General Drawing	1
OD-15	Typical Cross Section	1
OD-16~19	Drainage Details (1)~(4)	4
OD-20	Kerb Stone Details	1
OD-21	Lay-By Details	1
OD-22	Retaining Wall Details	1

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Basic Policy

Since the Project will be implemented under the framework of the Government of Japan's Grant Aid, the basic implementation policy in the Project is described below.

- 1) The work execution methods and schedule will be planned in reflection of natural conditions such as the local climate and terrain, local characteristics and current traffic conditions in the Project area.
- 2) In consideration of maintenance capacity on the local side, general execution methods will be planned so that no special construction machinery or technology are required after the road and bridge are constructed.
- 3) In compiling the implementation plan, the natural and social environment and securing traffic safety should be considered.
- 4) In order to contribute to the local economy, locally procurable equipment and materials will be utilized as much as possible.

(2) Bridge Works

1) Superstructure Work

The bridge superstructure will be constructed by the fixed scaffolding erection method. This needs coffering, directly assembling scaffolding in the river and installing the bridge by in-situ casting. The scaffolding is divided into three stages for every two spans. Incidentally, scaffolding work will not be implemented in the river during the rainy season when the flow rate increases.

2) Substructure Works

Excavation for the construction of abutments and piers will be done by the open-cut method. Submersible pumps will be used to drain rain water and groundwater from excavated areas. As with the superstructure works, the river will be temporarily coffered and works will not be conducted in the low-water channel during the rainy season.

3) Foundation Works

Foundation piles will be the bored piles (pile diameter 1.2m) by the all-casing method. Excavation machines will be a crawler crane and oscillating or fully rotating all-casing excavator (crawler type, maximum excavation diameter 1,500mm) procured from Japan. At the base of the excavator, the ground will be levelled and iron plates will be placed to disperse the machine weight and stabilize the machine during the works. As in the substructure works too, the river will be temporarily coffered and works will not be conducted in the low-water channel during the rainy season.

4) Coffering

In order to conduct the above-mentioned foundation works, substructure works, superstructure works and support works inside the river area, temporary coffering will be conducted by an embankment using riverbed material, soil and large sandbags. Because the river channel of Comoro River is limited in except for the rainy season, the river channel upstream of the bridge will be shaped by an embankment, and large sandbags will be placed at water impact parts around the bridge.

5) Revetment and Bed Protection Works

Blocks manufactured in the plant yard will be used for revetment. As for the riverbed protection, foot protection blocks manufactured in the river area yard will be put in place using a rough terrain crane.

(3) Access Road Works

1) Earth Works

Because the surplus soils generated in the cutting and structural excavation will be used as road embankment materials, it will be carried to the site yard. Additional soil will be extracted from borrow pits to provide roadbed materials. Moreover, on sections where there is existing road, work will first be conducted on one side while leaving the other side open for traffic, and then the work side will be changed upon switching traffic to the other side.

2) Pavement Works

Materials from quarries will be used as base course materials, while asphalt concrete will be procured from an existing plant in Dili. As with the earth works, the work will be executed by each side on sections where there is existing road.

3) Drainage Works

Precast products manufactured in the plant yard will be used for the road crossing culverts (box culverts and pipe culverts, etc.), U-shaped drains and covers for side ditches and catch basin. Other drainage structures will be cast in-situ.

4) Road Ancillary Facilities

Precast products manufactured in the plant yard will be used for the kerb stone and block masonry retaining walls. Other structures will be cast in-situ. Also, bus stop areas will be paved with concrete.

(4) Concrete Manufacture

Because there is no local plant able to supply large quantities of ready-mix concrete for the bridge works, a concrete plant procured from Japan will be installed onsite. The manufactured concrete will be carried to the works site by truck mixer.

2-2-4-2 Implementation Conditions

(1) Compliance with Labor Standards

The contractor shall comply with appropriate labor conditions and employment customs based on the existing construction legislation in Timor-Leste, and it shall strive to prevent disputes with workers and secure safety during the works period.

(2) Social and Environmental Conservation during the Works

- 1) Contaminated water and wastes generated in the works will be appropriately treated and disposed in order to mitigate and reduce environmental impacts as much as possible.
- 2) Measures will be taken to mitigate dust, noise and vibration, and monthly monitoring will be conducted to continually grasp and improve conditions.

(3) Safety Matter

- 1) Safety facilities (barricades, traffic cones, rotating lights) and security personnel will be positioned to the main intersections.
- 2) Since vehicles related to the construction will increase, signs for prohibiting entry to the works sites and informing local residents will be necessary in order to secure safety and prevent troubles.

(4) Communication on Sites

- 1) Since mobile phones can be used on the Project section, workers will carry mobile phones.
- 2) Traffic controllers will carry mobile transceivers and a setup for traffic safety control will be established in order to secure the safety of general traffic and local residents.

(5) Respect for Local Customs

When compiling the implementation plan, the works schedule will be planned in consideration of local customs.

(6) HIV Countermeasures

HIV prevention measures among the workers should be considered in the implementation plan.

(7) Customs Clearance

The implementation plan required for importing, unloading and customs clearance should be

considered.

(8) Securing of Site Land

It will be confirmed that the Government of Timor-Leste will secure prior consent and pay deposits, etc.

(9) Schedule

The obligation works of the Timor-Leste side will be carefully ascertained and coordinated. In particular, the E/N for the construction stage will be proceeded after confirming that the land acquisition and resettlement and relocation of obstacles have been finished.

2-2-4-3 Scope of Works

The works to be undertaken by the Japanese and Timor-Leste sides during the Project are outlined below.

(1) Scope of Works on the Japan Side

- Preparations and structure works required for bridge construction and road development
- Installation of temporary facilities (base camp, offices, warehouse, etc.)
- Procurement of labor, construction materials and machinery necessary for the works
- Safety control and measures for works implementation
- Detailed design, preparation of tender and contract documents, assistance with tender and consultant supervision of works

(2) Scope of Works on the Timor-Leste Side

- Securing of the ROW and base camp
- Securing of disposal sites for the wastes and surplus soil arising from the construction
- Relocation of obstacles, allocation of local supervisors and bearing of costs arising in land acquisition and resettlement
- Prompts customs clearance and tax exemption for equipment and materials at the embarkation port
- Provision of conveniences for Japanese nationals entering and staying in Timor-Leste for the Project
- Designation of counterparts and securing of counterpart personnel and budget

2-2-4-4 Consultant Supervision

After the exchange of notes (E/N) between the Government of Japan and Government of Timor-Leste, the Government of Timor-Leste will conclude the Grant Agreement (G/A). After the E/N and G/A, based on the recommendation letter issued by JICA, the Consultant will conclude the Consultant Agreement with MPW, which is the implementing agency of the Government of Timor-Leste, under the scope and procedure of Japan's Grant Aid. After conclusion of the agreement, the Consultant will implement the detailed design, assistance of the tender and

consultant supervision.

The main contents of work included in the consultant agreement are as follows.

(1) Detailed Design and Preparation Stage of Tender Documents

Based on the results of the natural conditions survey additionally implemented during the outline design and detailed design, detailed design will be conducted and design documents will be prepared. The necessary documents for tender will be prepared by the Consultant and approval from the Government of Timor-Leste will be obtained.

(2) Tender Stage

The Consultant will assist the Timor-Leste side with the notification of tender, prequalification (PQ), distribution of tender documents, tender implementation and tender assessment, and offer advice regarding the contract negotiations. It will also witness the binding of the works contract between the Government of Timor-Leste and the successful bidder.

Table 2-2-28 shows the personnel and their roles from the detailed design to tender.

Table 2-2-28 Personnel and Roles from Detailed Design to Tender

Assignment	Roles
Project Manager	General management of detailed design and tender
Deputy Project Manager / Bridge Design I (superstructure design)	Detailed design and tender work concerning bridge superstructure works
Bridge Design II (substructure design)	Detailed design concerning abutments and piers
Bridge Design III (foundation design)	Detailed design concerning foundation works, supervision of boring survey
River Structures Design (revetment / pier protection)	Detailed design concerning revetment and pier protection works
Deputy Project Manager / Road Design I (road structure)	Detailed design concerning road structure, supervision of topographic survey and tender
Road Design II (obstacle survey / ancillary facilities)	Detailed design concerning road ancillary structures, survey of obstructions
Environmental and Social Consideration (socio economic status survey/IEE)	Supervision of socio economic status survey, support for IEE application procedures
Environmental and Social Consideration (resettlement)	Support for land acquisition and resettlement
Procurement Plan / Cost Estimation	Review of procurement plan and project cost, organizing of unit prices
Preparation of Tender Documents	Preparation of tender documents, preliminary review and tender assistance

(3) Consultant Supervision Setup (consultant site supervision setup)

After concluding the contract with the Contractor, the Consultant will issue the written instruction to commence the works and assign the Resident Engineer to the site to conduct consultant supervision. In the consultant supervision, the Consultant will report the work progress to the Timor-Leste side and make recommendations to the Contractor for improvement of the works progress, quality control, safety and payments, etc. It will also give periodic reports to the local Japanese embassy and JICA office. Furthermore, it will conduct a completion (defect)

inspection one year after completion of the works.

A civil engineer with the experience of Japan's Grant Aid will be assigned as the Resident Engineer. Also, the Project Manager will be dispatched at important phases of the work to conduct work coordination and supervise the works. Also, various types of expert engineers will be dispatched at the start of works to conduct spot supervision and prevent any technical discrepancies. Table 2-2-29 shows the personnel and roles concerning consultant supervision.

Table 2-2-29 Personnel and Roles in the Consultant Supervision Stage

Assignment	Role
Project Manager	Coordination and technical management to ensure smooth execution of works
Resident Engineer	Routine management work and schedule control
Civil Engineer (bridge foundation works, substructure works)	Supervision of foundation and substructure works
Civil Engineer (bridge superstructure works)	Supervision of bridge superstructure works
Civil Engineer (accessory structures)	Supervision of road ancillary structures and revetment works
Civil Engineer (pavement works)	Supervision of pavement works
Civil Engineer (completion inspection)	Final inspections before handover of the completed facilities

In addition to the above Japanese personnel, supervision engineers recruited locally, office boy and driver will be assigned to assist the Resident Engineer.

2-2-4-5 Quality Control Plan

The consultant will instruct the Contractor to implement the tests indicated in Table 2-2-30 and reflect the results in quality control. Concerning the concrete plant procured from Japan, a plant inspection will be implemented in order to confirm quality and capacity in advance.

Table 2-2-30 List of Quality Control Items

Item		Method	Test Frequency	
Roadbed materials (crushed stone)	Mixing materials	Liquid limit, Plastic index	Each mix	
		Grain size distribution		
		Aggregate strength test		
		Aggregate density test		
		Maximum dry density (compaction test)		
Laying		Density test (compaction rate)	Once/day	
Prime coat, Tuck coat	Materials	Bitumen	Quality certificate	Each material
			Temperature and quantity at the time of keeping/spreading	Each delivery
Asphalt	Materials	Bitumen	Quality certificate, Ingredient analysis list	Each material
		Aggregate	Grain size distribution	Each mix/ once a month
			Water absorption rate	Each material
			Aggregate strength test	

	Mix test	Stability		Each mix	
		Flow value			
		Void ratio			
		Design asphalt value			
	Laying	Set temperature during mixing		As appropriate	
		Temperature during leveling		Each delivery	
Sampling Marshal test		Roughly once a day			
Concrete	Materials	Cement	Quality certificate, chemical and physical test results	Each material	
		Water	Ingredient test results	Each material	
		Admixture	Quality certificate, componential analysis sheet	Each material	
		Fine aggregate	Dry specific gravity		Each material
			Grain size distribution, coarse particle ratio		
			Clay lump and soft mote ratio		
		Coarse aggregate	Dry specific gravity		Each material
			Grain size distribution		
	During mixing test		Compression strength test	Each mix	
	During placement		Slump (concrete)		Each placement
			Air contents		Each placement
			Temperature		Each placement
Strength		Compression strength test (7 days, 28 days)	Each designated interval		
Reinforcing bars	Materials	Quality certificate, tensile strength test results		Each lot	

2-2-4-6 Procurement Plan

(1) Procurement Concept

1) Labor

In order to contribute employment opportunities, transfer of technology and promotion of the local economy, local engineers and laborers will be fully utilized. However, in case of jobs that cannot be handled with the technical level of Timor-Leste, skilled workers will be dispatched from Japan or third countries.

2) Construction Materials

The general materials (aggregate, timber, etc.) for the construction works are mainly produced in Timor-Leste. Imported cement, bitumen and reinforcing bars are available on the local market and can be procured in Timor-Leste. However, it is difficult to procure construction materials for the bridge superstructure such as PC cables, expansion joints and rubber supports, etc. in Timor-Leste, so these items will be procured from Japan.

Considering the above points, procurement has been planned as shown in Table 2-2-31.

Table 2-2-31 Procurement Sources of Main Materials

Material	Procurement Source			Remarks
	Timor-Leste	Japan	Third Country	
<General materials>				
Ordinary cement	●			
High-early-strength cement	●			
Fine aggregate, coarse aggregate	●			
Reinforcing bars	●			
Admixture	●			
Asphalt	●			Made in Indonesia, made in Singapore
Asphalt emulsion	●			
PVC pipes	●			
Gabion mesh	●			
Large sandbags	●			
Fuel	●			
<Bridge construction materials>				
PC cables		●		
Anchorage		●		
Expansion joints		●		
Rubber supports		●		
Waterproof sheet		●		
Grout materials		●		

3) Construction Machinery

Road construction machines excluding special machines used in bridge works, etc. can be rented from local construction companies in Timor-Leste. However, some of the machines that are leased by local construction companies are not maintained in suitable condition for use in the Project. Table 2-2-32 shows the construction machines to be procured in consideration of the expected works schedule and local procurement conditions.

Table 2-2-32 Main Construction Machinery Procurement Sources

Machine	Procurement Source			Remarks
	Timor-Leste	Japan	Third Country	
Bulldozer	●			Can be leased locally
Back hoe	●			Ditto
Wheel loader	●			Ditto
Dump truck	●			Ditto
Semi-trailer	●			Ditto
Truck crane	●			Ditto
Rough terrain crane	●			Ditto
Crawler crane (lifting capacity up to 50t)	●			Ditto
(lifting capacity 50~55t)		●		Cannot be procured locally
Motor grader	●			Can be leased locally
Road roller	●			Ditto
Tire roller	●			Ditto
Fork lift	●			Ditto
Vibrating roller	●			Ditto
Asphalt finisher	●			Ditto
Asphalt distributor	●			Ditto

Asphalt sprayer	●			Ditto
Concrete cutter	●			Ditto
Tamping rammer	●			Ditto
Vibrating compacter	●			Ditto
Line marker	●			Ditto
Submersible pump	●			Ditto
Generator	●			Ditto
Concrete mixer	●			Ditto
Concrete pumping vehicle	●			Ditto
Truck mixer	●			Ditto
Concrete plant		●		Cannot be procured locally
All-casing excavator (oscillating type)		●		Ditto

(2) Important Points in Procurement

The important points to consider regarding procurement in the Project are as follows.

- 1) Compile a procurement plan that is reasonable within the works schedule.
- 2) In order to contribute to promotion of the local economy, procure locally produced products as much as possible.
- 3) Concerning construction materials and equipment that cannot be procured locally, consider procurement from Japan or third countries while paying attention to the quality, ease of procurement, availability of quantities, and economy.
- 4) Regarding landed products procured from Japan or third countries at Dili Port, because Dili Port has currently insufficient handling capacity and takes a long time to land goods and get them through customs, a sufficient transportation and procurement plan is needed.
- 5) Internally transported construction machines will be transported by trailer, while general freight (materials) will be carried by truck.

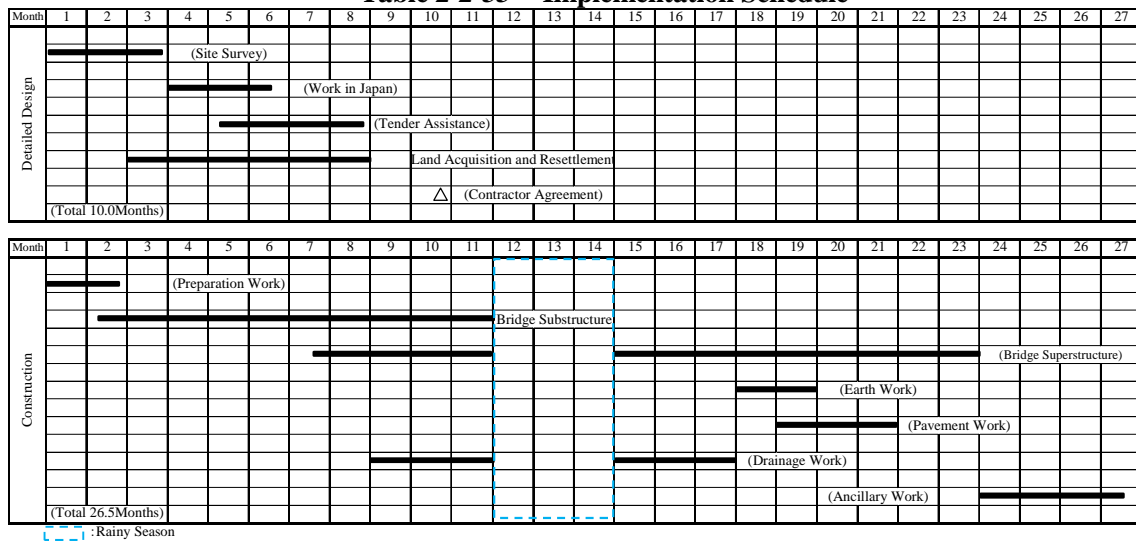
2-2-4-8 Soft Component Plan

Not applicable in the Project

2-2-4-9 Implementation Schedule

Table 2-2-33 shows the draft implementation schedule in the case where the Project is implemented under the Grant Aid. The overall estimated schedule is approximately 36.5 months including the detailed design and tender work (approximately 10.0 months) and construction works (26.5 months). This schedule takes into account the impacts of the rainy season in which no river works or drainage works can be done.

Table 2-2-33 Implementation Schedule



2-3 Obligations of Recipient Country

In the case where the Project is implemented under the Japan’s Grant Aid scheme, the following works will need to be borne by the Timor-Leste side in the preparatory stage, during the works and following construction.

- (1) Land acquisition for construction
- (2) Relocation and payment of compensation for obstructing buildings
- (3) Relocation of existing public utilities
- (4) Preparation and securing of land for the material stock yard and basecamp
- (5) Prompt customs clearance of equipment and materials transported from Japan and third countries
- (6) Exemption or bearing of tariffs, domestic taxes and any other levies on procurement of equipment and materials and provision of services by Japanese nationals
- (7) Provision of necessary conveniences for entry to, stay in and departure from Timor-Leste by Japanese nationals offering services for the Project
- (8) Appropriate and effective operation and maintenance of facilities constructed in the Project
- (9) Bearing of costs for Project officials on the Timor-Leste side

2-4 Project Operation Plan

Road and bridge maintenance in Timor-Leste is implemented by DRBFC. DRBFC headquarters in Dili conducts the budget management and planning for maintenance, design, ordering and contracting for construction work, while regional offices are responsible for implementing inspections and supervision works. Table 2-4-1 shows the major maintenance activities expected for the bridge and road in the Project.

Table 2-4-1 Main Maintenance Activities

Item	Frequency	Inspected Parts		Maintenance Contents
Routine maintenance	Twice/year	Bridge	Drainage facilities	Sediment removal, cleaning
			Expansion joints	Cleaning
			Bearing shoe	Cleaning
		Road	Side ditches, crossing culverts	Sediment removal, cleaning
			Slopes, shoulders	Grass trimming, repair of eroded parts
			Pavement	Patching
Periodic maintenance	Once/5 years	Bridge	Railings	Inspection, recoating, repair
			Revetment	Inspection, repair
		Road	Line Marking	Repainting
			Pavement	Overlaying

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Cost to be borne by Timor-Leste side

As is shown in Table 2-5-1, the costs of land acquisition, tax exemption and post-construction maintenance, etc. to be borne by the Timor-Leste side are estimated at approximately 6.2 million USD. Total cost borne by the roads and bridge development budget shown in the item 1~3 in Table 2-5-1 is approximately 2.2 million USD, and this covers around only 2.1% of the annual roads and bridges development budget in 2013 (approximately 106.4 million USD). Therefore, it is deemed to be affordable for the local side. Besides, the Survey Team has obtained the confirmation from MOF that the item 4 in Table 2-5-1 can be borne by Timor-Leste side.

Table 2-5-1 Costs to be Borne by the Timor-Leste Side

Cost Item		Contents	Amount (1,000 USD)
1	Environmental and social consideration	Relocation and compensation of houses, land acquisition costs, environmental monitoring	2,197
2	Relocation of existing public utility structures	Relocation of water pipes, telecommunication lines, power lines and telegraph poles	12
3	Preparation of temporary yard	Preparation of camp yard before the start of works	40
4	Others	Bearing of exempted taxes for the project works, etc.	3,986
Total			6,235

(2) Estimation Conditions

- 1) Point of estimation: July 2013
- 2) USD exchange rate: 1US\$=99.77 yen (mean value for the past 3 months counting from June 30, 2013)

※) Since Timor-Leste does not have its own currency, the US dollar is used.

- 3) Implementation period: 26.5 months
 4) Other: The Project will be implemented under the Grant Aid scheme of the Government of Japan.

2-5-2 Operation and Maintenance Cost

Table 2-5-2 shows the main routine and periodic maintenance work for the Project bridge and road, and it can be seen that the annual average maintenance cost will be approximately 34,600 USD. Since this represents just 0.13% of the Timor-Leste budget for road routine and periodic maintenance in 2013/14, this amount should not be a problem for the local side.

Table 2-5-2 Preliminary Maintenance Costs

Item	Frequency	Inspected Parts		Maintenance Contents	Preliminary Cost Estimate (USD)
Routine maintenance	Twice/year	Bridge	Drainage facilities	Sediment removal, cleaning	20
			Expansion joints	Cleaning	20
			Supports	Cleaning	20
		Road	Side ditches, crossing culverts	Sediment removal, cleaning	10,000
			Slopes, shoulders	Grass cutting, repair of corroded parts	6,000
			Pavement	Patching	12,000
		(1) Subtotal (per year)			
Item	Frequency	Inspected Parts		Maintenance Contents	Preliminary Cost Estimate (USD)
Periodic maintenance	Once/5 years	Bridge	Railings	Inspection, recoating, repair	5,000
			Revetment	Inspection, repair	4,000
		Road	Zone lines	Recoating	2,000
			Pavement	Overlaying	24,000
		(2) Subtotal (10 years)			
(3) Total routine and periodic maintenance cost over 10 years (= (1)*10 + (2))					315,060
(4) Operation cost (10% of above)					31,506
(5) Total ((3)+(4))					346,566
Annual routine and periodic maintenance cost (= (5)/10)					34,656

CHAPTER 3

PROJECT EVALUATION

Chapter 3 Project Evaluation

3-1 Preconditions for the Project Implementation

The preconditions necessary for the Project implementation will be as follows;

- (1) Land acquisition necessary for the construction of the planned bridge and access road
- (2) Relocation of houses and existing public utilities such as water pipes, electric lines, communication wires and so on around the bridge site and within ROW
- (3) Acquisition of environmental license
- (4) Securing and levelling of construction yard and camp yard
- (5) Extraction approval for the borrow pit and quarry
- (6) Securing of the access to electricity necessary for street lights installed in the Project

Above (1) - (4) have to be completed before the commencement of construction. Especially, the resettlement agreement between all APs and the Government of Timor-Leste and the completion of relocation work for all affected utilities are a condition to proceed to the signing of E/N for the construction stage.

3-2 Items to be borne by the Timor-Leste's Side Necessary for Attainment of the Overall Project Plan

Following inputs by the Timor-Leste's side will be necessary in order to realize and maintain the Project effects.

- (1) Securing budget and engineer for maintenance of the bridge and road
Although Facilities to be constructed in the Project are planned to minimize the burden of maintenance, routine and periodic maintenance and repair work according to the necessity will be necessary to maintain the function of the facilities properly.
- (2) Planning and development of road network in Dili urban area to support the future traffic demand
Planning and development of road network for the whole Dili urban area including the bridge and access road constructed in the Project will be necessary for the Project Goal "Securing of smooth traffic in Dili urban area".
- (3) Periodic Monitoring around the Project site
Continual monitoring on the environmental and social aspects will be necessary so as not to cause negative impacts on the Project site due to the implementation of the Project.

3-3 External Conditions

External conditions to realize and maintain the Project effects enough are as follows:

- (1) Currently the gravel extraction is being implemented in the Comoro River on a daily basis. The gravel extraction around the bridge site should be restricted to prevent the scouring at the bridge piers constructed in the Project.
- (2) Overspeed should be policed for the prevention of traffic accidents.
- (3) Increase of freight vehicles in the future is expected arising from the development of New Tibar Port and economic growth. Overloading and broken-down vehicles should be policed for the long life of the facilities.
- (4) Maintenance for the existing Comoro Bridge must be implemented properly for the traffic distribution among the planned bridge and existing Comoro Bridge.

3-4 Project Evaluation

3-4-1 Relevance

The relevance is shown as follows;

(1) Target Beneficiaries

Target beneficiaries of securing smooth and stable traffic in east-west direction in Dili urban area are mainly nationals in Dili District including impoverished groups, numbering about 230 thousand people. As the target beneficiaries are so many, about 20% of total population in Timor-Leste, the relevance of the Project is high.

(2) Living Improvement of Residents

The development in the project area, the western area of Dili District, is delayed compared with that in the city center, so living improvement of residents are urgently required. Therefore, the relevance of the Project is high.

(3) Coordination with the long-term development plan

In the SDP that is a long-term development plan in Timor-Leste, the northern corridor which composes of National Road A01 and A03 is recognized as an important corridor stimulating the economic growth in the country. Therefore, the coordination of the Project, which is expected to be a bypass of National Road A03, and the SDP is high. Besides, since the importance of the development of access roads with the development of a New Tibar Port is described in the SDP, a new bridge and access roads are expected to contribute to a physical distribution as a part of the above-mentioned access road. Accordingly, the relevance of the Project is high.

(4) Coordination with the assistance policy of Japan

As one of the assistance policy of Japan to Timor-Leste, “The development of infrastructure for promotion of the economy” is mentioned. Since the Project will contribute to the smooth and stable traffic in Dili urban area, the Project meets the above assistance policy and the relevance of the Project is high.

3-4-2 Effectiveness

(1) Quantitative Effect

The Project is to support the traffic demand in Dili urban area that is estimated to increase rapidly from now on, and contribute to the smooth and stable traffic as well as the promotion of economy.

Accordingly, it is suggested that the effectiveness of the Project is 1) Increase of traffic crossing Comoro River accompanied by the increase of traffic capacity by the construction of a new bridge, 2) Improvement of average travel speed, and 3) Increase of freight traffic accompanied by stimulated physical distribution.

Table-2 shows the indicators of quantitative effect, baselines, and target values in 3 years later after the completion of the Project.

Table 3-4-1 Indicators of Quantitative Effect

Indicator	Baseline (2013)	Target Value (2020) 【3 years after completion】
Traffic Volume (pcu/day) ※ ¹⁾	38,000 ※ ²⁾	57,000 ※ ³⁾
Average Travel Speed(km/h)	40 ※ ²⁾	60
Freight Traffic(vehicle/day)	3,400※ ²⁾	4,700※ ³⁾

※¹⁾ pcu: passenger car unit

※²⁾ value at the existing bridge

※³⁾ total traffic volume of the existing bridge and new bridge

(2) Qualitative Effect

- 1) Traffic jam in Dili will be mitigated by the distribution of traffic in the city
- 2) An alternative route of the existing bridge and National Road will be secured in case of emergency such as in disaster, etc.
- 3) Punctuality of the physical distribution will be ensured by securing the logistics route.
- 4) Economic development along the planned road will be promoted by the development of road in the Project area

APPENDICES

- Appendix 1 Member List of the Survey Team
- Appendix 2 Survey Schedule
- Appendix 3 List of Parties Concerned in the Recipient Country
- Appendix 4 Minutes of Discussions (M/D)
- Appendix 5 Other Relevant Data (Technical Note)
- Appendix 6 References
 - 6-1. Result of Traffic Survey
 - 6-2. Result of Population Census
 - 6-3. Outline Design Drawings

Appendix 1 Member List of the Survey Team

(1) Field Survey

Assignment	Name	Agency/Company
Leader	Nobuyuki TSUNEOKA	Senior Advisor, JICA
Project Coordinator	Sho TAKANO	Peace Building and Urban and Regional Development Division, Peace Building and Urban and Regional Development Group, Economic Infrastructure Department, JICA
Chief Consultant/ Bridge Planning 1/ Development Planning	Hisashi MUTO	Ingérosec Corporation
Deputy Chief Consultant/ Bridge Planning 2/ Bridge Design	Tsuyoshi MATSUMOTO	Nippon Engineering Consultants Co., Ltd.
River Plan	Makoto KODAMA	Idea Consultant, Inc.
Road Design	Makoto MATSUURA	Ingérosec Corporation
Natural Condition Survey	Shutaro SAKANAKA	Ingérosec Corporation
Environmental and Social Considerations	Ayako NAKAGAWA	Ingérosec Corporation
Construction and Procurement Planning/ Project Cost Estimation	Yoshiyuki AKAGAWA	Ingérosec Corporation

(2) Outline Explanation of the Preparatory Survey

Assignment	Name	Agency/Company
Leader	Nobuyuki TSUNEOKA	Senior Advisor, JICA
Project Coordinator	Sho TAKANO	Peace Building and Urban and Regional Development Division, Peace Building and Urban and Regional Development Group, Economic Infrastructure Department, JICA
Chief Consultant/ Bridge Planning 1/ Development Planning	Hisashi MUTO	Ingérosec Corporation
Deputy Chief Consultant/ Bridge Planning 2/ Bridge Design	Tsuyoshi MATSUMOTO	Nippon Engineering Consultants Co., Ltd.

Appendix 2 Survey Schedule

(1) Field Survey

Date	Leader	Project Coordinator	Chief Consultant/ Bridge and Develop Planning	Deputy Chief Consultant/ Bridge Planning and Design	River Planning	Road Design	Natural Condition Survey	Environmental and Social Consideration	Construction and Procurement Planning/Project Cost Estimation						
	Nobuyuki TSUNEOKA	Sho TAKANO	Hisashi MUTO	Tsuyoshi MATSUMOTO	Makoto KODAMA	Makoto MATSUURA	Shutaro SAKANAKA	Ayako NAKAGAWA	Yoshiyuki AKAGAWA						
18 Tue	Arrival in Dili, Courtesy call and Meeting with JICA office														
19 Wed	Courtesy call and Explanation of Inception Report to MPW/DRBFC														
20 Thu	Discussions with MPW/DRBFC														
21 Fri	Discussions with Relevant Authorities, Field Survey														
22 Sat	Field Survey														
23 Sun	Internal Meeting														
June	24 Mon	Signature on MD			Field Survey	Field Survey	Field Survey	Field Survey	Field Survey						
	25 Tue	Report to JICA office, EOJ													
	26 Wed	Dili-		Field Survey											
	27 Thu	-Japan													
	28 Fri														
	29 Sat														
	30 Sun	Internal Meeting													
	1 Mon			Field Survey						Field Survey	Field Survey	Field Survey	Field Survey	Field Survey	
	2 Tue														
	3 Wed														
4 Thu															
5 Fri															
6 Sat			Dili-												
7 Sun			-Japan	Internal Meeting											
8 Mon				Field Survey	Field Survey	Field Survey	Field Survey	Field Survey	Field Survey						
9 Tue															
10 Wed															
11 Thu															
12 Fri															
13 Sat															
14 Sun	Internal Meeting														
15 Mon	Report to JICA office, Field Survey														
16 Tue	Dili-						Field Survey	Field Survey	Field Survey						
17 Wed	-Japan														
18 Thu															
19 Fri															
20 Sat							Dili-								
21 Sun							Internal Meeting	-Japan	Internal Meeting						
22 Mon							Field Survey	Field Survey							
23 Tue															
24 Wed															
25 Thu															
26 Fri															
27 Sat							Dili-	Dili-							
28 Sun							-Japan	-Japan							

(2) Outline Explanation of the Preparatory Survey

Date		Leader	Project Coordinator	Chief Consultant/ Bridge and Develop Planning	Deputy Chief Consultant/ Bridge Planning and Design	
		Nobuyuki TSUNEOKA	Sho TAKANO	Hisashi MUTO	Tsuyoshi MATSUMOTO	
Jan.	16	Thu			Arrival in Dili, Courtecy call and Meeting with JICA office	
	17	Fri			Site Confirmation/Discussions with Relevant Authorities	
	18	Sat			Site Confirmation	
	19	Sun			Site Confirmation	
	20	Mon	Arrival in Dili/ Internal Meeting	Arrival in Dili/ Internal Meeting	Discussion with MOF/ Internal Meeting	
	21	Tue	Discussion on M/D			
	22	Wed	Signature on M/D, Report to EOJ			
	23	Thu	Report to JICA office /Dili-			
	24	Fri			-Japan	

Appendix 3 List of Parties Concerned in the Recipient Country

Ministry of Public Works, MPW	
Gastao Francisco de Sousa	Minister
Jose Piedade	Director General for Public Works
Antonio Raos Naikoli	Advisor
Vera Costa	Technical Advisor for Director General for Public Works
Frederick G. Santos	Chief Technical Advisor, Project Management Unit
Rosa Vong	Director, Housing and Building
Directorate of Road, Bridge and Flood Control, DRBFC	
Rui Hernani	Director of Road, Bridge and Flood Control
Milton Monteiro	Chief, Department of External Cooperation
Joao Gama	Chief, Department of Planning and Program
Abrao Vieira	Bridge Engineer
Jose A. L. S. Freitas	Road Engineer
Marquinho Borrito de Sorsa	River Engineer
Roberto Ugalino	Technical Advisor
Yukihiro Tateyama	Road Policy Advisor
Ministry of Finance, MOF	
Cancio de Jesus Oliveira	Chief, Development Partnership Management Unit
Leny Sarmiento Soares	Officer in charge of Japan, Development Partnership Management Unit
Arlindo daCruz Monterio	AIMS Manager, Development Partnership Management Unit
Takeshi Watanabe	Advisor, Development Partnership Management Unit
National Development Agency, ADN	
Alexandere R.B.Sarmiento	Deputy Director
Aleixo Docharmo	
National Directorate of Environment, NDE	
Antonio Lelo Tacu	Director
Francisco Poto	Chief, Environmental Impact Assessment
National Directorate of Land, Property and Cadastral Services, DNTPSC	
Romao Guterres	Director
Gabriel Araujo	Chief, Cadastral Information and Evaluation
Nunecio Neste	Director, Cadastral Services, Dili District Office
Horacio Da Silva	
National Directorate of Forestry, NDF	
Manuel Da Cruz	
Manuel Mendes	
Xefe Suco, Xefe Aldeia	
Eurico da Costa de Jesus	Xefe Suco Comoro
Deolindo Fernandes do Rosario	Xefe Aldeia 30 de Agosto
Jose da Costa Lopes Calau	Xefe Aldeia 4 de Stembro
Jose Soares Maia	Xefe Aldeia Foment II
Nicolau de Jesus	Xefe Aldeia Golgota
Sebastião Zeca Ximenes de Jesus	Xefe Aldeia Moris Foun
Asian Development Bank, ADB	
Frederick G. Santos	Chief Technical Advisor, Project Management Unit
Odete Genoveva V. Da Costa	Project Manager, Project Management Unit
Richard Phelps	Principal Infrastructure Specialist, Pacific Department
Ministry of Transport and Communications, APORTIL	

Hiroyuki Onishi	Advisor for Port Facility & Security
Toll Marine Logistics	
Mohd Azni (Baba)	Dili Trade Manager
Embassy of Japan	
Yoshitaka Hanada	Ambassador
Toshihide Kawasaki	Counselor
Tomotaka Yoshimura	First Secretary
JICA Timor-Leste Office	
Hirohiko Takata	Chief Representative
Atsushi Soma	Representative
Masahiro Suzuki	Representative

Appendix 4 Minutes of Discussions (M/D)

(1) Field Survey

Minutes of Discussions
on
The Preparatory Survey
on
The Project for the Construction of Upriver Comoro Bridge
in the Democratic Republic of Timor-Leste



In response to a request from the Government of the Republic of Timor-Leste (hereinafter referred to as "Timor-Leste"), the Japanese Government decided to conduct a Preparatory Survey on the Project for the Construction of Upriver Comoro Bridge (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Timor-Leste the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Dr. Nobuyuki Tsuneoka, Senior Advisor, JICA and is scheduled to stay in the country from June 18 to June 25, 2013.

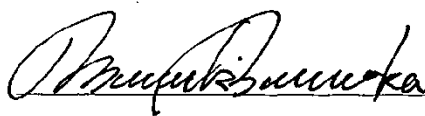
The Team held discussions with the officials concerned with the Government of Timor-Leste (hereinafter referred to as "the GoTL") and conducted a field survey in the Project area.

In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the draft final report.

Dili, 18-7-, 2013

GASTAO FRANCISCO DE SOUSA
Minister
Ministry of Public Works
The Democratic Republic of Timor-Leste



Nobuyuki TSUNEOKA
Leader
Preparatory Survey Team
Japan International Cooperation Agency

(Witness)




SANTINA J. R. F. VIEGAS CARDOSO
Vice Minister
Ministry of Finance
The Democratic Republic of Timor-Leste

ATTACHEMENT

1. Objective of the Project

The objective of the Project is to improve the connectivity of west and east part of Dili urban area, and to secure alternative access for the existing Comoro Bridge by constructing the Upriver Comoro Bridge.

2. Title of the Project

JICA requested to change the title of the Project from “Detailed Design and Construction of Upriver Comoro Bridge” to “Construction of Upriver Comoro Bridge”. The Ministry of Public Works agreed to change the title.

3. Project Site

The Project Site is located in the Comoro area which is shown in Annex-1.

4. Responsible and Implementing Organizations

4-1. The responsible organization is the Ministry of Public Works.

4-2. The implementing organization is the Directorate of Road, Bridge and Flood Control, Ministry of Public Works.

The organization charts are shown in Annex-2.

5. Confirmation of the items requested by the GoTL

After discussions with the Team, the requested components were confirmed as follows. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

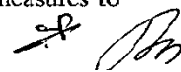
- New Bridge Construction at Comoro river
- Approach roads

The target location of the new bridge Project will be confirmed at the mission to explain the contents of draft final report.

6. Japan's Grant Aid Scheme

6-1. The Timor-Leste side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the GoTL explained by the Team as described in Annex-3 and Annex-4.

6-2. The Team explained major undertakings to be taken by each government as described in Annex-5 as a general principle of Japan's Grant Aid. However, considering the legal environment of Timor-Leste and the necessary measures to



provide a financial contribution by Timor-Leste, both sides agreed that liabilities of taxes, duties and levies with respect to the Project will remain further discussion.

7. Environmental and Social Considerations

7-1. The Team explained the outline of the JICA Guidelines for Environmental and Social Considerations (hereinafter referred to as “the JICA Guidelines”) to the Timor-Leste side. The Timor-Leste side understood the concept of the JICA Guidelines and confirmed to conduct the necessary procedure.

7-2 The Team explained the Project is categorized as “Category B” according to the JICA Guideline, since the Project is the construction of the new bridge and the approach roads, and its impact on the environment may be expected.

7-3 The Timor-Leste side understands the Project needs to follow the JICA guideline. Therefore the initial environmental examination (IEE) shall be done through the Survey.

7-4 The Timor-Leste side explained that they already obtained a basic agreement for an implementation of the Project from the Environmental Protection Agency (hereinafter referred as “EPA”) and had confirmed the concrete procedure in accordance with due process stipulated in the Environmental Assessment Regulations.


7-5 The Timor-Leste side shall obtain the Environmental Permit for the Project from EPA by the end of January 2014.

7-6. Regarding the Project Affected Persons (PAPs) within the Project sites, the Timor-Leste side agreed to secure the appropriate budget to be allocated for resettlement and compensation and secure the land before the implementation of the Project. In this regard a Resettlement Action Plan (RAP) will be prepared and approved by the responsible authorities beforehand and Ministry of Public Works will take necessary measures to PAPs according to a RAP in close communication with JICA.

8. Schedule of the Study

8-1. The Team will proceed with further studies in Timor-Leste until July 27, 2013.

8-2. JICA will prepare a draft final report in English and dispatch a mission to Timor-Leste in order to explain its contents around November 2013.



8-3. If the contents of the draft final report is accepted in principle by the Timor-Leste side, JICA will complete the final report in English and send it to Timor-Leste around March 2014.

9. Undertaking of the GoTL

The Ministry of Public Works shall, at its own expense, provide the Team with the following items in cooperation with other organizations concerned.

- (1) security-related information as well as measures to ensure the safety of the survey team;
- (2) information as well as support in obtaining medical service;
- (3) data and information related to the Preparatory Survey;
- (4) counterpart personnel;
- (5) suitable office space with necessary equipment and secretarial service;
- (6) credentials or identification cards;
- (7) entry permits necessary for the survey team members to conduct field surveys;
- (8) support in making transportation arrangements; and
- (9) support in obtaining other privileges and benefits if necessary.

10. Other Relevant Issues

10-1. (Questionnaire) The Ministry of Public Works submits answers in English to the Questionnaire with relevant documents by the end of July 2013.

10-2. (Plan of the Project) The Team explained that the Project will prepare the planning of approach roads in order to secure the access from the city center to the west side of Dili urban area.

Both sides confirmed that necessary information for an approximate estimation of the construction cost for Upriver Comoro Bridge and the approach roads would be provided by the Team and explained its result in the draft final report.

10-3. (Construction) The GoTL confirmed that the following undertakings should be taken by the Timor-Leste side at the Timor-Leste expenses under the Project if the implementation of the Project is accepted by the Government of Japan.

- (1) To secure sites for material storing yard, temporary construction yard and waste disposal for the Project.
- (2) To relocate existing utilities within the Project site to designated area.
- (3) To arrange issuance of license, permission and other necessary procedures for the Project



- 10-4. (Maintenance) The Timor-Leste side shall secure enough budget and personnel necessary for the operation and maintenance of the facilities implemented by the Project, including the periodical maintenance work after the completion of the Project.
- 10-5. (Location of Bridge) Both sides confirmed that location of the bridge would be decided considering future road development plan and area of land acquisition through successive discussion between the Timor-Leste side and the Team, and its result would be explained in the draft final report.
- 10-6. (Type of Bridge) The Team explained how to select type of the bridge by conducting hydraulic analysis, comparison of construction and cost estimates. The Timor-Leste side requested to consider the beauty of the bridge, even though it may need additional cost at its own expense in order to compensate a symbolic image and landscape of the city. Both sides confirmed that through successive discussion between the Timor-Leste side and the Team its result would be explained in the draft final report.
- 10-7. (Traffic Survey) Both sides agreed that Upriver Comoro Bridge of the Project shall be a bridge with one lane for each direction. The Team explained the importance of coordination with Dili Urban Planning Master Plan and the Team will conduct traffic survey to forecast future traffic demand for the bridge and approach roads.

Annex-1 Project Site

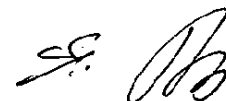
Annex-2 Organization Chart

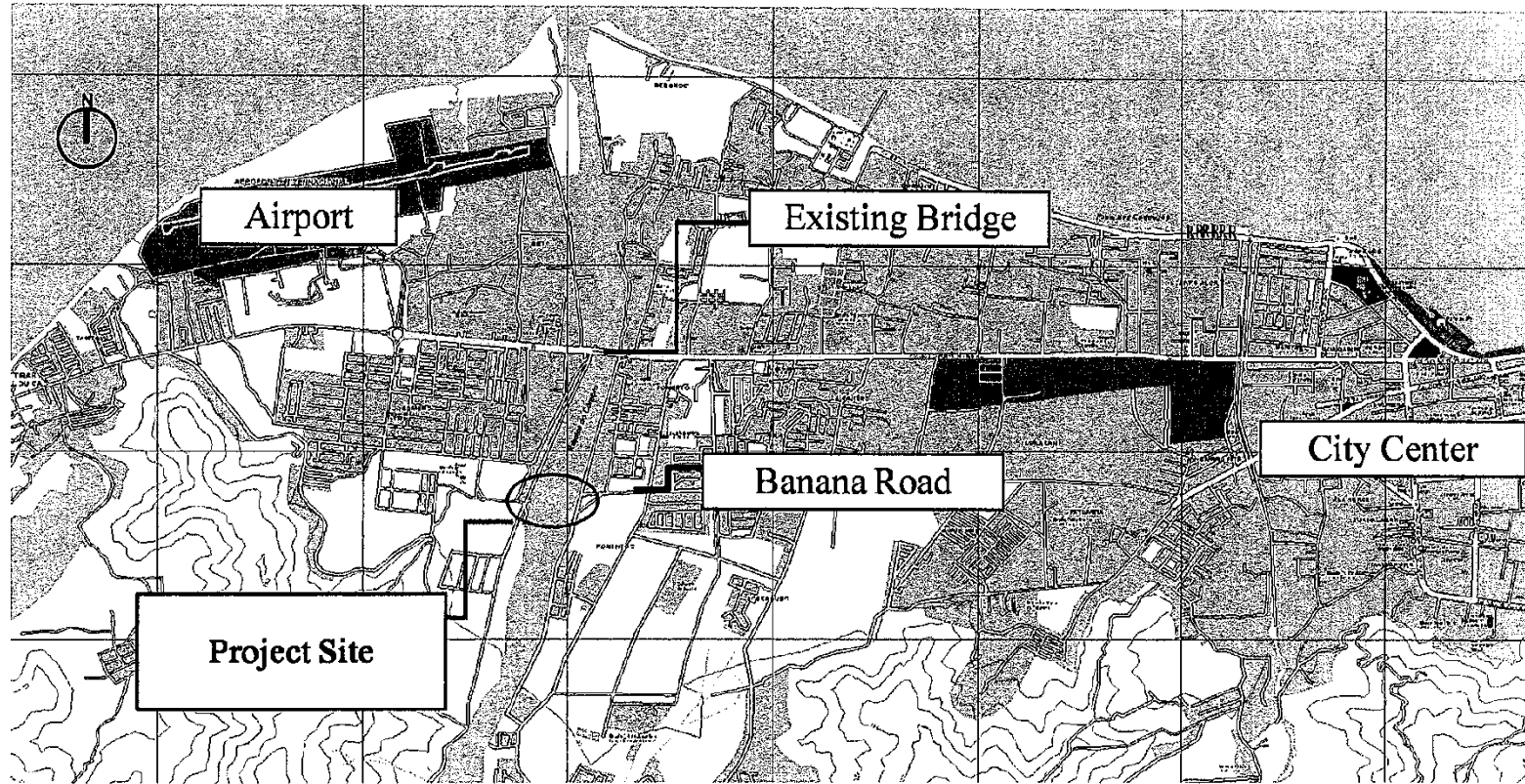
Annex-3 Japan's Grant Aid

Annex-4 Flow Chart of Japan's Grant Aid Procedures

Annex-5 Major Undertakings to be taken by Each Government

Annex-6 List of Attendants

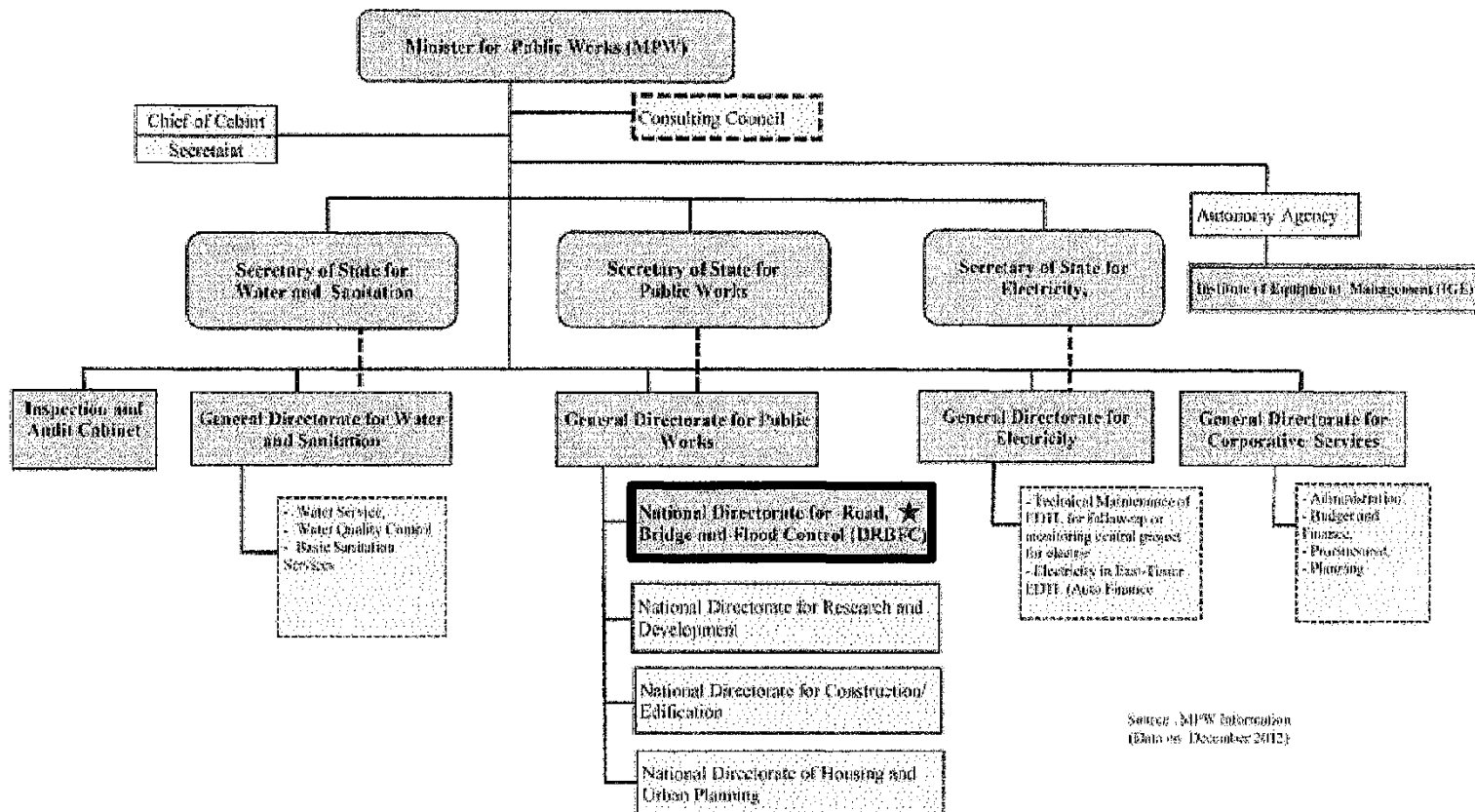




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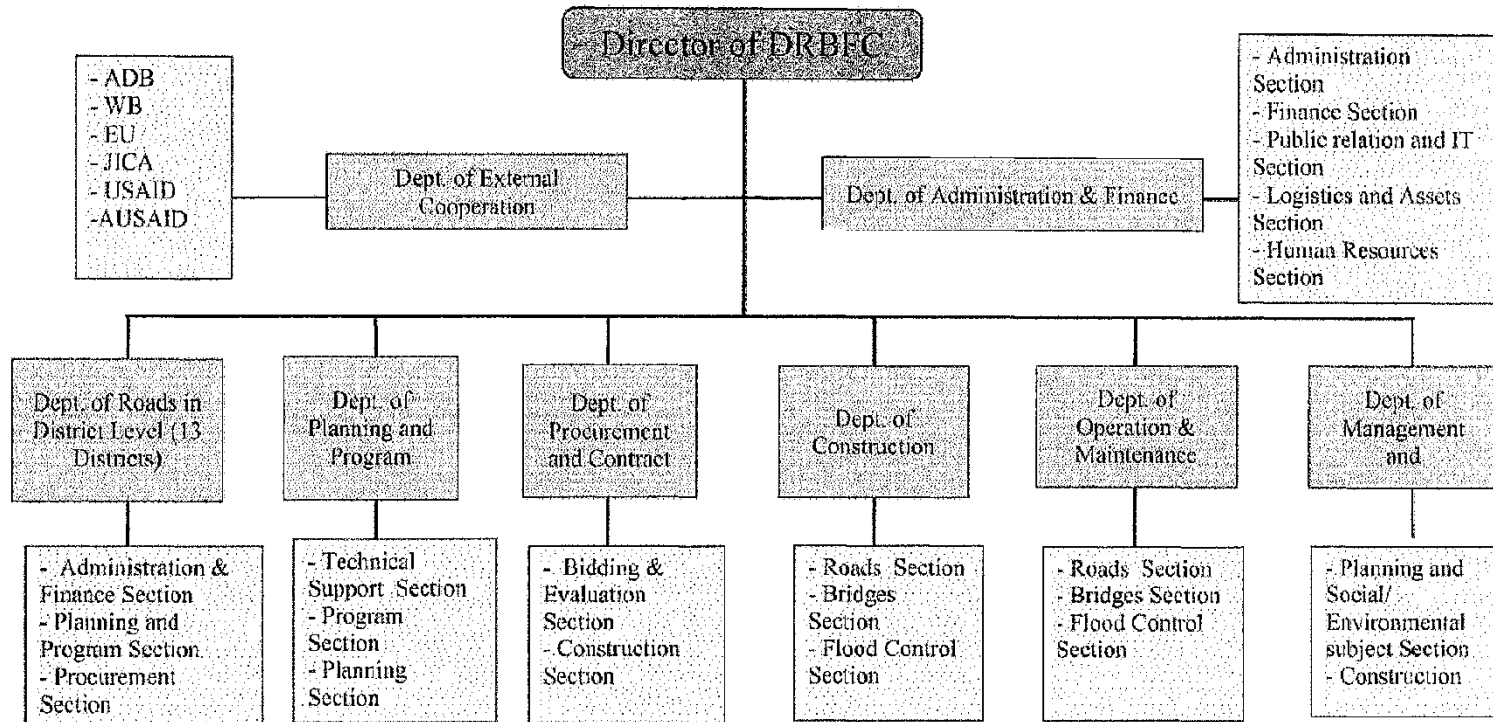
Organization Chart 1: Ministry of Public Works



Source: MPW Information (Data as December 2012)

★ = Counterpart

Organization Chart 2: DRBFC



Source : DRBFC Information (as of January 2013)

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

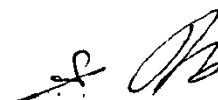
- Preparatory Survey
 - The Survey conducted by JICA
- Appraisal & Approval
 - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
 - Agreement concluded between JICA and a recipient country
- Implementation
 - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.



The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and the G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese



yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex-4.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

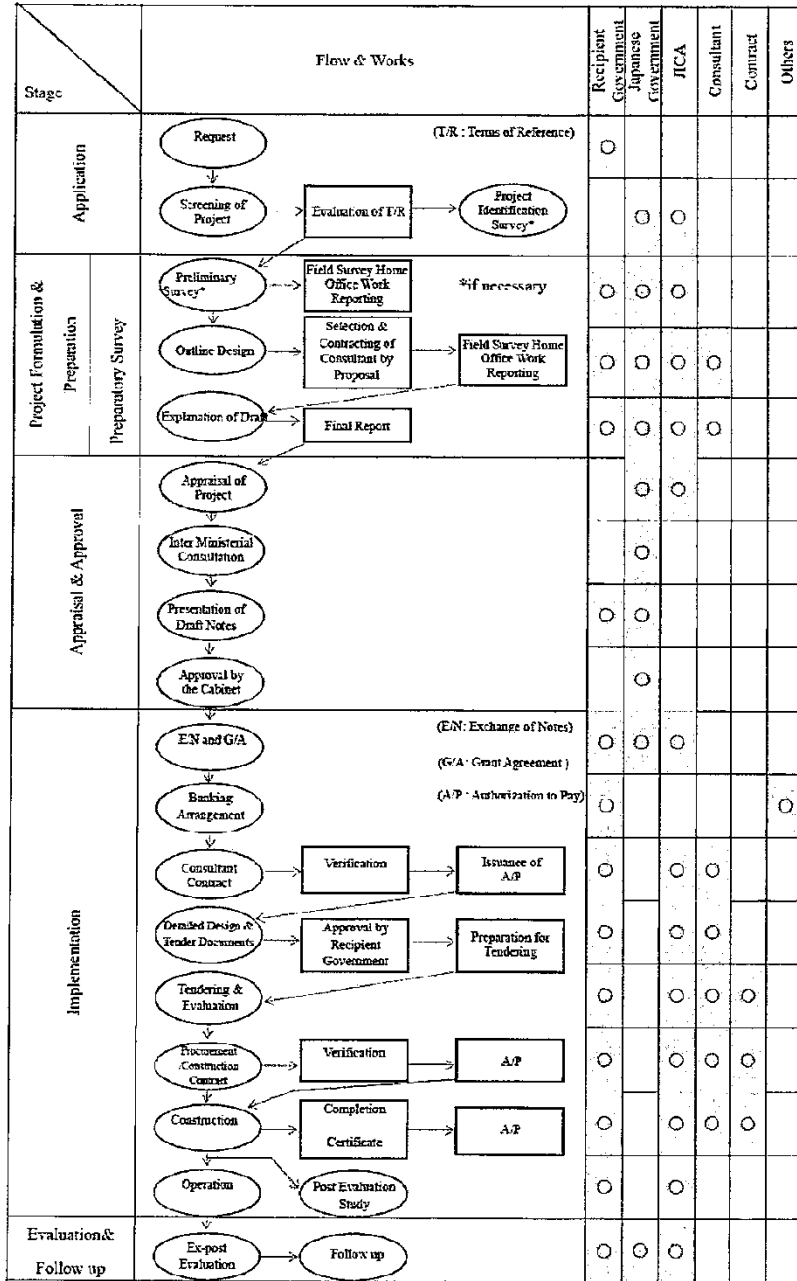
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA guidelines for environmental and social considerations.



FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure a lot of land necessary for the implementation of the Project and to clear the site.		●
2	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
4	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
5	To ensure that the facilities be maintained and used properly and effectively for the implementation of the Project		●
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
7	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●

(B/A : Banking Arrangement, A/P : Authorization to pay)



List of Attendants

<Ministry of Public Works>

Gastao Francisco de Sousa	Minister
Jose Piedade	Director General for Public Works
Antonio Raos Naikoli	Advisor
Vera Costa	Technical Advisor for Director General for Public Works

<Directorate of Road, Bridge and Flood Control>

Rui Hernani	Director of Road, Bridge and Flood Control
Milton Monteiro	Chief, Department of External Cooperation
Joao Gama	Chief, Department of Planning and Program
Abrao Vieira	Bridge Engineer
Jose A. L. S. Freitas	Road Engineer
Roberto Ugalino	Technical Advisor

<Ministry of Finance>

Cancio de Jesus Oliveira	Chief, Development Partnership Management Unit
Leny Sarmento Soares	Officer in charge of Japan, Development Partnership Management Unit
Arlindo daCruz Monterio	AIMS Manager, Development Partnership Management Unit

<National Development Agency>

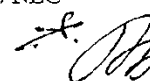
Alexandere R.B.Sarmento	Deputy Director
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<Japan International Cooperation Agency>

Nobuyuki Tsuneoka	Team Leader / Senior Advisor
Sho Takano	Project Coordinator
Atsushi Soma	Representative, JICA Timor-Leste Office

<JICA Study Team>

Hisashi Muto	Chief Consultant/Ingórosec Corporation(Isec)
Tsuyoshi Matsumoto	Bridge Planning and Design/Nippon Engineering Consultants CO.,LTD(NEC)
Makoto Kodama	River Planning/IDEA Consultants INC.
Makoto Matsuura	Road Design/ Isec
Ayako Nakagawa	Environmental and Social Consideration/ Isec
Jun Nakamura	Environmental and Social Consideration/ NEC



(2) Outline Explanation of the Preparatory Survey

Minutes of Discussion
on
the Preparatory Survey
on
The Project for Construction of Upriver Comoro Bridge
in the Democratic Republic of Timor-Leste
(Explanation on Draft Final Report)

In June 2013, Japan International Cooperation Agency (hereinafter referred to as “JICA”) dispatched the Preparatory Survey Team on the Project for Construction of Upriver Comoro Bridge in the Democratic Republic of Timor-Leste (hereinafter referred to as the “**Project**”) to the Democratic Republic of Timor-Leste (hereinafter referred to as “**Timor-Leste**”), and through discussions, field surveys and technical examination of the results of the survey in Japan, JICA prepared a Draft Final Report of the Outline Design.

In order to explain and consult with concerned officials of the Government of Timor-Leste, on the component of the Draft Final Report, JICA sent to Timor-Leste the Preparatory Survey Team for Draft Final Explanation (hereinafter referred to as the “**Team**”), which is headed by Dr. Nobuyuki TSUNEOKA from the 20th of January to the 23rd of January, 2014.

As a result of the discussion, both sides confirmed the main items described in the attachment.

Dili, 22nd of January, 2014

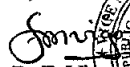



Nobuyuki TSUNEOKA
Leader
Preparatory Survey Team
Japan International Cooperation Agency



Gastao Francisco de Sousa
Minister of Public Works
Government of the Democratic Republic of
Timor-Leste

(witness)

Santina J. R. F. Viegas Cardoso
Vice-Minister of Finance
Government of the Democratic Republic of
Timor-Leste

ATTACHMENT

1. Project Components

After the explanation of the contents of Draft Final Report by the Team, Timor-Leste side agreed in principle to the project components.

2. Japan's Grant Aid Scheme

- (1) Timor-Leste side confirmed the Japan's Grand Aid scheme and the necessary measures to be taken by Timor-Leste side as explained by the Team as described in Annex 3 and 4 of the Minutes of Discussion signed by both sides on the 18th of July, 2013.
- (2) The Team explained major undertakings to be taken by each government as described in Annex-1 as a general principle of Japan's Grant Aid. However, considering the legal environment of Timor-Leste and the necessary measures to provide a financial contribution by Timor-Leste, both sides agreed that liabilities of taxes, duties and levies with respect to the Project will remain subject to further discussion.

3. Schedule of the Study

JICA will complete the Final Report and send it to the Government of Timor-Leste by the end of February, 2014.

4. Project Cost

Timor-Leste side was informed that the Project cost should not exceed the upper limit of amount agreed on in the Exchange of Notes (E/N) and the Grant Agreement (G/A) and understood that the Project Cost Estimate attached as Annex-2 is not final and is subject to change by the result of examination through revision of the Outline Design.

5. Environment and Social Considerations

- (1) Timor-Leste side explained the IEE study report will be submitted to the National Directorate of Environment (NDE) of the Ministry of Commerce, Industry and Environment from the National Directorate of Road, Bridge and Flood Control (DRBFC) by the middle of November 2014 and the approval by NDE will be obtained within 30 business days from the submission. The Team explained that the approval should be obtained prior to the E/N for the construction stage.
- (2) Both sides agreed on the contents of environmental checklist as shown in Annex-3.



- (3) Both sides agreed to monitor the procedures in accordance with the monitoring forms shown in Annex-4.
- (4) Timor-Leste side confirmed that the result of environmental monitoring will be provided to JICA as a part of Monthly Progress Report by filling in the monitoring form attached as Annex-4 on a quarterly basis until the completion of the project.
- (5) Timor-Leste side confirmed it will take stipulated procedures for information disclosure in accordance with Decree Law on Environmental Licensing No.5/2011. In addition, JICA requested Timor-Leste side to disclose the monitoring results to local Project stakeholders, and Timor-Leste side agreed to disclose monitoring results on their website / in their field offices.

6. Maintenance of the Project Structures

The Team explained the necessary cost for the maintenance of the structure as shown in Chapter 6 of the Draft Final Report. Timor-Leste side confirmed that the cost will be secured in the annual budget.

7. Confidentiality of the Project

Timor-Leste side agreed that all the information related to the Project such as detailed drawings, specifications, and the result of cost estimate shall not be released to a third party before conclusion of all the contract(s) for the Project, because they are confidential documents that contain information related to the tender.

8. Other Issues

- (1) Both sides confirmed that the following undertakings should be taken by the Timor-Leste side at its own expense under the Project.
 - 1) To acquire the land in accordance with the boundary peg installed by the consultant in the detailed design phase.
 - 2) To assign person(s) in charge of land acquisition and involuntary resettlement and to establish the necessary team for the preparation and implementation of Abbreviated Resettlement Action Plan (ARAP) until the completion of resettlement.
 - 3) To install the permanent electric distribution boards for street lights installed in the Project.
 - 4) To restrict the gravel extraction which is being implemented around the bridge site in the Comoro River in order to prevent the scouring and protect the bridge substructures.



(2) Timor-Leste side agreed that the resettlement agreement between all PAPs (Project Affected Persons) and the Government of Timor-Leste and the completion of relocation work for all affected utilities are a condition to proceeding to the signing of E/N for the construction stage.

(3) Both sides agreed that the width of Right of Way (ROW) for Section 2-1 and Section 3 where the land acquisition is required will be 25m.

<List of Annex>

- Annex-1 Major undertakings to be taken by each Government
- Annex-2 Project Cost Estimate (Confidential)
- Annex-3 Environmental Check List
- Annex-4 Monitoring Form



Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure a lot of land necessary for the implementation of the Project and to clear the site.		●
2	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
4	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
5	To ensure that the facilities be maintained and used properly and effectively for the implementation of the Project		●
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
7	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

To be discussed further by both parties.




Project Cost Estimate (Confidential)

(1) Project Cost to be Borne by Japan's Grant Aid

This Part is concealed for the confidentiality.

(2) Initial Cost to be Borne by Timor-Leste Side
Approximately 2,628 Thousand USD

(Unit: Thousand USD)

Components	Cost
Environmental and Social Considerations including Land Acquisition	2,197
Relocation of Existing Utilities	12
Securing/Clearance of Temporary Construction Yard	40
Others	3,886
Total	6,235

(3) Condition for Estimate

- 1) Point of estimation: July 2013
- 2) USD exchange rate: 1US\$=99.77 yen
- 3) Implementation period: 26.5 months
- 4) Other: The Project will be implemented under the Grant Aid scheme of the Government of Japan. The Cost is subject to change by further examination.




Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explana tion	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) EIA/IEE will be prepared by National Directorate of Road, Bridge and Flood Control (DRBFC) and submitted to National Directorate of Environment (NDE) during detailed design period. (b) EIA/IEE is expected to be approved by NDE during detailed design period. (c) Conditions imposed on the approval of EIA/IEE reports are not expected. (d) Environmental License is required to implement the project. For category B project, IEE and Environmental Management Plan (EMP) need to be submitted to NDE for the issue of license. Environmental License application form and Project Document will be submitted during the preparatory survey for the categorization according to the criteria of Government of Timor-Leste (GoTL). Cutting of affected trees will be approved based on the confirmation at the project site by National Directorate of Forestry (NDF).
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) Survey kick-off meeting and Stakeholder consultation were held and sufficient information disclosure at the preparatory survey phase was conducted. Understanding and support from the local stakeholders were confirmed through the meeting and consultation. (b) Information and comments from village chief and other stakeholders have been reflected on the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Alternative plans have been examined in terms of social and environmental aspects such as potential number of households required resettlement and trees to be cut etc.
2 Pollutio n Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken? (b) If air quality already exceeds country's standards near the route, is there a possibility that the project will make air pollution worse?	(a) Y (b) N	(a) Since GoTL has not established air quality standard yet, voluntary measures to minimize the impact by the construction vehicle will be taken. Since majority of the existing roads in the project area are not paved, watering can minimize the impact by dust. (b) Currently air quality issues are not observed in the project site and significant adverse effect on the neighborhood are not expected during construction.

	(2) Water Quality	<p>(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?</p> <p>(b) Is there a possibility that the project will contaminate water sources, such as groundwater?</p> <p>(c) Do effluents from various facilities, such as parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas not to comply with the country's ambient water quality standards?</p>	<p>(a) N</p> <p>(b) N</p> <p>(c) N</p>	<p>(a) Sediment control measures will be taken during the construction to prevent water quality degradation.</p> <p>(b) Since surface runoff will be treated to prevent water contamination, it is not expected that contaminated water will be infiltrated and affect groundwater.</p> <p>(c) Facilities such as parking areas/service will not be constructed.</p>
	(3) Wastes	<p>(a) Are wastes generated from the project facilities, such as parking areas/service areas, properly treated and disposed of in accordance with the country's regulations?</p>	<p>(a) N</p>	<p>(a) Facilities such as parking areas/service will not be constructed.</p>
	(4) Noise and Vibration	<p>(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?</p> <p>(b) Do low frequency sound from the vehicle and train traffic comply with the country's standards?</p>	<p>(a) N</p> <p>(b) N</p>	<p>(a) (b) Since GoTL has not established standards for noise, vibration, and low frequency sound, voluntary countermeasures will be taken to minimize the impact. Also, construction method will be carefully selected to prevent nuisance to local community.</p>
3 Natural Environment	(1) Protected Areas	<p>(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?</p>	<p>(a) N</p>	<p>(a) The project site is not located in protected areas and negative influence is not expected on the protected areas.</p>
	(2) Ecosystem	<p>(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?</p> <p>(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?</p> <p>(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on</p>	<p>(a) N</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p> <p>(e) N</p>	<p>(a) (b) Since the project site is located in the City of Dili, it does not encompass valuable habitats and endangered species.</p> <p>(c) Due to the reason listed above, significant ecological impacts are not expected.</p> <p>(d) Habitat migration routes of wildlife have not been identified in the project area. Since some households have livestock such as pigs and chickens, advance notice of construction schedule will be provided to the residents in the project site to protect them as needed.</p> <p>(e) Since the project site is located in the City of Dili, extensive loss of natural habitat such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of non-native</p>

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		<p>the ecosystem?</p> <p>(d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock?</p> <p>(e) Is there a possibility that installation of bridges and access roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?</p> <p>(f) In cases the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?</p>	(f) N	<p>species and pest are not expected.</p> <p>(f) Even though there are some possibilities for new developments due to the construction of bridge and access roads, they are not expected to provide significant negative impacts on natural habitat due to the existing urbanized natural conditions.</p>
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the installation of structures will adversely affect surface water and groundwater flows?	(a) N	(a) Since appropriate drainage structures will be installed by the construction of bridge and access roads, adversely effects will not be expected.
	(4) Topography and Geology	<p>(a) Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?</p> <p>(b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides?</p> <p>(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?</p>	<p>(a) N</p> <p>(b) N</p> <p>(c) N</p>	<p>(a) (b) Adequate countermeasures will be taken to prevent slope failures and landslides. Slope protection measures will be selected based on the steepness of the slope and soil conditions.</p> <p>(c) Adequate countermeasures such as silt fence installation during construction will be considered in detailed design and will be implemented during the construction.</p>
4 Social Environment	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on</p>	<p>(a) Y</p> <p>(b) Y</p>	<p>(a) The number of Project Affected Units (PAUs) and Affected Persons (APs) will be minimized through the consideration of road alignment and width configuration.</p> <p>(b) Public consultation will be held at the beginning of detailed design in April 2014 and assistance and consultation will be provided for affected people prior to resettlement.</p> <p>(c) Preliminary socioeconomic status (SES) survey has been conducted during preparatory survey to prepare a draft of</p>

	<p>compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?(d) Are the compensations going to be paid prior to the resettlement?</p> <p>(e) Are the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p>	<p>(c)Y</p> <p>(d)Y</p> <p>(e)Y</p> <p>(f)Y</p> <p>(g)Y</p> <p>(h)Y</p> <p>(i) Y</p> <p>(j) Y</p>	<p>abbreviated resettlement plan (ARAP) including preliminary cost estimate and livelihoods rehabilitation. Final survey will be conducted during detailed design phase.</p> <p>(d) (e) Compensation policies will be indicated in ARAP including schedule of land expropriation which aims for completion of payment of compensation prior to the construction.</p> <p>(f) Vulnerable groups or people will be identified through SES survey and measures will be taken based on the results as needed and included in ARAP.</p> <p>(g) Public consultation will be conducted at the beginning of detailed design in April 2014 and it aims for the agreements with APs prior to resettlement.</p> <p>(h) In the preparatory survey, the framework, capacity and budget will be identified and budget will be secured accordingly.</p> <p>(i) Monitoring plan will be prepared during the preparatory survey and included in ARAP.</p> <p>(j) The grievance redress mechanism has been identified through the interviews in the preparatory survey.</p>
(2) Living and Livelihood	<p>(a) Where bridges and access roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?</p> <p>(b) Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce</p>	<p>(a) N</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p> <p>(e) N</p> <p>(f) N</p>	<p>(a) Negative impacts on the existing means of transportation and associated workers as well as significant impacts will not be expected. Adequate measures will be taken for PAUs and APs to secure their livelihood.</p> <p>(b) Adversely effect on the living conditions of the residents outside the project area will not be expected.</p> <p>(c) Adequate measures will be taken to prevent diseases for the workers during construction.</p> <p>(d) (e) Traffic control measures will be taken to prevent congestion, accidents and inconvenience for the local residents due to the construction.</p> <p>(f) Sun shading and radio interference will not be expected due to the construction.</p>

		<p>the impacts, if necessary?</p> <p>(c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p> <p>(d) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)?</p> <p>(e) Is there any possibility that project will impede the movement of inhabitants?</p> <p>(f) Is there any possibility that bridges will cause a sun shading and radio interference?</p>		
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) Even though gate of religious place (Ave Maria) will be relocated due to the construction, adequate measures will be taken to minimize the impact according to the rules of local community and church.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Adversely effects will not be expected on the local landscape. Proposed street planting will improve the local streetscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a)(b) Ethnic minorities and indigenous people have not been identified in the project area.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents,	(a) Y (b) Y	(a) The project proponent will not violating any laws and ordinances. (b) Safety considerations will be in place for individuals involved in the project.

		and management of hazardous materials?		
		(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(c) Y (d) Y	(c) Intangible measures will be planned and implemented for individuals involved in the project. (d) Appropriate measures will be taken to ensure security during construction.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a)(b) Adequate measures will be considered and reflected on EMP to implement the project in an appropriate manner. (c) Adequate measures will be considered and reflected on EMP and ARAP to implement the project in an appropriate manner.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system	(a) Y (b) Y (c) Y (d) Y	(a)(b) EMP will be prepared and monitoring methods and frequencies will be indicated in EMP. (c) Adequate monitoring framework will be identified and established through the preparation of EMP. (d) Project proponent will submit the monitoring report to NDE every 6 months.

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		identified, such as the format and frequency of reports from the proponent to the regulatory authorities?		
6 Note	Reference to Checklist of Other Sectors	<p>(a) Where necessary, pertinent items described in the Roads, Railways and Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation).</p> <p>(b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).</p>	(a) N (b) N	<p>(a) The project will not include large areas of deforestation and adverse effects on roads and railways.</p> <p>(b) The project will not include installation of power transmission lines and/or distribution facilities.</p>
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Significant negative effects on transboundary and/or global issues will not be expected.

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Monitoring Form

(1) Pre-Construction Period

1) Involuntary Resettlement and Land Acquisition

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organization
			Achievement until last month	Achievement of this month	Planned Achievement of next month	Achievement until last month	Achievement until the end of this month		
Formulation of PMU									DRBFC
Employment of Consultants		Man-month							
Organize ARP Implementing Committee									
Organize Property Valuation Team									
Organize Social Safeguard Team									
Preparation of ARAP									DRBFC
Implementation of Socio-Economic Status Survey (including Census Survey)									
Revise draft of ARAP									
Approval of ARAP			Date of Approval:						
Preparation of Summary in local language									
Implementation of ARAP									DRBFC
Finalization of AP's List		No. of PAPs							
Inform Cut-off Date									
Individual consultation with AP to finalize the amount of compensation									
Allocation of budget for payment of compensation									
Open bank account to secure the amount of compensation on behalf of PAS									
Progress of Compensation Payment for Immovable Assets (Structures, Plants etc.)		No. of HH's							
Lot 1									

Lot 2										
Lot 3										
...										
Progress of Land Acquisition (All Lots)			ha							
Lot 1			ha							
Lot 2			ha							
Lot 3			ha							
...										
Progress of Compensation Payment for Livelihoods			No. of APs							
PAP1										
PAP2										
PAP3										
...										
Progress of Movable Asset Relocation (All Lots)			No. of HH's							
Lot 1			No. of HH's							
Lot 2			No. of HH's							
Lot 3			No. of HH's							
...										
Progress of Relocation of Infrastructure										
water										
electricity										
telecommunication										
Progress of Relocation of APs (All Lots)			No. of HH's							
Lot 1			No. of HH's							
Lot 2			No. of HH's							

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Lot 3			No. of HH's							
• • •										
Hosting Public Consultation										DRBFC
Inform APs in advance for the date and venue										
Prepare information materials										
Hosting Stakeholder Meeting										DRBFC
Organize Inter-Ministerial Working Group										
Prepare information materials										

2) Public Consultation

No.	Date	Place	Attendees	Contents of the consultation: Main comments and answers
1				
2				
3				

3) Stakeholder Meeting

No.	Date	Place	Attendees	Contents of the consultation: Main comments and answers
1				
2				
3				

4) Preparation of Resettlement Sites (where necessary)

No.	Explanation of the site (e.g. Area, no. of resettlement HH, etc.)	Status (Completed (date)/not completed)	Details (e.g. Site selection, identification of candidate sites, discussion with PAPs, Development of the site etc.)	Expected Date of Completion
1				
2				
3				

(2) Construction Period

The latest results of the below monitoring items shall be submitted to JICA and DRBFC throughout the construction period.

1) Response and Actions to the Comments

Responsible Organization: DRBFC




Category of Correspondent	Name of Correspondent	Date of Comment	Contents of Comment	Date of Response	Contents of Response	Date of Action	Contents of Action
Public	Chief of Village						
Public	Chief of Alderia						
Government							

*Add comments from the local residents as necessary

2) Environmental Pollution

Responsible Organization: DRBFC

Supervision Organization: NDE

- Water Quality

Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standards	Standards for the Project	International Standards	Date	Measurement Point	Frequency
ph	-			N/A					every 4 month
BOD	mg/l			N/A					
COD	mg/l			N/A					
SS	mg/l			N/A					

- Air Quality (Ambient Air Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standards	Standards for the Project	International Standards	Date	Measurement Point	Frequency
Dust				N/A					every 4 month

- Noise

Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standards	Standards for the Project	International Standards	Date	Measurement Point	Frequency
Noise Level	dB(A)			N/A					every 4 month

- Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standards	Standards for the Project	International Standards	Date	Measurement Point	Frequency
Vibration Level	dB(A)			N/A					every 4 month

3) Accident

Responsible Organization: DRBFC

Monitoring Item	Location	Date	Numbers of Injuries	Damage of Equipment	Details of Accidents including amount of compensation	Prevention measures	Frequency
Accident							monthly

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(3) Operation Period

The latest results of the below monitoring items shall be submitted to JICA and DRBFC for the first 3 years of operation.

1) Response and Actions to the Comments

Responsible Organization: DRBFC

Category of Correspondent	Name of Correspondent	Date of Comment	Contents of Comment	Date of Response	Contents of Response	Date of Action	Contents of Action
Public	Chief of Village						
Public	Chief of Alderia						
Government							

*Add comments from the local residents as necessary

2) Environmental Pollution

- Water Quality

Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standards	Standards for the Project	International Standards	Date	Measurement Point	Frequency
ph	-			N/A					every 4 month
BOD	mg/l			N/A					
COD	mg/l			N/A					
SS	mg/l			N/A					

- Noise

Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standards	Standards for the Project	International Standards	Date	Measurement Point	Frequency
Noise Level	dB(A)			N/A					every 4 month

- Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max)	Country's Standards	Standards for the Project	International Standards	Date	Measurement Point	Frequency
Vibration Level	dB(A)			N/A					every 4 month

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Appendix 5 Other Relevant Data (Technical Note)



Date: 4th July 2013

Mr. Rui GUTERRES
Director of Road and Bridge
Ministry of Public Works (MOPW)

Dear Sir

**RE: THE PREPARATORY SURVEY FOR THE CONSTRUCTION OF UPRIVER COMORO
BRIDGE IN THE DEMOCRATIC REPUBLIC OF TIMOR-LESTE**
**SUB: CONFIRMATION OF TECHNICAL NOTE TO BE USED FOR THE
PROJECT**

We are very pleased to confirm the Technical Note for the key design value to be used for the captioned project. The values on the Technical Note is based upon the result of the series of discussions carried out between MOPW, Japan International Cooperation Agency (JICA) Survey Team and other concerned agencies during the field survey in Timor-Leste.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Hisashi Muto', written over a horizontal line.

Hisashi MUTO
Chief Consultant
Preparatory Survey for the Construction of
Upriver Comoro Bridge
Consortium of Ingérosec Corporation, Nippon
Engineering Consultants Co., LTD. and IDEA
Consultants, Inc.

Attachment : Memorandum of Technical Note

CC; Representative, JICA Timor-Leste Office

Handwritten initials 'T.M.' and a signature in black ink.

Memorandum

15-July, 2013

Subject: Technical note of Design Value to be used for The Preparatory Survey for the Construction of Upriver Comoro Bridge

The JICA Preparatory Survey Team will propose the following principal standard for the design of captioned project.

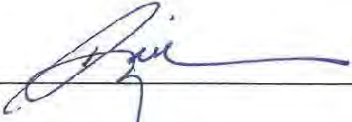
Description		Units	Value
Road			
Design Forecast Year		-	10 years
Design Speed		Km/hr	60 (Partially 40)
No. of Lanes		No.	2 (Provisional)
Carriageway width		m	3.5 / direction
Shoulder width		m	0.5~1.0
Footpath width		m	1.0~2.0 (depend on other facilities)
Cross Slope on Carriageway		%	2.5
Maximum Superelevation		%	8
Maximum Gradient		%	5 (Partially 11)
Minimum Gradient		%	0.5
Minimum Radius of Horizontal Curve		m	113 (Partially 43)
Crest Vertical Curve		K-value	11 (Partially 4)
Sag Vertical Curve		K-value	18 (Partially 9)
Fill Slope	Granular soil	Angle	1:1.5~2.0 (depend on soil type)
Cut Slope	Hard Rock	Angle	1:0.2~0.5
	Other than Rock	Angle	1:1.0~1.5 (depend on soil type)
Pavement Design Life		-	10 years
Pavement Type (Carriageway)		-	Asphaltic Concrete Surface
Upriver Comoro Bridge			
Design Forecast Year		-	50 years
Live load		-	HS20-44-25%(Alias HS25)
Peak Base Acceleration		-	0.25g
Carriageway width		m	3.5 / direction


Sheet 1/2

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The Preparatory Survey for the Construction of Upriver Comoro Bridge in the Democratic Republic of Timor-Leste
 JICA Survey Team

Shoulder width	m	0.5
Footpath width	m	0.75~2.0
<p>Note:</p> <p>1) Proposed Bridge Location and Road Alignment</p> <p>Proposed bridge location and road alignment are shown in the Figure-1 in comparison to the alternatives. Considering the function of the new bridge and access road, the alternative route 2 is recommended.</p> <p>As the new bridge and access road are planned to be expanded from 2 lanes to 4 lanes by Timor-Leste's side in the future, the new bridge in this project should be constructed at the downstream side to minimize the land acquisition and resettlement by this project.</p> <p>2) Major Intersections</p> <p>Location of major intersections to be considered is shown in the Figure-1</p> <ul style="list-style-type: none"> - A roundabout is considered for Intersection No.1 considering the future traffic flow and the accessibility to Banana Road and the other roads. - At grade intersections are considered for Intersections No.2 and No.3 considering the limited land and the connection with the crossing bank roads. - A roundabout is considered for Intersection No.4 considering the accessibility to the airport. - Channelized intersections are considered for Intersections No.5 and No.6 considering the limited land and the road function of new road and the existing road. <p>3) Proposed Cross Section</p> <p>Each proposed typical cross section is shown in the Figure-1 taking into consideration the future expansion by Timor-Leste's side.</p> <p>4) Accessory facilities</p> <p>Planting street trees at the footpath and the installation of drainages along the new road is recommended considering the function and appearance of new road as an urban trunk road.</p>		


 Rui Hernani Freitas GUTERRES
 Director of Roads, Bridges and Flood
 Control
 Ministry of Public Works
 Democratic Republic of Timor-Leste


 for
 Hisashi MUTO
 Chief Consultant of JICA Survey Team
 Preparatory Survey for the Construction of
 Upriver Comoro Bridge
 Consortium of Ingérosec Corporation,
 Nippon Engineering Consultants Co., LTD.
 and IDEA Consultants, Inc.

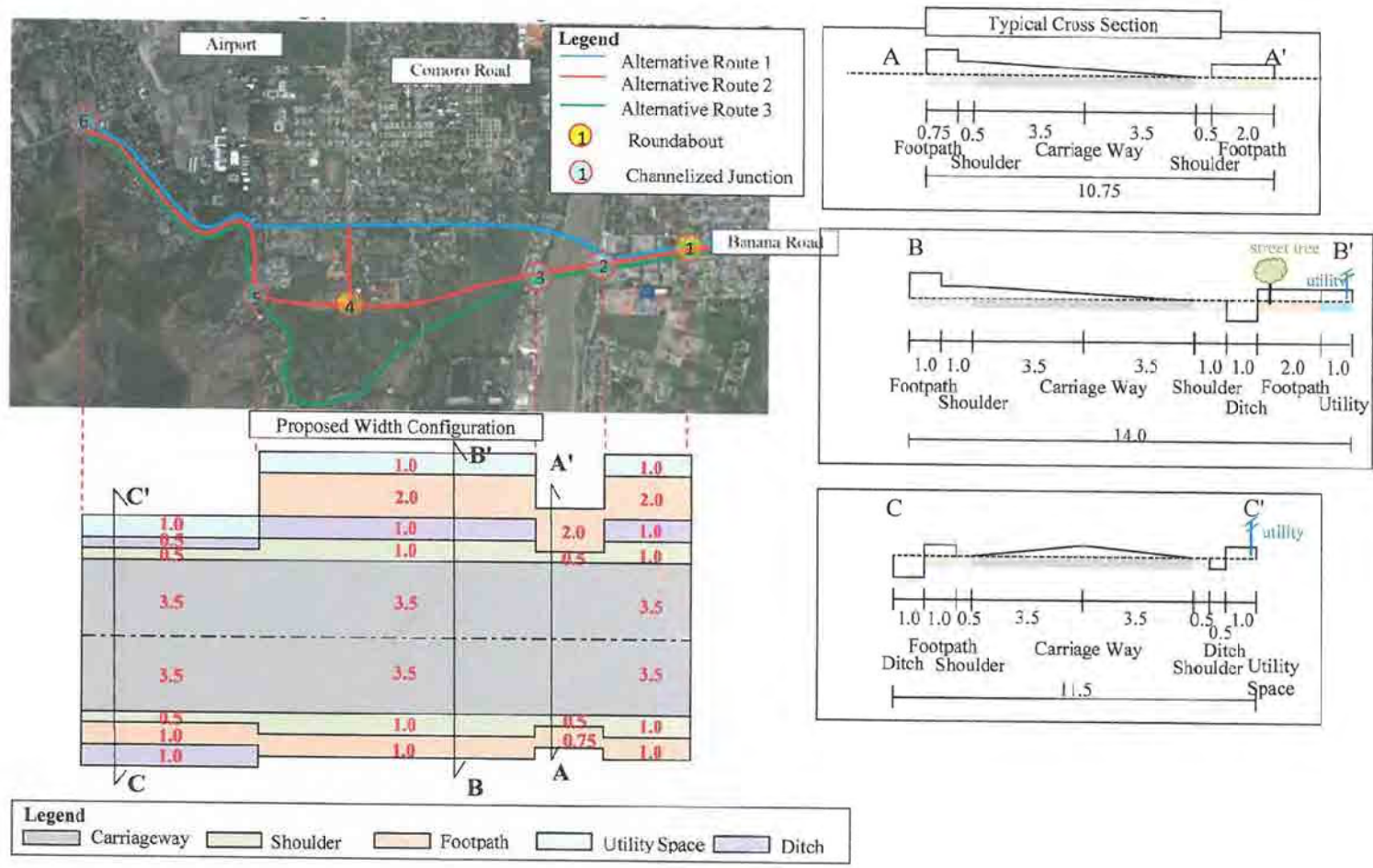


Figure-1

Appendix 6 References

6-1 Result of Traffic Survey

Date										Guidance Diagram										
Survey Date		Month			Year					To West										
4		7			2013															
Survey Point Name										To East										
West side of Existing Comoro Bridge																				
Direction1 From East										To East										
to West																				
Direction2 From West										To East										
to East																				
direction	Direction 1										Direction 2									
	Type of Vehicle					Total *1	Truck+ Trailer *2	Comm ercial Vehicle Ratio *2/*1 [%]	Total /Daily Traffic [%]	Type of Vehicle					Total *1	Truck+ Trailer *2	Comm ercial Vehicle Ratio *2/*1 [%]	Total /Daily Traffic [%]		
Motorc ycle	Passen ger Car	Bus	Truck	Trailer	Motorc ycle					Passen ger Car	Bus	Truck	Trailer							
Time	[Veh]	[Veh]	[Veh]	[Veh]	[Veh]	[Veh]	[Veh]	[%]	[%]	[Veh]	[Veh]	[Veh]	[Veh]	[Veh]	[Veh]	[Veh]	[%]	[%]		
07:00-08:00	1,750	175	161	54	1	2,141	55	2.6%	11.2%	850	683	188	41	0	1,762	41	2.3%	8.5%		
08:00-09:00	1,350	180	89	79	3	1,701	82	4.8%	8.9%	950	798	332	104	2	2,186	106	4.8%	10.5%		
09:00-10:00	1,200	195	99	105	5	1,604	110	6.9%	8.4%	620	485	130	92	6	1,333	98	7.4%	6.4%		
10:00-11:00	1,060	205	86	96	5	1,452	101	7.0%	7.6%	390	450	100	111	6	1,057	117	11.1%	5.1%		
11:00-12:00	1,200	190	88	128	4	1,610	132	8.2%	8.4%	450	461	90	118	3	1,122	121	10.8%	5.4%		
12:00-13:00	1,200	170	98	97	2	1,567	99	6.3%	8.2%	580	675	88	102	1	1,446	103	7.1%	7.0%		
13:00-14:00	912	180	90	87	4	1,273	91	7.1%	6.6%	1,200	860	99	75	3	2,237	78	3.5%	10.8%		
14:00-15:00	1,150	185	105	90	5	1,535	95	6.2%	8.0%	950	700	95	103	5	1,853	108	5.8%	8.9%		
15:00-16:00	1,120	185	81	76	7	1,469	83	5.7%	7.7%	1,140	526	85	77	6	1,834	83	4.5%	8.8%		
16:00-17:00	1,130	180	107	98	4	1,519	102	6.7%	7.9%	1,120	550	91	99	4	1,864	103	5.5%	9.0%		
17:00-18:00	1,200	185	108	102	3	1,598	105	6.6%	8.3%	1,090	660	114	90	0	1,954	90	4.6%	9.4%		
18:00-19:00	1,300	235	84	77	0	1,696	77	4.5%	8.8%	1,230	729	80	75	2	2,116	77	3.6%	10.2%		
Total	14,572	2,265	1,196	1,089	43	19,165	1,132	5.9%	100.0%	10,570	7,577	1,492	1,087	38	20,764	1,125	5.4%	100.0%		
direction	Direction Total																			
	Type of Vehicle					Total *1	Truck+ Contai ner truck *2	Comm ercial Vehicle Ratio *2/*1 [%]	Total /Daily Traffic [%]											
Motorc ycle	Passen ger Car	Bus	Truck	Trailer																
Time	[car]	[car]	[car]	[car]	[car]	[car]	[car]	[%]	[%]											
07:00-08:00	2,600	858	349	95	1	3,903	96	2.5%	9.8%											
08:00-09:00	2,300	978	421	183	5	3,887	188	4.8%	9.7%											
09:00-10:00	1,820	680	229	197	11	2,937	208	7.1%	7.4%											
10:00-11:00	1,450	655	186	207	11	2,509	218	8.7%	6.3%											
11:00-12:00	1,650	651	178	246	7	2,732	253	9.3%	6.8%											
12:00-13:00	1,780	845	186	199	3	3,013	202	6.7%	7.5%											
13:00-14:00	2,112	1,040	189	162	7	3,510	169	4.8%	8.8%											
14:00-15:00	2,100	885	200	193	10	3,388	203	6.0%	8.5%											
15:00-16:00	2,260	711	166	153	13	3,303	166	5.0%	8.3%											
16:00-17:00	2,250	730	198	197	8	3,383	205	6.1%	8.5%											
17:00-18:00	2,290	845	222	192	3	3,552	195	5.5%	8.9%											
18:00-19:00	2,530	964	164	152	2	3,812	154	4.0%	9.5%											
Total	25,142	9,842	2,688	2,176	81	39,929	2,257	5.7%	100.0%											

6-2 Result of Population Census

	Name of Alderia					Total
	Foment 2	30 de Agosto	4 de Setembro	Golgota	Moris Foun	
Female	39	3	63	16	17	138
Male	32	3	62	17	23	137
Age (0-9)	18	0	37	9	4	68
Age (10-19)	25	2	29	7	7	70
Age (20-29)	14	1	30	4	19	68
Age (30-39)	8	0	18	9	6	41
Age (40-49)	4	2	6	1	2	15
Age (50-59)	0	0	2	1	1	4
Age (60-69)	1	0	1	0	0	2
Age (70-79)	0	0	0	1	0	1
Age(unidentified)	1	1	2	1	1	6
Timorese	71	6	125	33	40	275
Foreigner	0	0	0	0	0	0
# of household (HH); PAU	13	2	24	7	9	55
Ave. # of HH members	5.5	3.0	5.2	4.7	4.4	5.0
Total Population	71	6	125	33	40	275

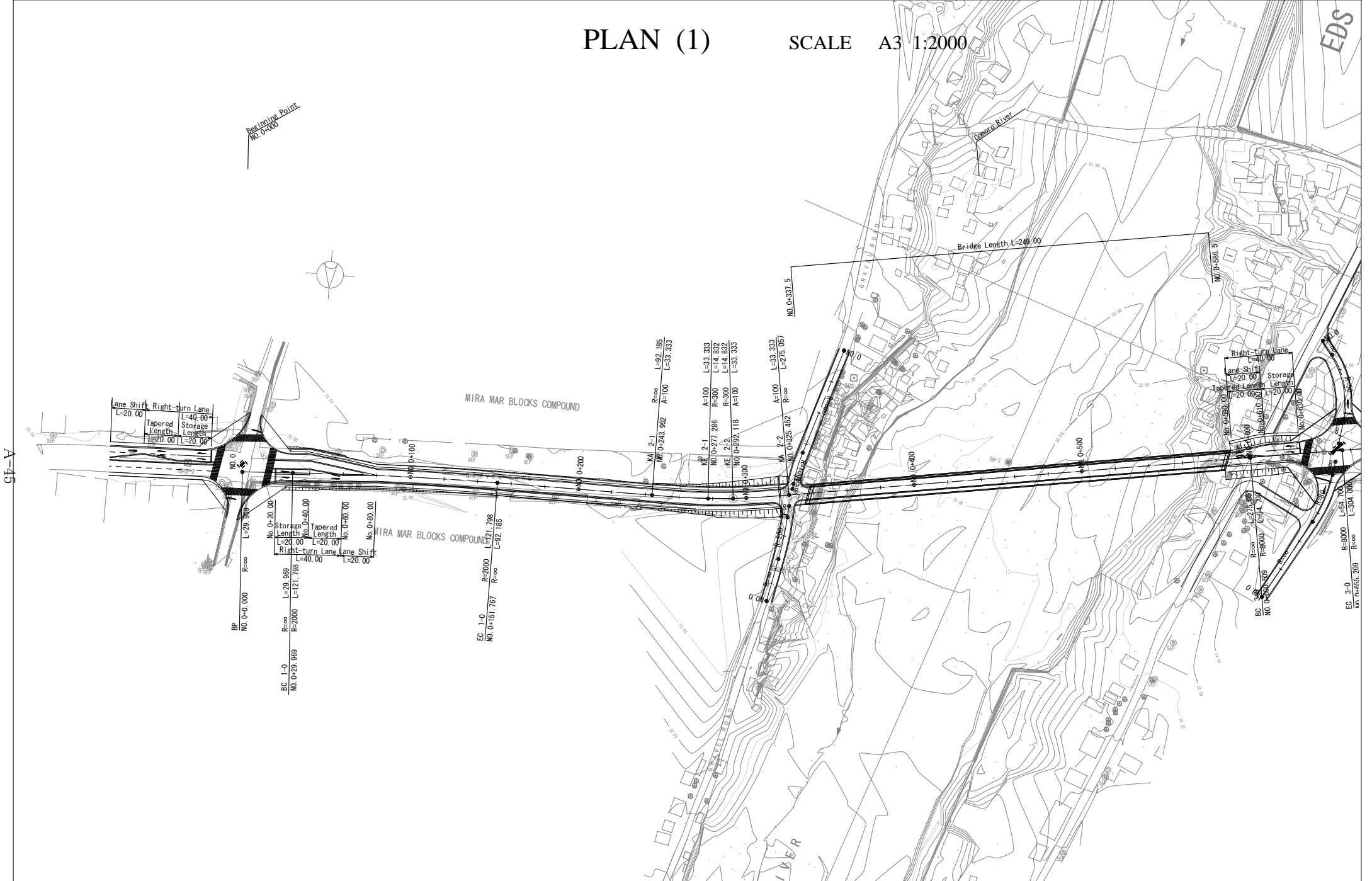
6-3 Outline Design Drawings

List of Outline Design Drawings

No.	Title	Pages
OD-1~6	Plan (1)~(6)	6
OD-7~13	Profiles (1)~(7)	7
OD-14	Upriver Comoro Bridge – General Drawing	1
OD-15	Typical Cross Section	1
OD-16~19	Drainage Details (1)~(4)	4
OD-20	Kerb Stone Details	1
OD-21	Lay-By Details	1
OD-22	Retaining Wall Details	1

PLAN (1)

SCALE A3 1:2000

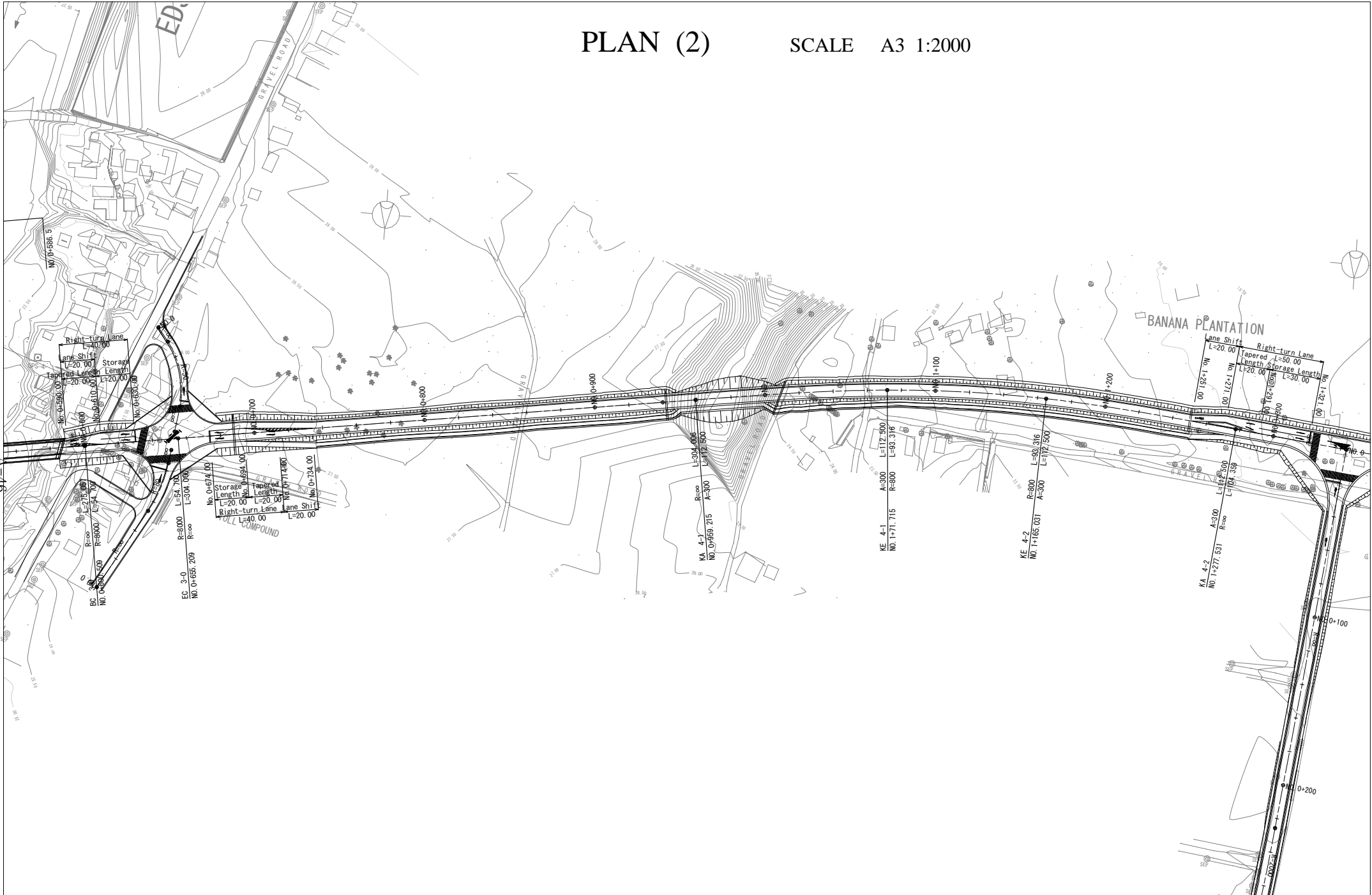


A-45

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PLAN (2)

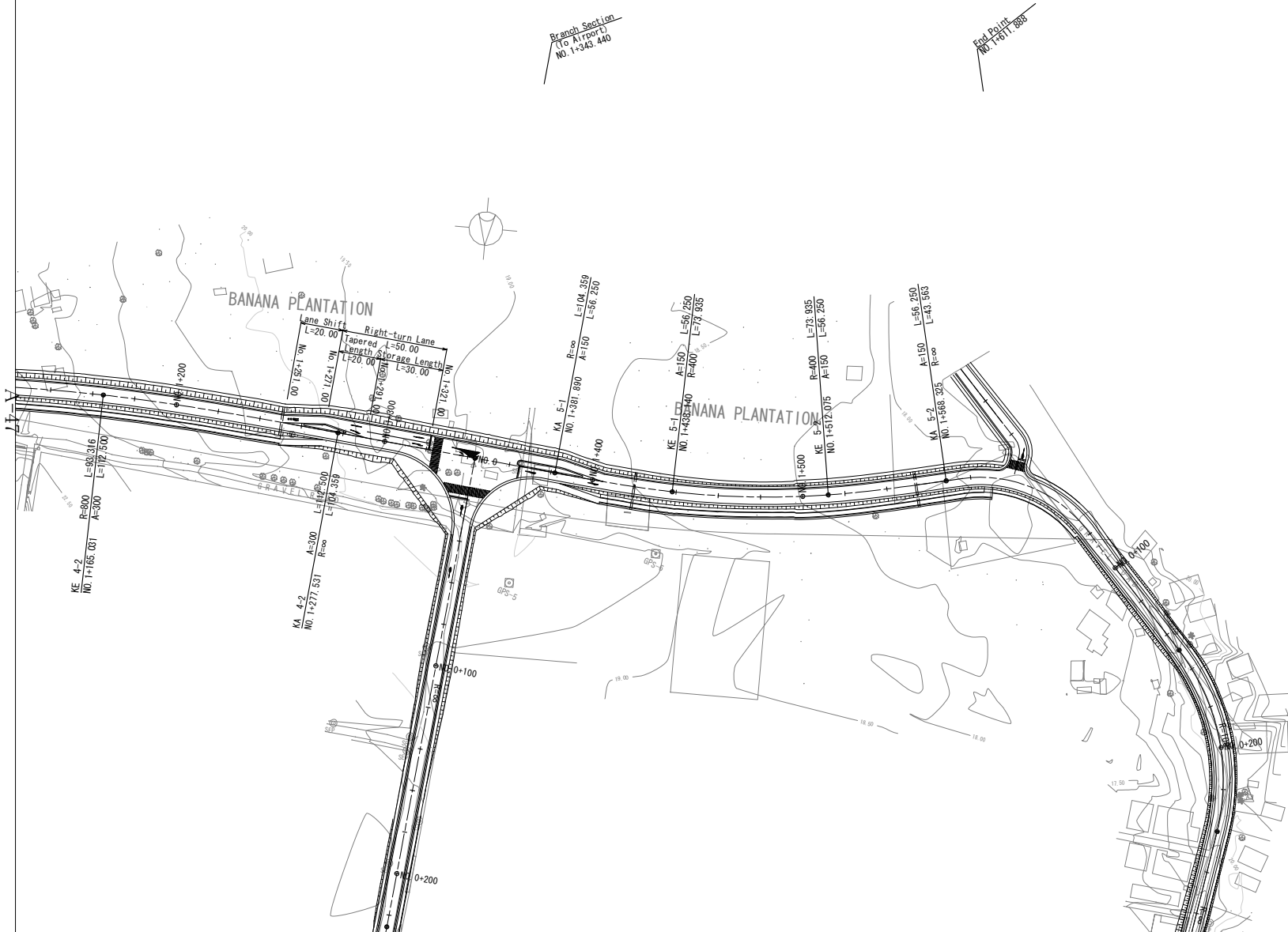
SCALE A3 1:2000



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PLAN (3)

SCALE A3 1:2000



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PLAN (4)

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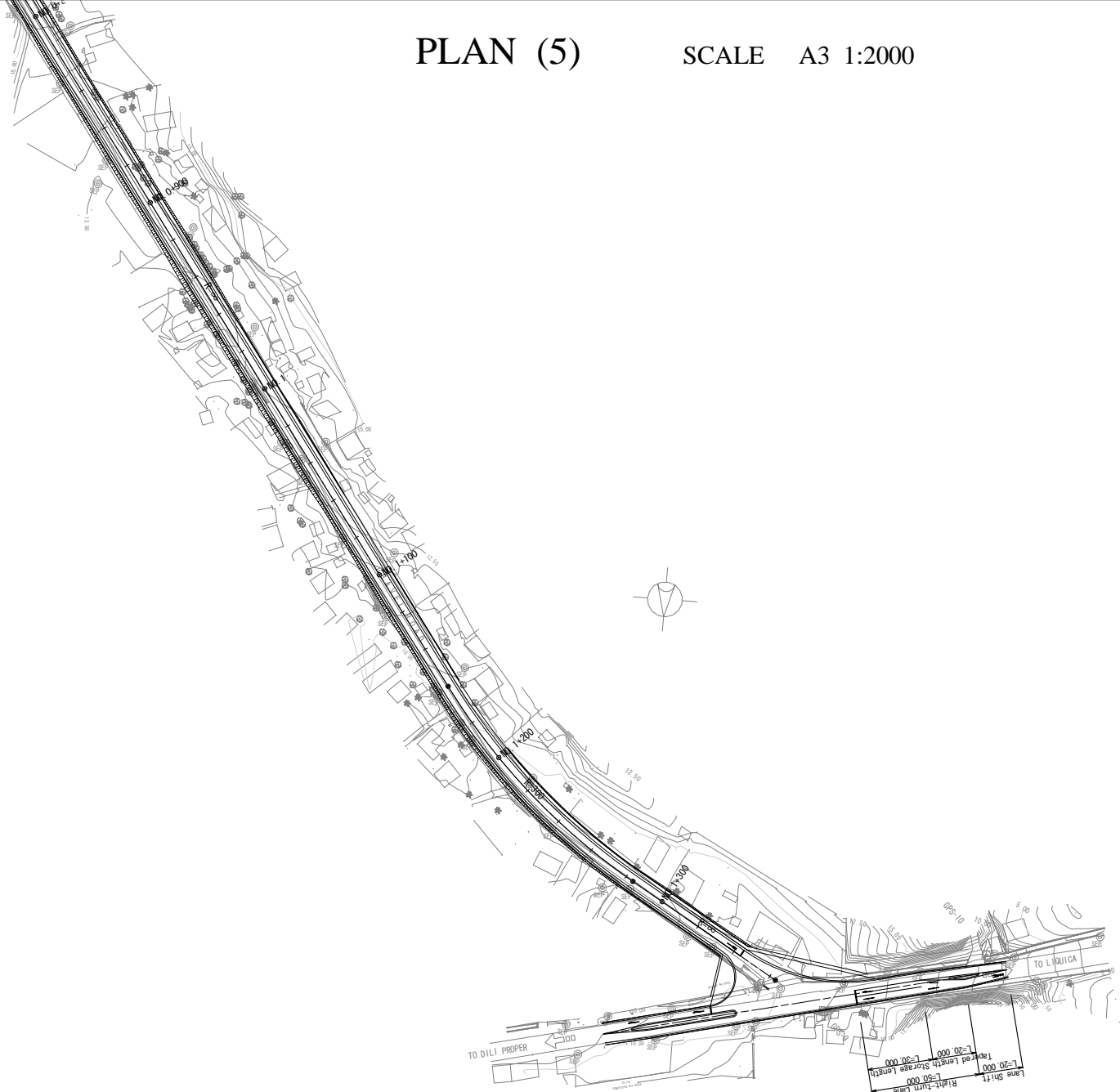


A-48

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				PREPARED BY:	0D-4
				CHECKED BY:	

PLAN (5)

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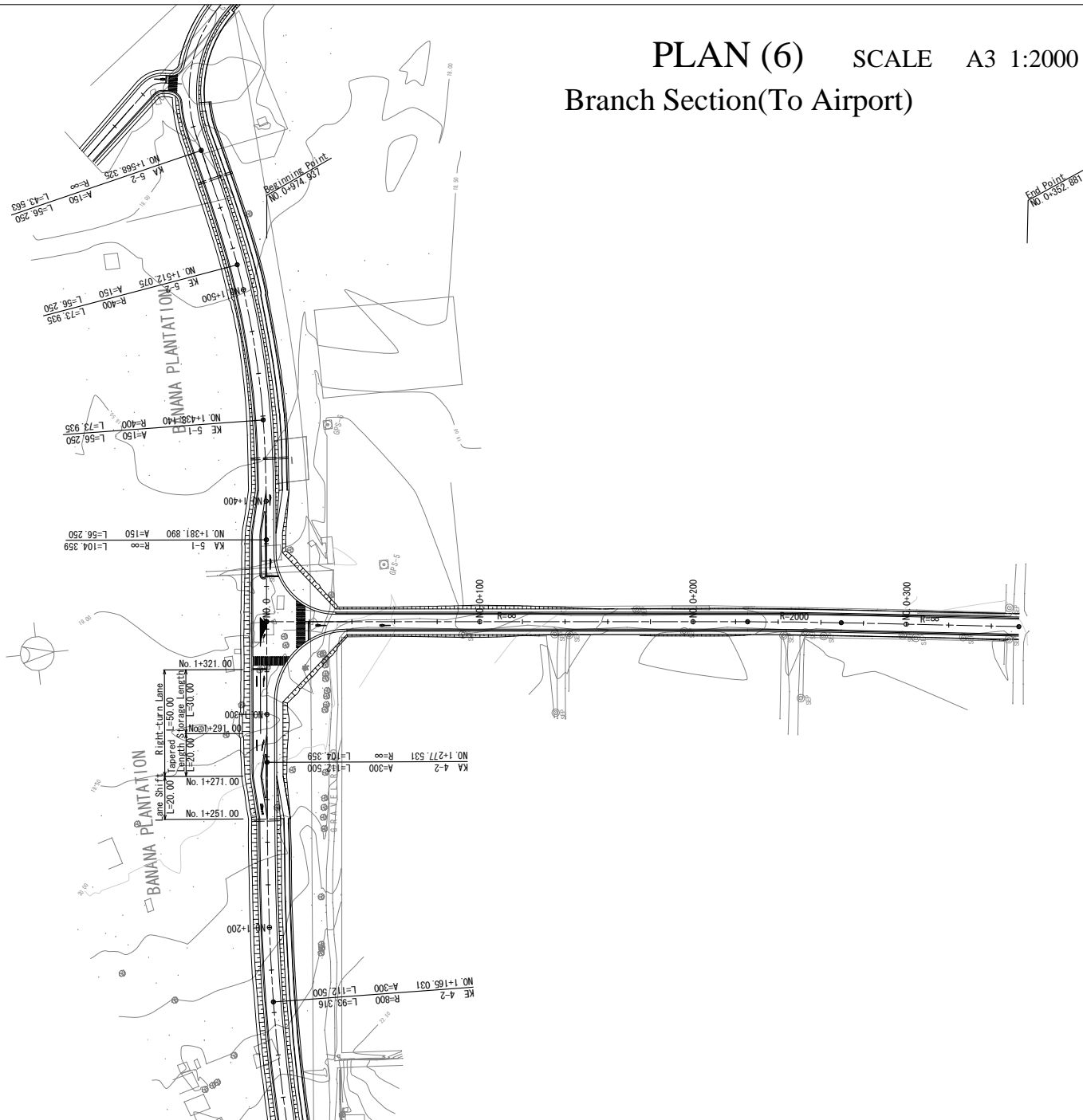


A-49

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				CHECKED BY:	

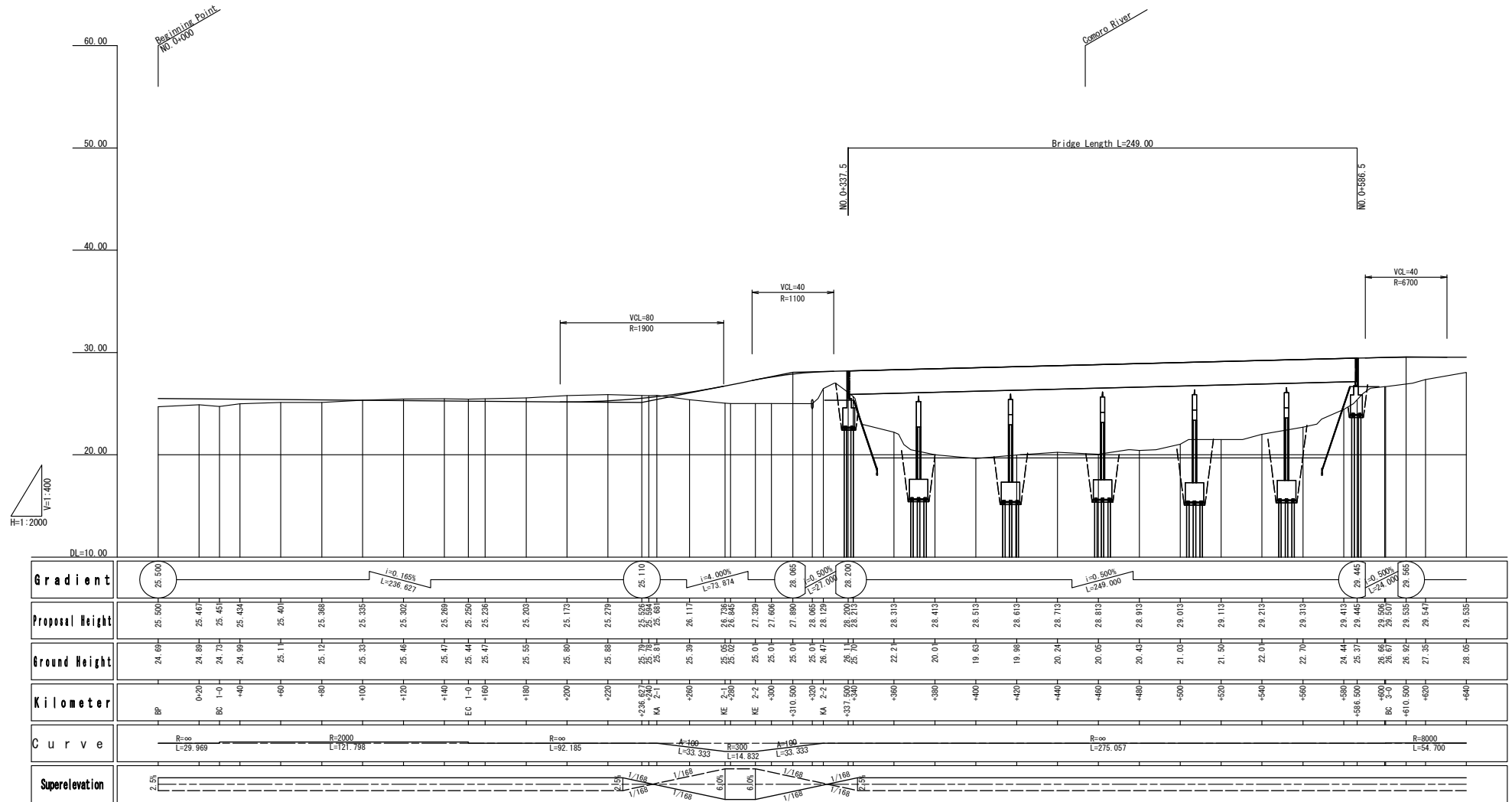
PLAN (6) SCALE A3 1:2000

Branch Section(To Airport)



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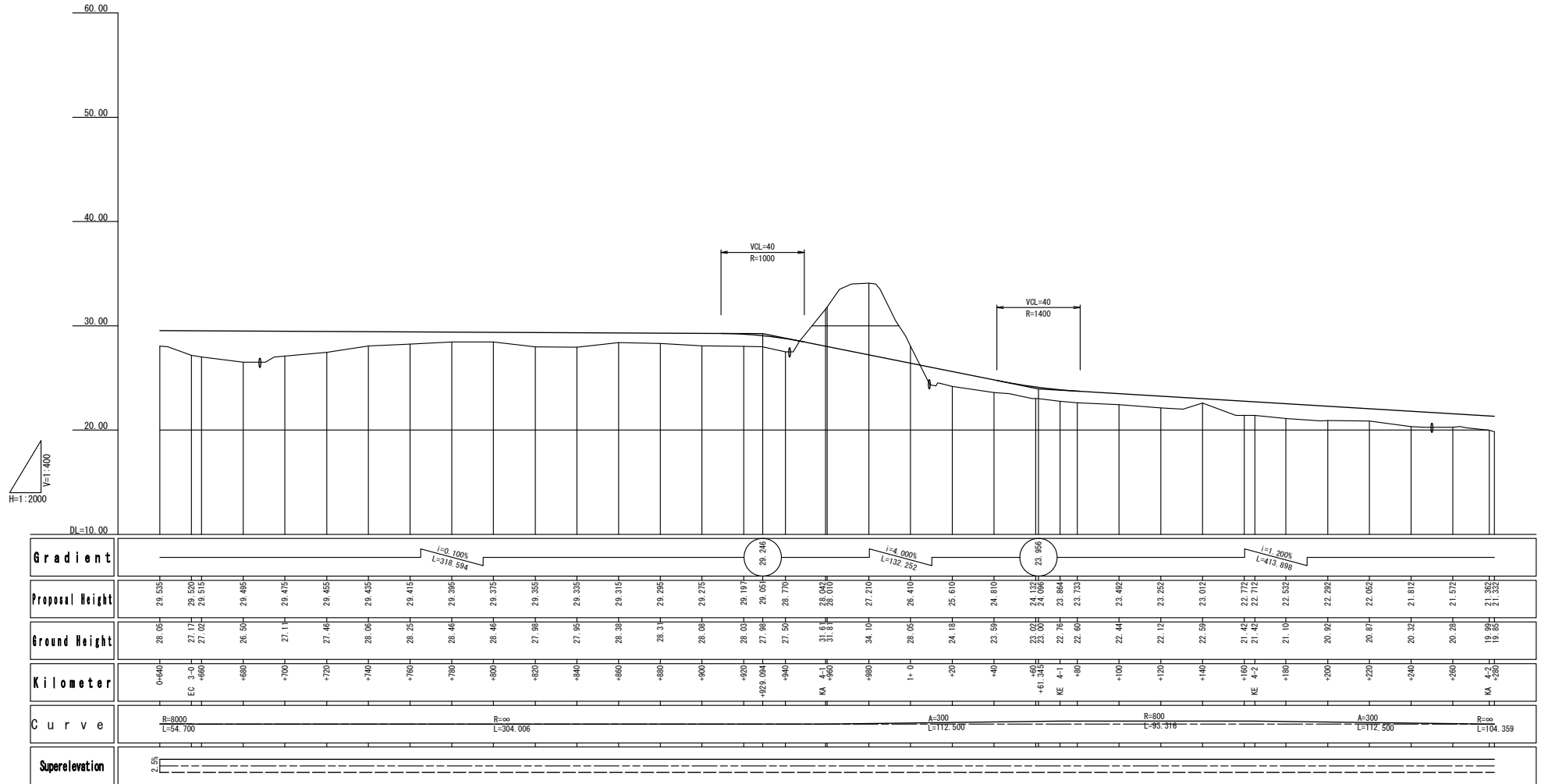
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A-15

MINISTRY OF PUBLIC WORKS(MPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS: THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTAMTS, INC	PROJECT NAME: THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	DRAWING TITLE: PROFILE (1)	DATE:	DRAWING No. :
					PREPARED BY:
				CHECKED BY:	

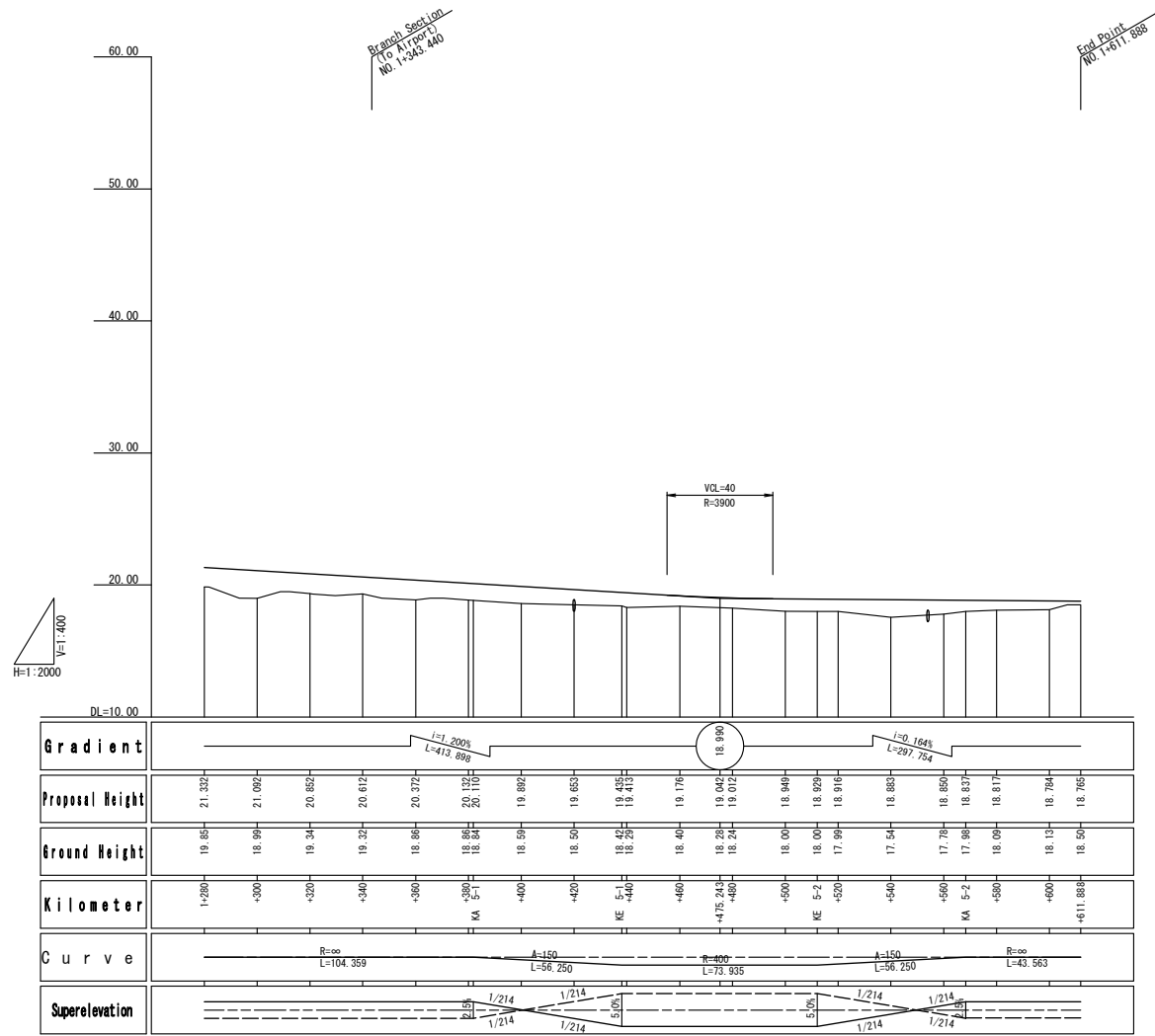
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A-52

MINISTRY OF PUBLIC WORKS(MPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS:	PROJECT NAME:	DRAWING TITLE:	DATE:	DRAWING No. :
	THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTAMTS, INC	THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	PROFILE (2)	PREPARED BY:	OD-8
				CHECKED BY:	

PROFILE (3) SCALE A3 V=1:400 H=1:2000

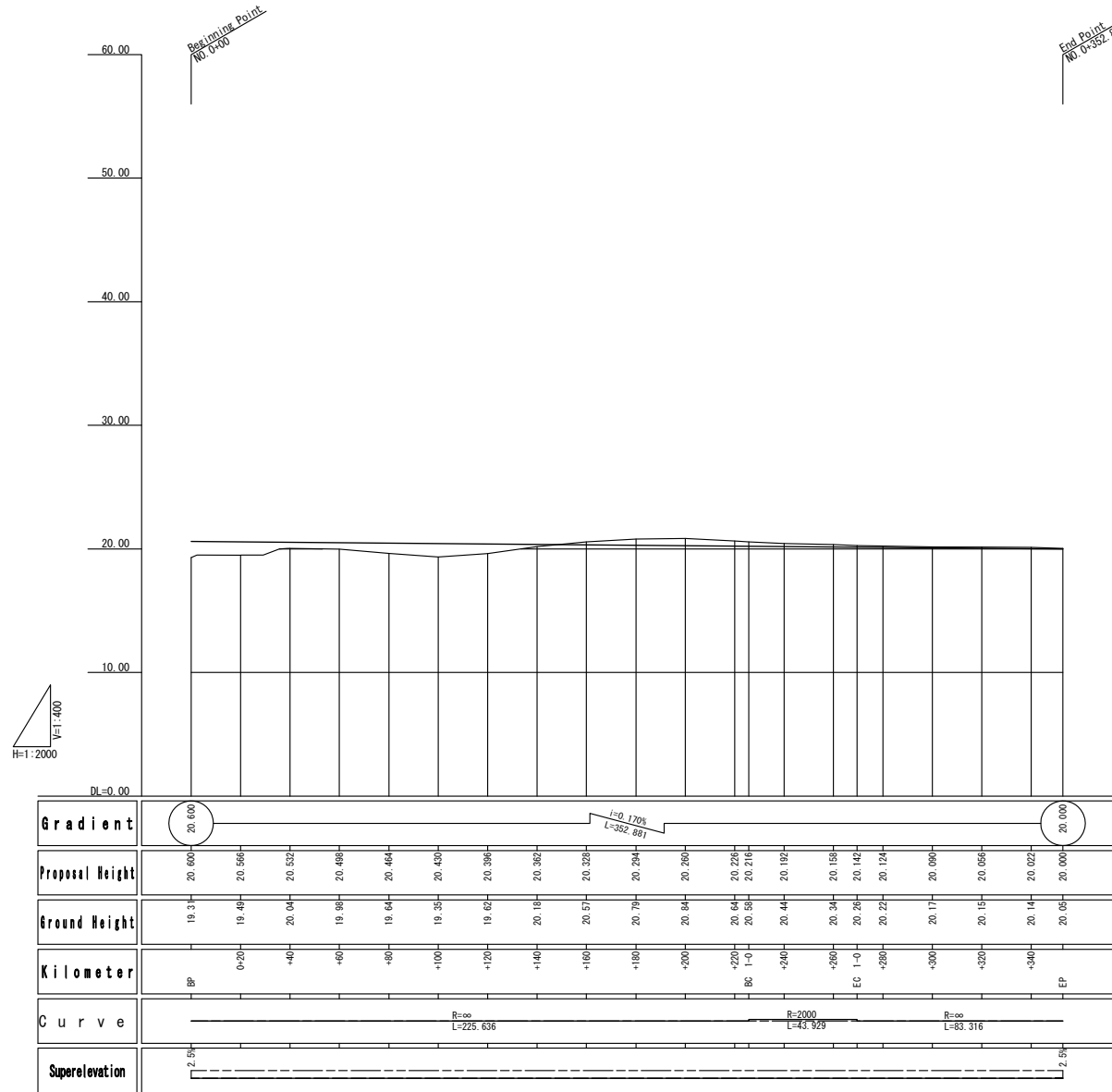


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MINISTRY OF PUBLIC WORKS(MPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS: THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTANTS, INC	PROJECT NAME: THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	DRAWING TITLE: PROFILE (3)	DATE:	DRAWING No. :
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				CHECKED BY:	

PROFILE (4) SCALE A3 V=1:400 H=1:2000

Branch Section(To Airport)



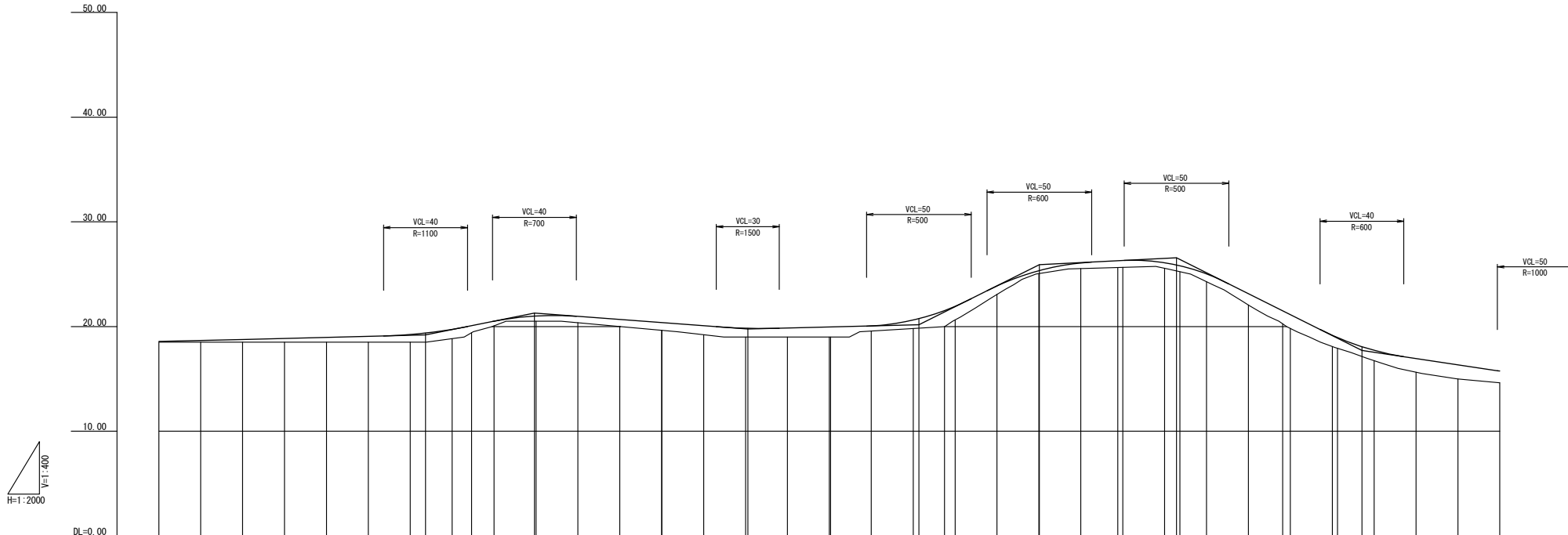
75-V

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PROFILE (5) SCALE A3 V=1:400 H=1:2000

Limited Land Section(1)

A-55



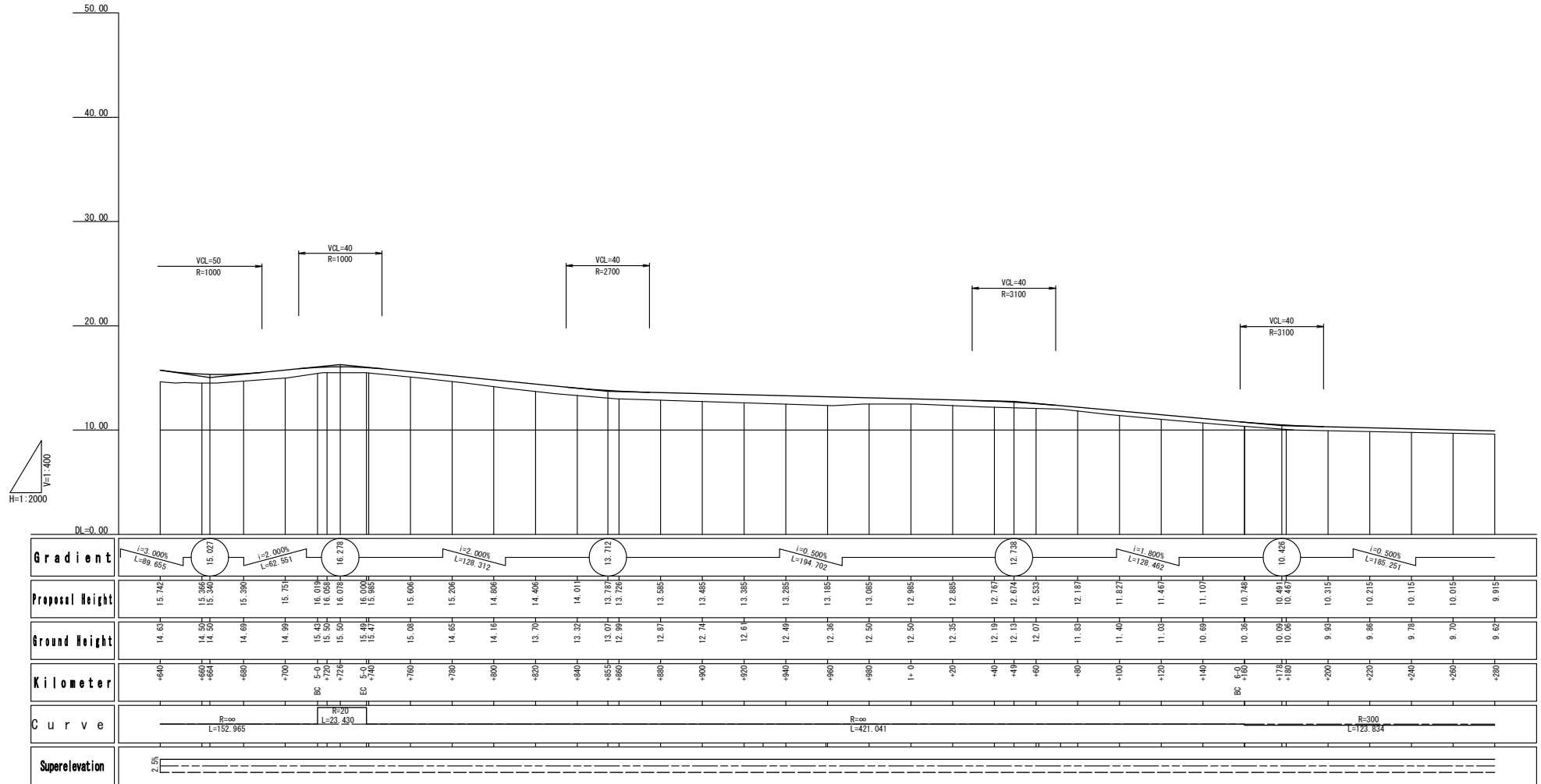
Gradient	18.565 $i=0.500\%$ $L=127.310$	18.202 $i=4.000\%$ $L=51.954$	21.280 $i=1.500\%$ $L=101.828$	19.152 $i=0.500\%$ $L=61.664$	20.161 $i=10.000\%$ $L=51.500$	25.911 $i=1.000\%$ $L=65.418$	26.655 $i=10.000\%$ $L=88.478$	17.717 $i=3.000\%$ $L=89.695$																																								
Proposal Height	18.595	18.685	18.765	18.885	18.985	19.065	19.235	19.377	19.732	20.082	20.509	21.015	20.988	20.669	20.389	20.088	19.833	19.827	19.847	19.947	19.947	20.052	20.154	20.154	21.542	21.542	23.885	25.333	26.082	26.284	26.308	26.607	25.561	25.872	25.803	25.007	23.132	21.489	21.122	19.182	18.935	18.067	17.717	16.942	16.342	15.742		
Ground Height	18.59	18.59	18.59	18.59	18.59	18.59	18.59	18.59	18.44	19.44	20.07	20.57	20.97	20.00	19.64	19.22	19.00	19.00	19.00	19.00	19.00	19.00	19.57	18.81	19.88	20.00	20.00	20.00	25.01	25.05	25.53	25.63	25.64	25.64	25.56	25.31	25.23	24.29	22.00	20.25	19.83	19.93	18.09	17.94	16.74	15.63	14.99	14.63
Kilometer	0	+20	+40	+60	+80	+100	+120	+127	+140	BC 1-0	+160	+169	+169	+200	+220	+240	EC 1-0	+260	+260	+300	BC 2-0	+320	+340	+360	+381	EC 2-0	+380	+400	+420	+440	BC 3-0	+460	+480	EC 3-0	+500	+520	+540	BC 4-0	+560	+574	+580	+600	+620	+640				
Curve	$R=\infty$ $L=149.330$		$R=100$ $L=90.761$		$R=\infty$ $L=80.466$		$R=500$ $L=54.346$		$R=\infty$ $L=82.729$		$R=30$ $L=29.673$		$R=\infty$ $L=49.021$		$R=30$ $L=26.180$		$R=\infty$ $L=152.965$																															
Superelevation	2.0%																																															

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PROFILE (6) SCALE $A3 \ V=1:400$ $H=1:2000$

Limited Land Section(2)

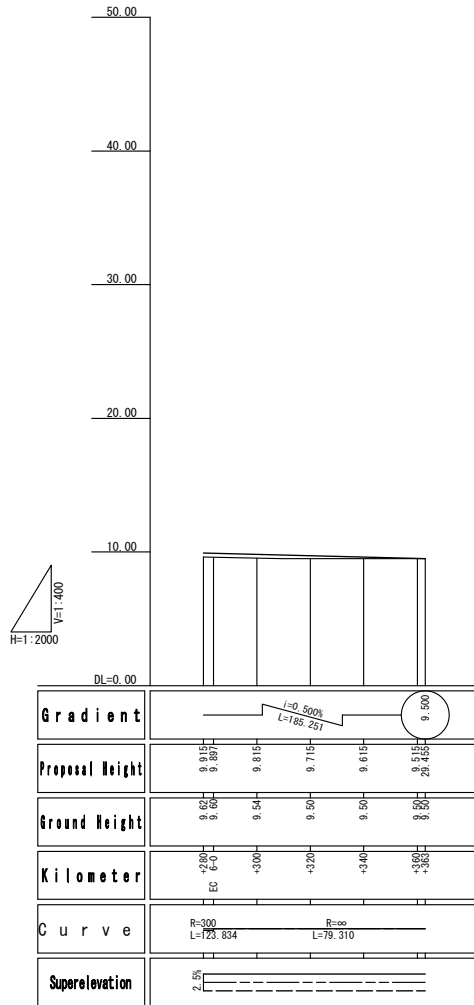
A-56



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PROFILE (7) SCALE ^{A3} V=1:400 H=1:2000

Limited Land Section(3)

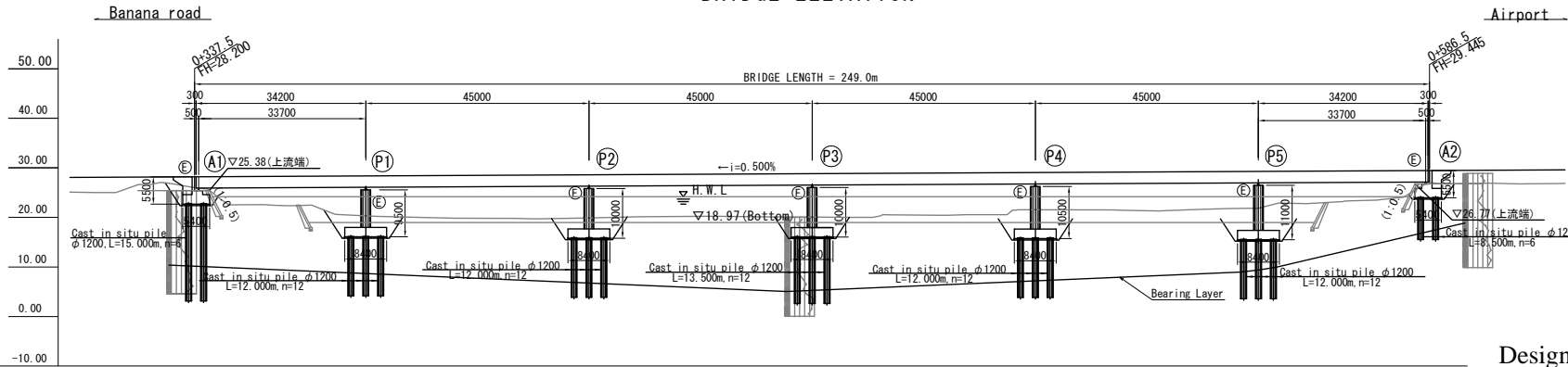


A-57

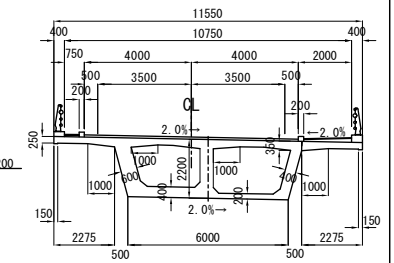
MINISTRY OF PUBLIC WORKS(MPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS:	PROJECT NAME:	DRAWING TITLE:	DATE:	DRAWING No. :
	THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTANTS, INC	THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	PROFILE (7) Limited Land Section(3)	PREPARED BY: CHECKED BY:	0D-13

GENERAL DRAWING

BRIDGE ELEVATION SCALE A3 1:1000



SECTION SCALE A3 1:200

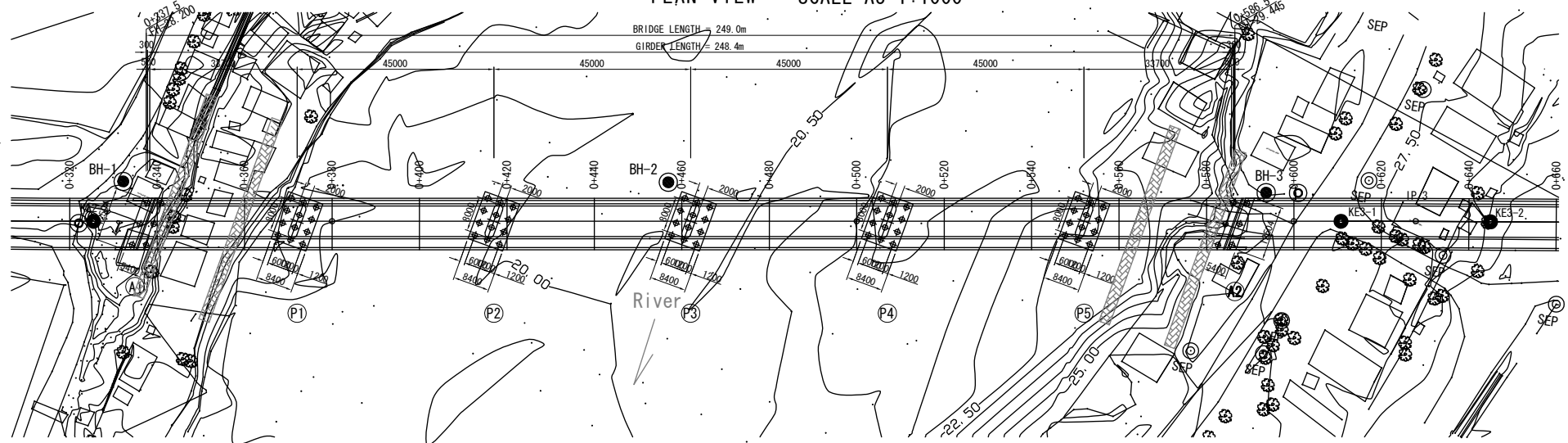


Gradient	0.500%													
Proposed Height	28.200		28.373		28.600		28.825		29.050		29.275		29.445	
Ground height	27.04		20.27		19.88		20.06		21.54		21.96		26.93	
Distance	0.000	17.500		20.000		17.000		20.000		7.000		20.000		6.500
Station	0+320	+17.50		0+340		0+360		+12.000		0+380		0+400		+17.000

Design Conditions

Bridge length	L = 249.00m
Span arrangement	34.5m + 4@45.0m + 34.5m
Road width	Shoulder:0.5m, Roadway:3.5m, Sidewalk:2.0m
Skew	70° 00' 00"
Alignment	R = ∞
Gradient	i = 0.5 %
Transversal slope	Roadway:2.0%, Sidewalk:2.0%
Design road	AASHTO HS-25 (406.25 kN)
Seismic coefficient	Kh=0.25
Super structure	PC Box girder bridge (6 spans)
Sub structure	Inverted T formula abutment
Applicable criteria	Extended pier

PLAN VIEW SCALE A3 1:1000

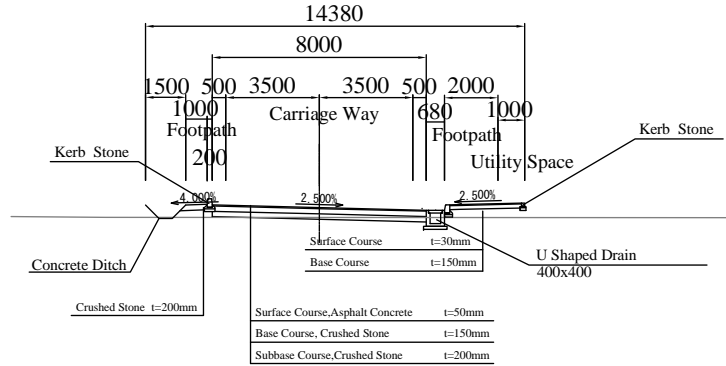


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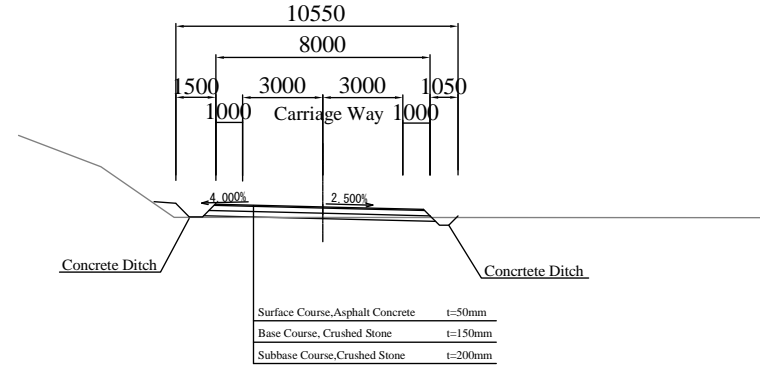
TYPICAL CROSS SECTION

SCALE A3 1:200

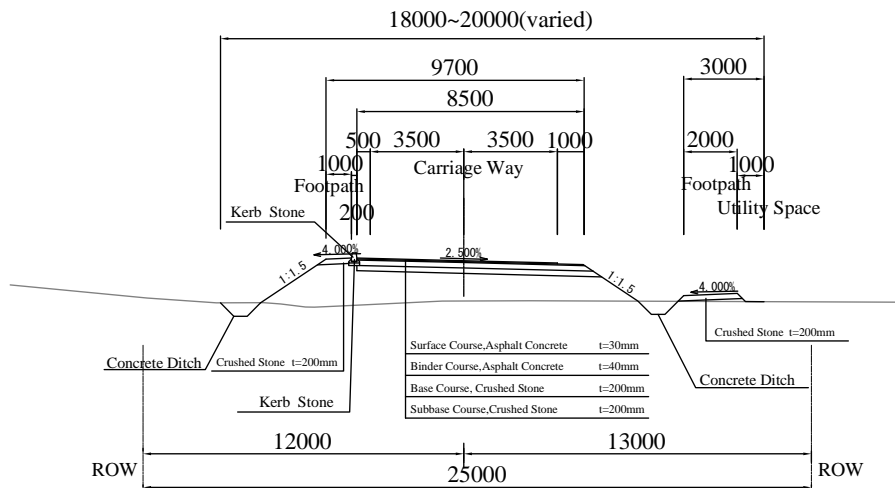
FLAT SECTION



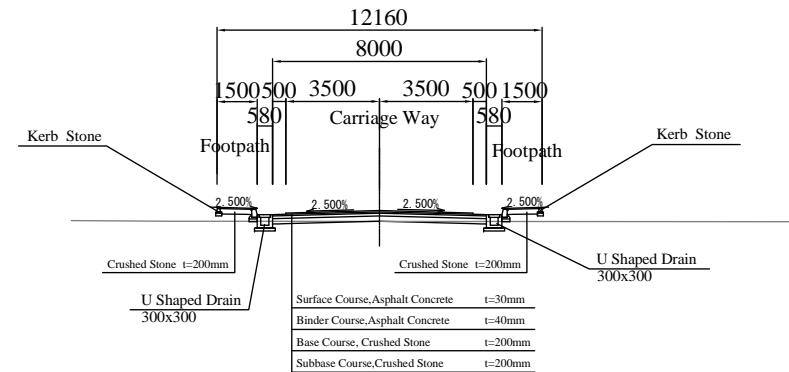
LAND LIMITED SECTION



EMBANKMENT SECTION



BRANCH SECTION (To Airport)



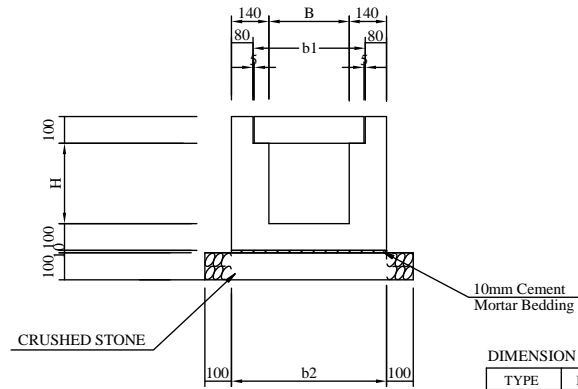
A-59

MINISTRY OF PUBLIC WORKS(MPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS: THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTANTS, INC	PROJECT NAME: THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	DRAWING TITLE: TYPICAL CROSS SECTION	DATE:	DRAWING No. : OD-15
				PREPARED BY: CHECKED BY:	

DRAINAGE DETAILS (1)

SCALE A3 1:20

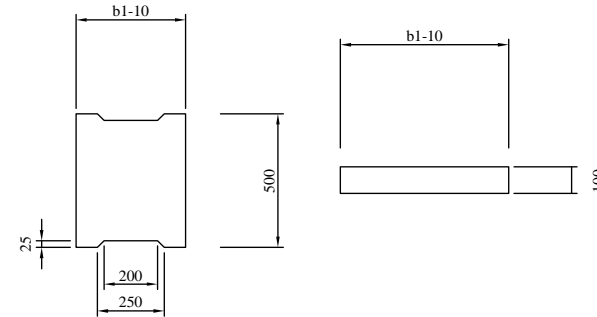
U-SHAPE SIDE DITCH SCALE 1:20 (Precast)



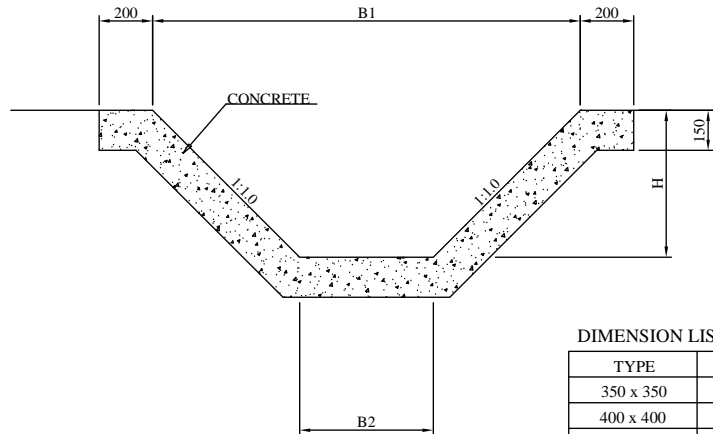
DIMENSION LIST

TYPE	B	H	b1	b2	Re-bar	
					Ditch	Cover
300 x 300	300	300	420	580	16kg/m	2kg/piece
400 x 400	400	400	520	680	20kg/m	3kg/piece
500 x 500	500	500	620	780	23kg/m	3kg/piece

CONCRETE COVER



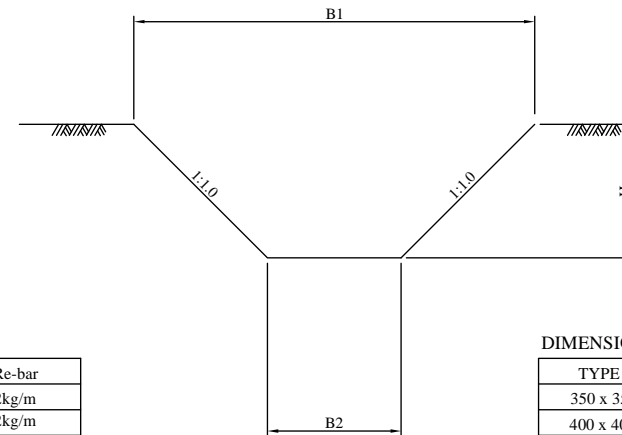
CONCRETE LINING DITCH SCALE 1:20



DIMENSION LIST

TYPE	B1	B2	H	Re-bar
350 x 350	1050	350	350	2kg/m
400 x 400	1200	400	400	2kg/m
500 x 500	1500	500	500	2kg/m
1200 x 1200	3600	1200	1200	5kg/m

OPEN DITCH SCALE 1:20 TYPE-1,-2,-3 (FLAT BOTTOM TYPE)



DIMENSION LIST

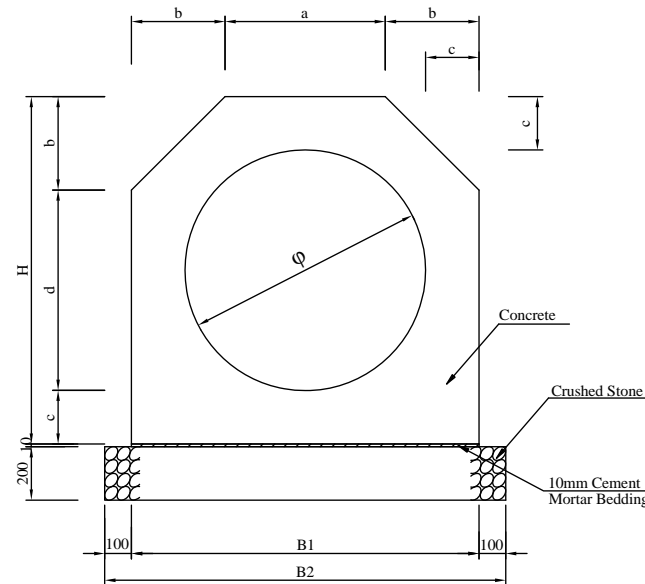
TYPE	B1	B2	H
350 x 350	1050	350	350
400 x 400	1200	400	400
500 x 500	1500	500	500

DRAINAGE DETAILS (2)

SCALE A3 1:20

PIPE CULVERT

PRECAST TYPE



DIMENSION LIST

TYPE	φ	B1	B2	H	a	b	c	d	Re-bar
φ400	400	700	900	700	300	200	150	350	32kg/m
φ600	600	900	1100	900	500	200	150	550	49kg/m
φ900	900	1300	1500	1300	600	350	200	750	93kg/m

I9-V

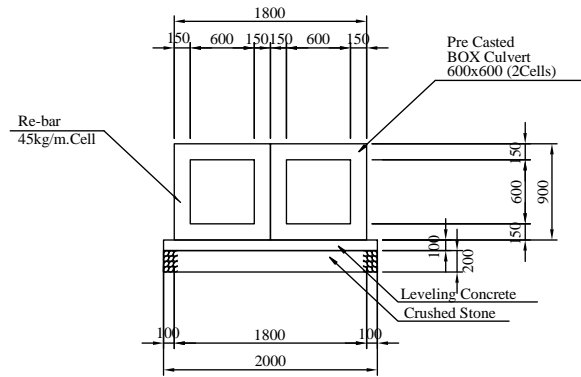
MINISTRY OF PUBLIC WORKS(MOPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS:	PROJECT NAME:	DRAWING TITLE:	DATE:	DRAWING No. :
	THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTAMTS, INC	THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	DRAINAGE DETAILS (2)	PREPARED BY: CHECKED BY:	OD-17

DRAINAGE DETAILS (3)

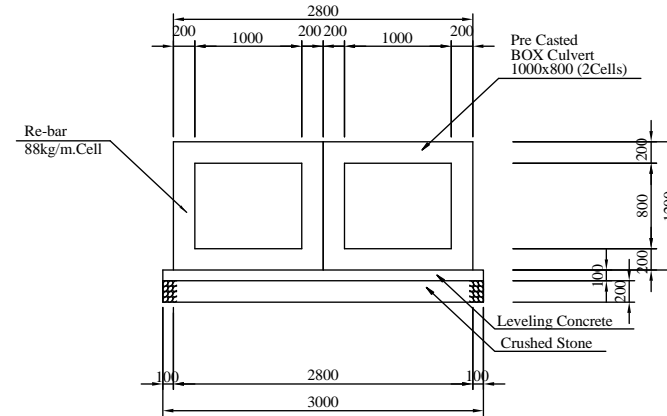
SCALE A3 1:50

BOX CULVERT(PRECAST)

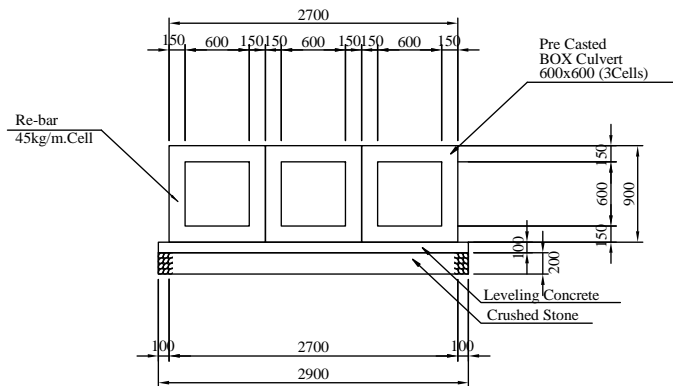
600×600 (2CELLS)



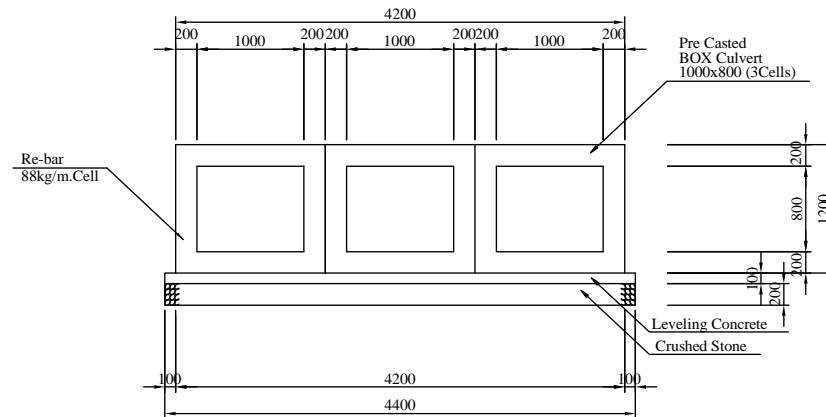
1000×800 (2CELLS)



600×600 (3CELLS)



1000×800 (3CELLS)



A-62

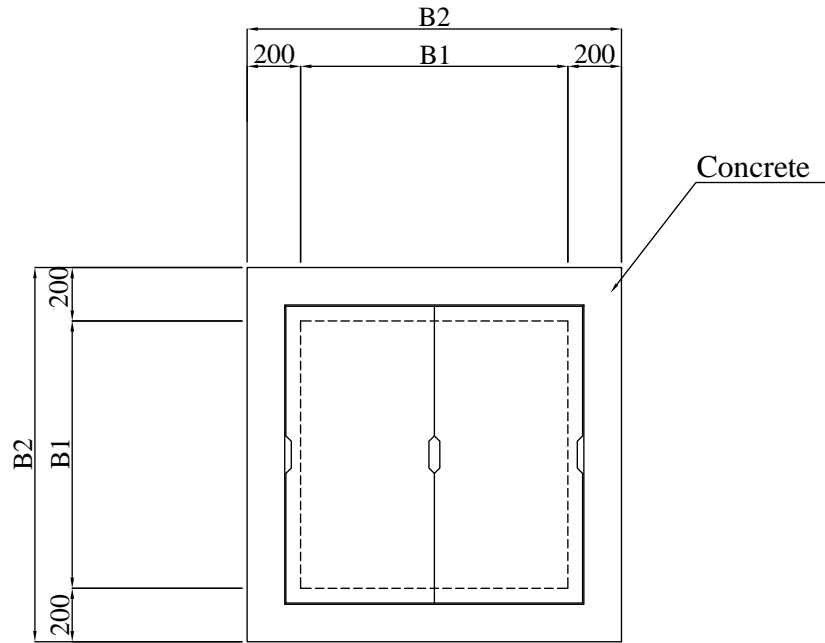
MINISTRY OF PUBLIC WORKS(MOPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS: THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTANTS, INC	PROJECT NAME: THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	DRAWING TITLE: DRAINAGE DETAILS (3)	DATE:	DRAWING No. : OD-18
				PREPARED BY: CHECKED BY:	

DRAINAGE DETAILS (4)

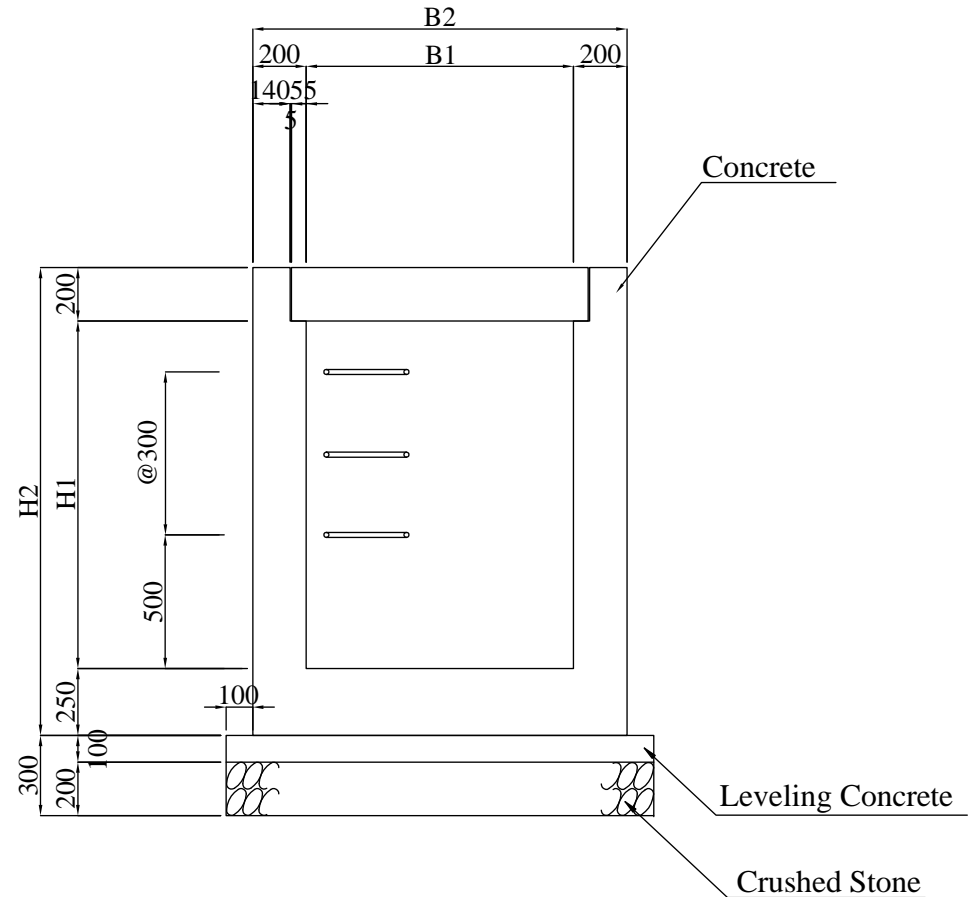
SCALE A3 1:20

CATCH BASIN

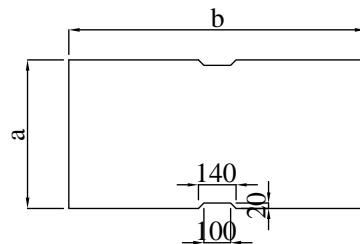
PLAN



SECTION



COVER(PRECAST)



DIMENSION LIST

TYPE	B1	B2	H1	H2	a	b	Re-bar	
							Catch Basin	Cover
600-600-1200	600	1000	1200	1650	355	710	78kg	7kg/piece
700-700-1400	700	1100	1400	1850	405	810	99kg	10kg/piece
700-700-1600	700	1100	1600	2050	405	810	109kg	10kg/piece
800-800-1600	800	1200	1600	2050	455	910	123kg	12kg/piece
900-900-1800	900	1300	1800	2250	505	1010	150kg	15kg/piece

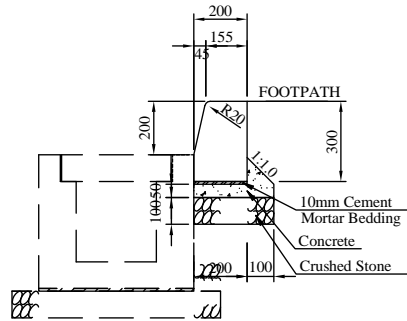
E9-V

MINISTRY OF PUBLIC WORKS(MOPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS:	PROJECT NAME:	DRAWING TITLE:	DATE:	DRAWING No. :
	THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTANTS, INC.	THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	DRAINAGE DETAILS (4)	PREPARED BY: CHECKED BY:	OD-19

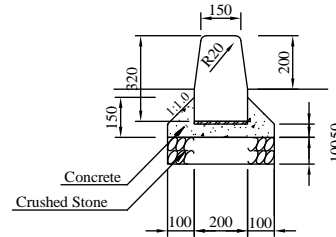
KERB STONE DETAILS

SCALE A3 1:20

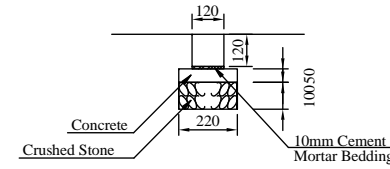
Type-1(Precast)



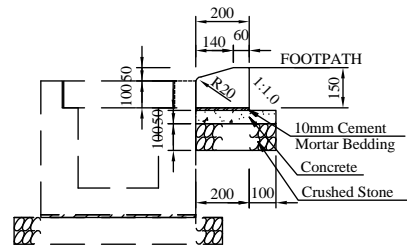
Type-2(Precast)



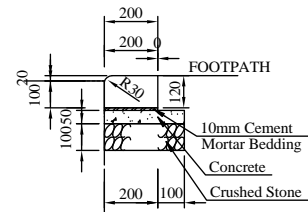
Type-3(Precast)



Type-4(Precast)



Type-5(Precast)

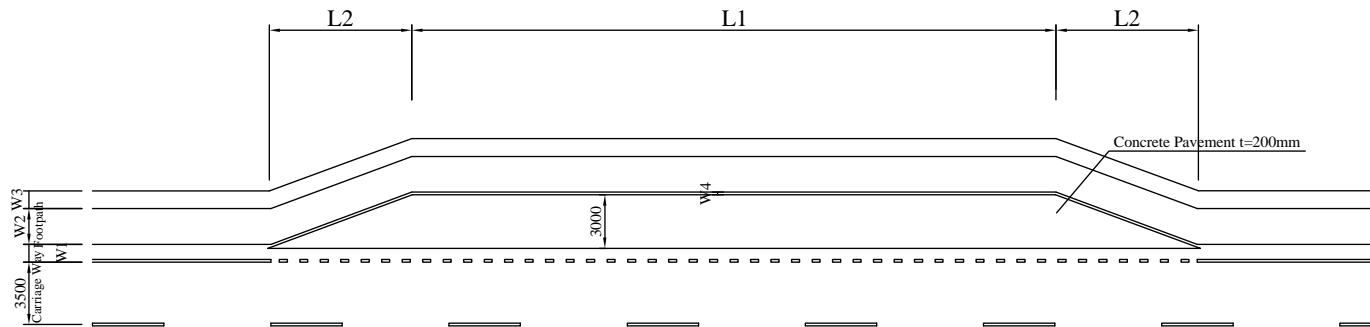


E-9-V

MINISTRY OF PUBLIC WORKS(MOPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS: THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTANTS, INC	PROJECT NAME: THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	DRAWING TITLE: KERB STONE DETAILS	DATE:	DRAWING No. :
				PREPARED BY:	OD-20
				CHECKED BY:	

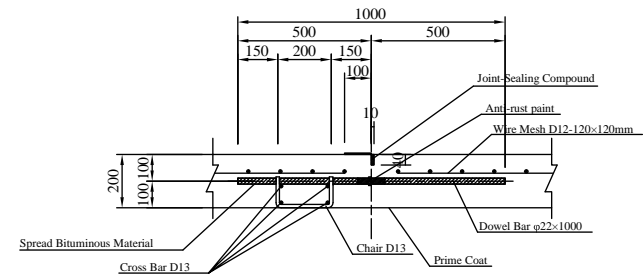
LAY-BY DETAILS (1) SCALE AS SHOWN

PLAN OF LAY BY SCALE A3 1:300



Detail of Joint SCALE A3 1:10

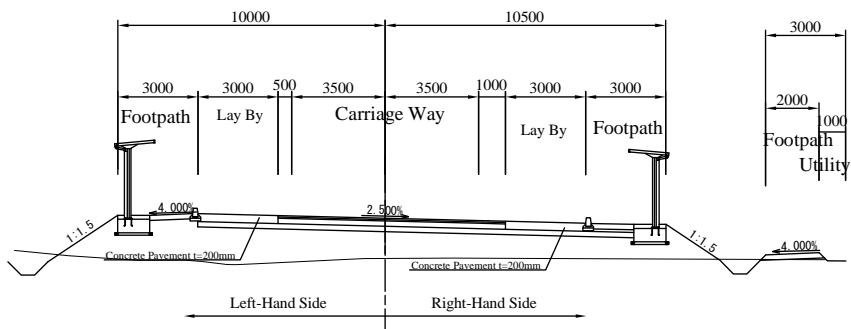
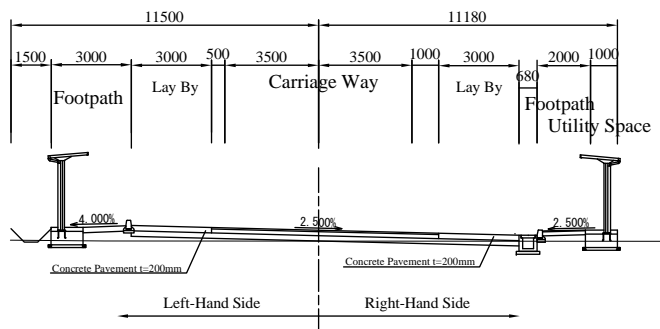
Longitudinal Joint



TYPICAL LAYOUT OF LAY BY SCALE A3 1:200

Section-1

Section-2,3



Type List

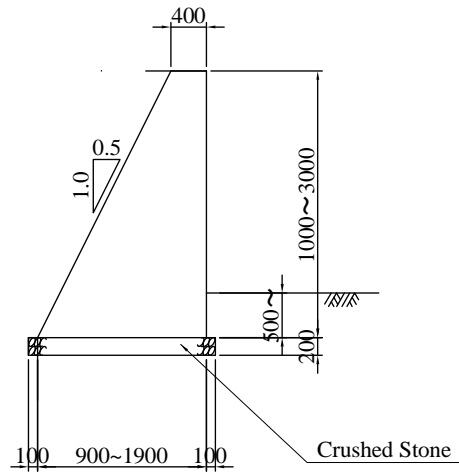
Type	L1	L2
Type 1	24000	8000
Type 2	36000	9000
Type 3	45000	9000

MINISTRY OF PUBLIC WORKS(MPW) THE DEMOCRATIC REPUBLIC OF TIMOR LESTE JAPAN INTERNATIONAL COOPERATION AGENCY	CONSULTANTS:	PROJECT NAME:	DRAWING TITLE:	DATE:	DRAWING No. :
	THE CONSORTIUM OF INGEROSEC CORPORATION, NIPPON ENGINEERING CONSULTANTS CO.,LTD. AND IDEA CONSULTAMTS, INC	THE PROJECT FOR THE CONSTRUCTION OF UPRIVER COMORO BRIDGE	LAY-BY DETAILS	PREPARED BY:	OD-21
				CHECKED BY:	

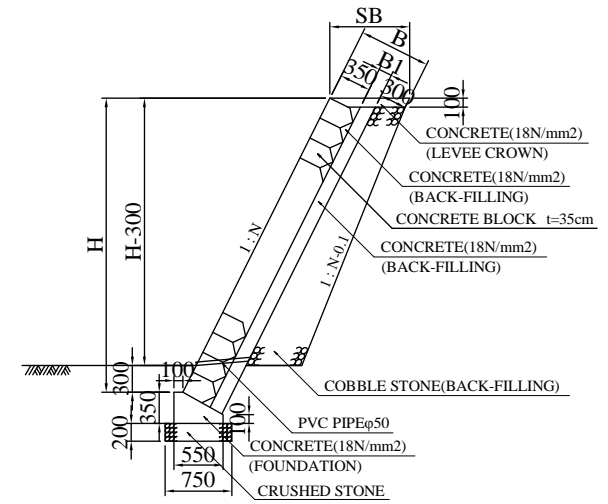
RETAINING WALL DETAILS

SCALE A3 1:60

Gravity Type Retainig Wall



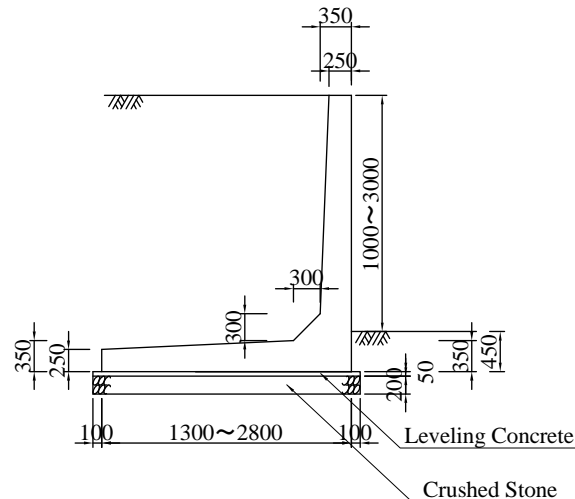
Concrete Block Retaining Wall



DIMENSION LIST

H	B1	B	SB	N	mm
0~1.5	100	750	783	0.3	
1.5~3.0	100	750	808	0.4	
3.0~5.0	150	800	894	0.5	

L Type Retaining Wall



99-V

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