Ethiopian Roads Authority
The Federal Democratic Republic of Ethiopia

Preparatory Survey Report
on
The Project
for
Rehabilitation of Trunk Road, Phase IV
in
The Federal Democratic Republic of Ethiopia

April 2011

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.
EIGHT-JAPAN ENGINEERING CONSULTANTS CO., LTD.

E I D
J R
11-060

Ethiopian Roads Authority
The Federal Democratic Republic of Ethiopia

Preparatory Survey Report
on
The Project
for
Rehabilitation of Trunk Road, Phase IV
in
The Federal Democratic Republic of Ethiopia

April 2011

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.
EIGHT-JAPAN ENGINEERING CONSULTANTS CO., LTD.

Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey on the Project for Rehabilitation of Trunk Road, Phase IV in the Federal Democratic Republic of Ethiopia, and organized a survey team headed by TATSUMI Masaaki of the consultant (and consist of Oriental Consultants Co., Ltd. and Eight-Japan Engineering Consultants Co., Ltd.) between July, 2010 to April, 2011.

The survey team held a series of discussions with the officials concerned of the Government of Ethiopia, and conducted a field investigations. As a result of further studies in Japan, 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 Ethiopia for their close cooperation extended to the survey team.

April, 2011

KONISHI Kiyofumi
Director General,
Economic Infrastructure Department
Japan International Cooperation Agenc

Summary

Ninety five (95%) percent of international cargo transportation and interurban transportation in Ethiopia is borne by road traffic. The improvement of the low density of pavement road network (paved road of length 6,938km compared to the total road length of 46,812km, the ratio becomes 14.8% as at 2009) and the road condition (46% of the total road length is in poor condition as at 2009) is the urgent issue for Ethiopia.

The Government of the Federal Democratic Republic of Ethiopia (GOE) has been focusing on improving its national road network in order to connect existing and potential agricultural production areas and industrial areas with markets as a major component of its development policy. Ethiopian Roads Authority (ERA) has endeavored to develop the road network, especially the construction of the arterial roads based on the Road Sector Development Program (RSDP) from 1997 under technical and/or financial backing by foreign countries and international organizations. Ethiopia is a landlocked country surrounded by Djibouti, Eritrea, Sudan, Kenya and Somalia, therefore one concept of RSDP is designed to open up an international corridor leading to these neighboring countries.

Trunk Road Route 3 between Addis Ababa and Metema at the Sudan border (a distance of about 988km) is a significant corridor which connects Addis Ababa city as the market and Amhara region which is an important grain-growing region that covers 40 percent of agricultural consumption in Ethiopia. Moreover, the road is used as the transportation route of fuel imported from Sudan which covers 80 percent of fuel consumption by the industries in the vicinity of Addis Ababa. Furthermore, the road is a significant route as part of the Trans-East African Highway.

The improvement of the road between Addis Ababa and Dejen (about 223km) has been implemented as a Japanese Grant Aid Project by the Government of Japan (GOJ) in response to GOE's request for rehabilitation of Route 3 from Addis Ababa to Debre Markos. On the other hand, sections from Debre Markos to Bahir Dar (length of about 265km) and from Bahir Dar to Gondar (length of about 213km) have been improved and paved under the aid of the World Bank in 2004 and 2007, respectively. And the improvement of the section between Gondar and Metema (length of about 221km) was completed in March 2011 by GOE's own fund. Only the road section between Dejen and Debre Markos (length of about 65.5km) remains unpaved, and the rehabilitation of the section is urgent.

In 2009, ERA conducted a detailed design study from Dejen to Debre Markos with its own funding in order to expedite the improvement of the section. In the detailed design, the realignment plans at seven locations affecting a large number of houses were proposed. The Preparatory Survey Team has suggested to ERA the alternative realignment plans to reduce the number of affected houses, and ERA agreed to the Preparatory Survey Team's proposal based on discussions.

The Preparatory Survey was conducted along all the sections between Dejen and Debre Markos. However, the Project was divided into two phases; that is Phase I covering the section between Dejen and Lumame (30.5km) and Phase II covering the section between Lumame and Debre Markos (35km).

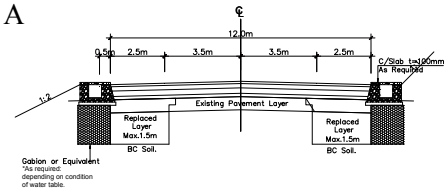
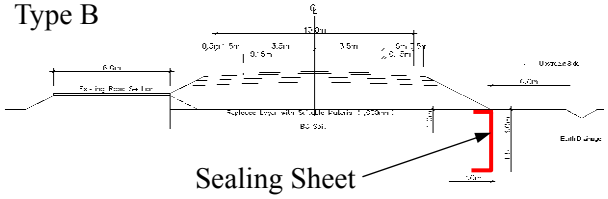
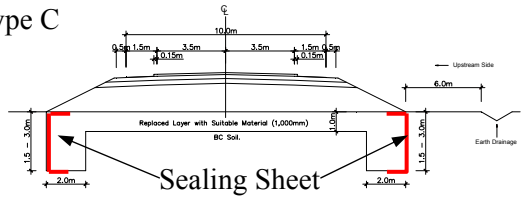
Both phases will be completed before the end of June,2015 in tandem with the target year of RSDP IV.

The Preparatory Survey Team conducted the field survey and discussion with ERA's counterparts for periods from July 15 to August 13 and from September 12 to November 10, 2010 in Ethiopia. After return to Japan, the survey team performed further in-depth studies regarding road alignment, road width, affected houses, road structures including bridges, pavement structure, and countermeasure method against the black cotton soil on the basis of in-situ survey results. The team performed the outline design of road and structures, calculation of the approximate work quantity, development of the implementation plan and estimation of the approximate project cost. During the period from March 4 to 18 in 2011, the survey team explained to ERA and the concerned organizations in Ethiopia the draft of the Preparatory Survey Report.

The Project road traverses long stretches of the so called "Black Cotton Soil (BCS)" which swells and shrinks according to change of moisture content, and some spots of the road are closed frequently due to flooding during every rainy season. The replacement method and embankment were applied as countermeasure against BCS and flooding respectively. The Project road is rehabilitated as two lane road with 13 small bridges and culverts. The basic construction of road is shown below on the basis of the outline design study results.

Facility Name		**Contents**	
		Phase I	**Phase II**
Road	Length	30.5km	35.0km
	Cross Section	Overall width：11.0m－20.0m Carriageway width：3.5m x 2 Shoulder：1.5m－3.5m（Include Parking lane） Footway：2.5m（Both Side）：Residential area	
	Pavement	Surface Course：5cm Binder Course：5cm Base Course：20cm Sub-base Course：25cm Capping Layer：20cm（If necessary）	
	Replaced Layer for BCS	1.5m－3.0m	
Bridge	RC Slab	10m:1Bridge	10m+10m:1Bridge
	RC Girder	17m+17m:1Bridge 15m:1Bridge	15m:2Bridges 15m+15m:1Bridge
RC Culvert		1Unit	5Units

The new countermeasures with the vertical wall on both sides of the road against the BCS in the Project road are proposed below. To secure the function of the vertical wall, sealing sheets are applied in the low land area such as Abeya and Yeda river, and in the areas where is seen to be not well drained subject to land form.

Type of Replacement for BCS	Thickness of Replacement (m)	Sealing Sheet	Phase I	Phase II
Type A 	1.5	-	6.8km	1.9km
Type B 	2.5	○	5.1km	-
		-	4.3km	-
	3.0	○	4.8km	-
		-	-	-
Type C 	2.0	○	1.0km	-
		-	-	-
	2.5	○	0.5km	-
		-	1.0km	-
	3.0	○	3.2km	4.4km
		-	3.5km	-
Sub-total		○	14.6km	4.4km
		-	15.6km	1.9km
Total			30.2km	6.3km

Note ; ○ means that sealing sheet is applied

If the Project is implemented under Japanese Grant Aid Program scheme, the implementation schedule would consist of some 3 months of the detailed design, 3 months of tender process, 27 months of construction stage giving a total of 33 months for Phase I, and 6 months of the detailed design, 3 months of tender process, 22 months of construction stage giving a total of 31 months for Phase II.

Project Effect

Quantitative Effect

(1) After the completion of the Project road, the average speed of vehicles which use it can be improved, and consumable parts and fuel consumption costs of them can be reduced. The expected figures of shortened travel time and reduction of consumption cost are as shown in the table below;

Indicator		Current situation	After improvement	Improvement effect
Car (4WD)	Average speed	44.8km/hrs.	60.6km/hrs.	16km/hrs. ; improvement
	Driving time	87min.	64min.	23min. ; reduction
Heavy trucks	Average speed	30.0km/hrs.	50.0km/hrs.	20km/hrs. ; improvement
	Driving time	130min.	78min.	52min. ; reduction
	Transportation cost*	1.74USD/km**	1.32USD/km	24% ; reduction

Note* : Fuel consumption cost/ Consumable parts cost of tires, tube and so on

** : Source of survey results by USAID on 2001

(2) Since the Project road is rehabilitated to resolve the flooding problem during rainy season, the punctuality, reliability and stability of transportation can be improved. The improved condition is as shown in the table below;

Indicator	Current situation	After improvement
Times of closing	About 10 times/year*	0 time/year

Note* ; Closing hours are 3～6 per one time

Qualitative Effect

Since the countermeasure against the BCS which exist extensively in the area is implemented, the maintenance and repair cost for the deterioration due to BCS could be reduced.

The rehabilitated of Route 3 which is an international corridor can improve the punctuality/timeliness and reliability/stability of transportation, and contribute to the activation and development of economy of Ethiopia.

The improvement of credibility of transportation on the rehabilitated road can result in the easy access to medical/educational facilities and contribute to the reduction of poverty.

Recommendation

ERA should undertake adequate maintenance work of the Project road and bridges after they are open to the public in order to ensure that these structures produce the maximum intended benefits. Especially, efficient implementation of routine maintenance work such as daily inspection, light repairs of pavement, shoulders, drainage facilities, banking and cut slope and traffic safety facilities is important to maximize the life of a road structure. In addition, the regulation of overloaded vehicles should be strengthened since such vehicles seriously damage the pavement structure.

In order to secure the function of the Project road in an effective manner, the matters that ERA should consider to implement specially are recommended as explained below;

To maintain sustained clean up of road drainage facilities

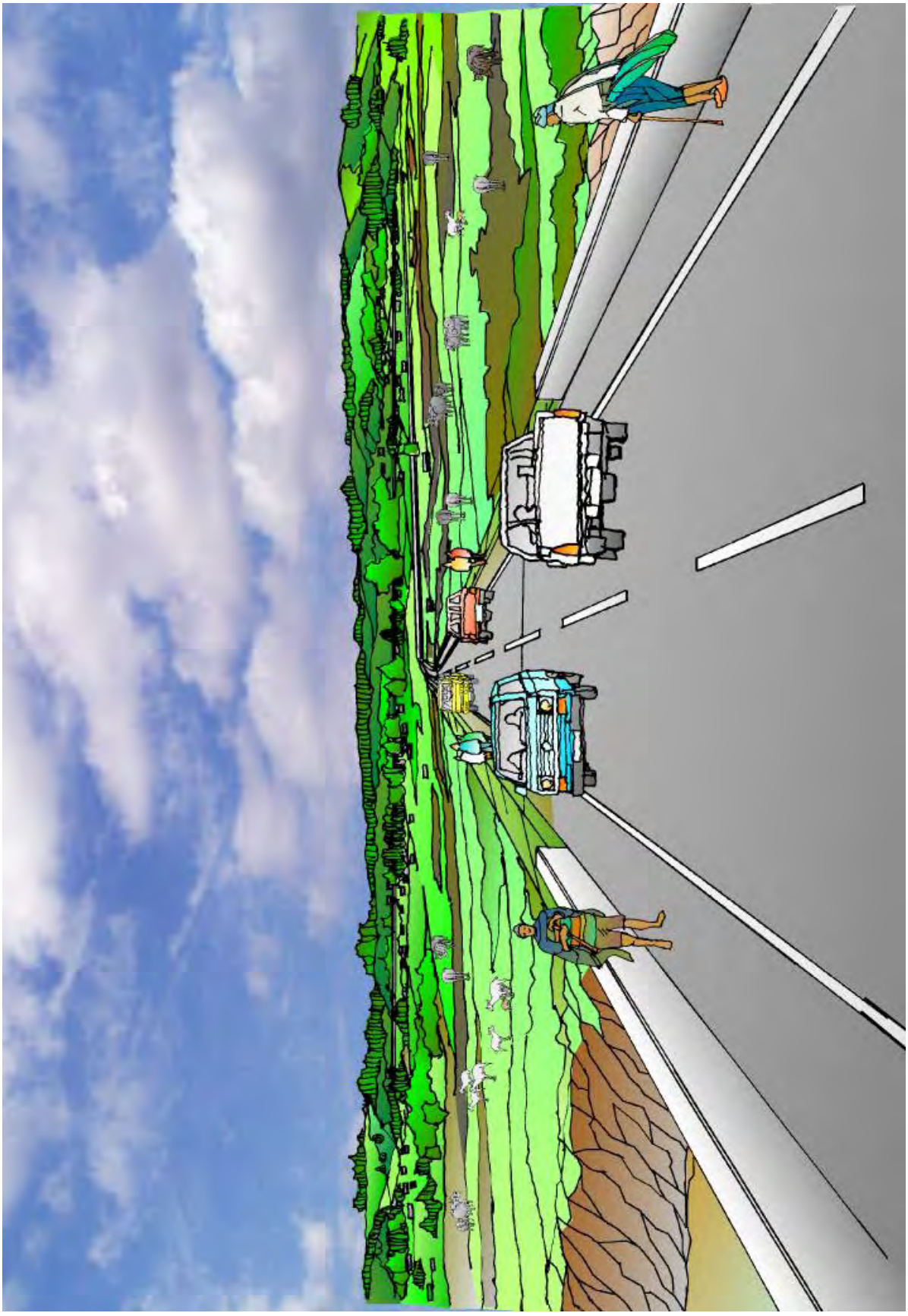
Accumulated sediment in drains such as side gutters, ditches and culverts will cause water to enter into the subgrade that will speed up of deterioration of subgrade, subbase course, base course and pavement. Thus, the cleaning of road drainage facilities is very important for protecting road structure. So, it is recommended that ERA should undertake all of the drainage cleaning work for the entire Project road before and during each rainy season.

Regulation against overloaded vehicles

One major cause of pavement and structure deterioration is overloaded vehicles. Therefore, it is necessary for ERA to install a facility for weighing vehicles (weigh-bridge) to carefully and strictly regulate heavy vehicles.

Table of Contents

Location Map



The Perspective of Project

List of Tables

Page

List of Figures

Page

Abbreviations

AASHTO	: American Association of State Highway and Transport Officials
AFDB	: African Development Bank
BCS	: Black Cotton Soil
CBR	: California Bearing Ratio
COI	: Corridor Of Impact
DBST	: Double Bituminous Surface Treatment
DDM	: Drainage Design Mannual
EEPCO	: Ethiopian Electric Power Corporation
EIA	: Environmental Impact Assessment
EMB	: Environmental Management Branch
EPA	: Environmental Protection Authority
ERA	: Ethiopian Roads Authority
ERCC	: Ethiopian Roads Construction Corporation
EU	: European Union
IDA	: International Development Association
IEE	: Initial Environmental Evaluation
IEIA	: Initial Environmental Impact Assessment
IMF	: International Monetary Fund
IUCN	: International Union for Conservation of Nature and Natural Resources
LRFD	: Load and Resistance Factor Design
PAPs	: Project Affected Persons
PRSP	: Poverty Reduction and Sustainable Development Program
RAPs	: Resettlement Action Plans
Rbt	: Round About
RC	: Reinforced Concrete
RSDP	: Road Sector Development Program
RSDPSP	: Road Sector Development Program Support Project
ROW	: Right of Way
ROWB	: Right- of Way Branch
SATCC	: Southern African Transport and Communications Commission
SCS	: Soil Conservation Service Method
UNECA	: United Nations Economic Commission for Africa
USAID	: United States Agency for International Development

CHAPTER 1 Background of the Project

CHAPTER 1 Background of the Project

1.1 Background of the Project

Ninety five (95%) percent of international cargo transportation and interurban transportation in Ethiopia is borne by road traffic. The improvement of the low density of pavement road condition (the paved road length 6,938km compared the total road length 46,812km, the ratio is 14.8% in 2009) and the road condition (46% of the total road length is in poor condition in 2009) is the urgent issue for Ethiopia.

The Government of the Federal Democratic Republic of Ethiopia (GOE) has been focusing on improving its national road network in order to connect existing and potential agricultural production areas and industrial areas with markets as a major component of its development policy. Ethiopian Roads Authority (ERA) has endeavored to develop the road network, especially the construction of the arterial roads based on the Road Sector Development Program (RSDP) from 1997 under the backing by foreign countries and international organizations. Ethiopia is a landlocked country surrounded by Djibouti, Eritrea, Sudan, Kenya and Somalia, therefore one concept of RSDP is designed to an international corridor leading to these neighboring countries.

Route 3 between Addis Ababa and Metema at the Sudan border (a distance of about 988km) is a significant corridor which connects Addis Ababa city as the market and Amhara region which is grain-growing region that covers 40 percent of agricultural consumption in Ethiopia. And also, the road is used as the transportation route of fuel imported from Sudan which covers 80 percent of fuel consumption by the industries in the vicinity of Addis Ababa. Furthermore, the road is a significant route as a part of the Trans-East African Highway.

The improvement of the road between Addis Ababa and Dejen (about 223km) has been implemented as Japanese Grant Aid Project by the Government of Japan (GOJ) in response to GOE's request for rehabilitation of Route 3 from Addis Ababa to Debre Markos. On the other hand, sections from Debre Markos to Bahar Dar (length about 265km) and from Bahar Dar to Gondar (length about 213km) have been improved and paved under the aid of the World Bank in 2004 and 2007 respectively. And the improvement of the section Gondar and Metema (length about 221km) was completed in March 2011 by GOE's own fund. Only the section between Dejen and Debre Markos (length about 65.5km) remains as the unpaved road, and the rehabilitation of the section is urgent.

In 2009, ERA has conducted a detailed design study from Dejen to Debre Markos with its own funding in order to expedite the improvement of the section. In the detailed design, the realignment plans at seven locations which affects a huge numbers of houses were proposed. The Preparatory Survey Team has suggested ERA the alternative realignment plans to reduce the number of affected houses, and ERA agreed the Preparatory Survey Team's proposal based on the discussion.

The Preparatory Survey was conducted along all the sections between Dejen and Debre Markos. However, the Project was divided into two phases; that is Phase I covering the section between Dejen and Lumame (30.5km) and Phase II covering the section between Lumame and Debre

Markos (35km). Both phases will be completed before the end of June, 2015 in tandem with the target year of RSDP IV

1.2 Natural Conditions

1.2.1 Hydrological Condition

(1) Meteorological Condition

The meteorological data of the observation stations such as temperature and precipitation at Dejen and Debre Markos are shown in Table 1.2.1. The rainy season is from June to September.

Table 1.2.1 Weather data in the Project area

1) Monthly mean maximum and minimum temperatures Debre Markos (1993-2002)

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
MAX	22.5	25.3	25.6	25.1	23.1	19.9	18.8	17.8	19.3	22.0	23.0	23.0	22.11
MIN	8.9	10.3	11.4	12.3	11.8	10.2	10.3	10.9	10.2	9.2	8.9	8.6	10.25

2) Monthly relative humidity (%) Debre Markos

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
AM 6	65	52	63	70	81	95	98	97	94	80	73	68	78
AM 12	32	25	32	40	50	69	78	78	67	51	40	31	50
PM 6	33	24	32	42	51	74	84	86	77	61	48	36	54

3) Monthly rainfall (mm) (1993-2002)

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Dejen	13.5	4.8	55.4	90.8	117.2	180.3	452.5	409.4	176.1	115.8	30.7	8.4	1654.9
Debre Markos	19.2	4.4	37.4	79.4	120.0	167.9	275.1	307.0	216.0	113.7	19.6	23.0	1382.5

4) Monthly mean wind speed (km/h) Debre Markos (2000-2005)

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
AVG	1.3	1.5	1.5	1.6	1.5	1.5	1.3	1.2	1.1	1.3	1.3	1.2	1.3

(2) River condition

Table 1.2.2 shows the river conditions in the Project area, the three spots of the road which are Abeya, Getla and Yeda river are frequently closed due to flooding during rainy season.

Table 1.2.2 River Conditions

ame of river	Basin area (km²)	Flood conditions	Flowing water during a the dry season	Remark
Asamatech	4.30	-	Exist	-
Bechet	165.05	-	Exist	-
Taba	57.45	-	Not-exist	constructed by ERA in 2009
Aba adem	10.90	-	Exist	-
Abeya	28.60	0.2m over bridge surface	Exist	closed by sediment
Bogena	199.00	-	Exist	banks are scoured partially
Yekeyet	5.30	-	Exist	-
Getla	104.50	0.2m over bridge surface	Exist	alignment was shifted 1.7km upstream
Mintkat	6.50	-	Not-exist	-
Ziba	47.80	-	Exist	-
Yeda	109.90	1.2m over bridge surface	Exist	alignment was shifted 1.0km upstream
Ambesh	7.35	-	Exist	-
Chemoga	299.75	-	Exist	-
Wiseta	28.63	-	Exist	-

1.2.2 Geological Condition

The geological investigation of 19 mechanical boring holes and 40 test pits was carried out along the Project road, and the geological features are summarized in Table 1.2.3 and 1.2.4 in accordance with the investigation results. The “Black Cotton Soil (BCS)” is observed in almost entire section of Phase I and at Getla & Yada area in Phase II, the thickness of BCS is mainly until 4m while over 10m is observed at Abeya and Yeda area.

Table 1.2.3 Survey Result of Black Cotton Soil (Phase I)

Boring and Test pit	STA	Place name	BCS	Red. / Brn	N values	CBR	Expansion rate %	PI	NMC	S.L.	Eex
NTP 01	1+500		0.8-2.0		< 10			38			
NTP 02	4+000		0.6-2.6		< 10	2	10.0	51			112
NBH 01	5+060		1.0-2.5		8-9			77	39	3.2	
NTP 03	5+500		0.5-1.9		< 10			48			
BH 09	8+500	Yetnora	0.95-2.7		2-6			47			
NTP 05	9+500		0.8-2.8		< 10			46			
BH 10	10+500		0.0-2.0		3-10			36	31		
BH 11	11+400		0.0-4.0		4-9			25	40		
NTP 06	11+500		0.5-3.1		< 10			73			
BH 12	12+500	Bechet	0.5-2.5		1-6			52	46		
NTP 07	13+500		0.7-2.5		< 10	2	8.0	42			97
NBH 02	14+560		0.6-2.0		8			72	39	2.8	
NTP 08	15+500		0.8-2.5		< 10			62			
NTP 09	16+500		0.9-2.6		< 10			73			
NTP 10	17+500		0.6-2.4		< 10			74			
BH 13	18+500	Taba	0.0-3.0		1-4			78	51		
NTP 11	19+500	Wejel	0.5-2.4		< 10			47			
BH 14	20+000	Aba Adem	0.0-2.1		3-4			52			
NBH 03	20+090	Aba Adem	0.5-3.5		9-14			70	44	4,4	

Boring and Test pit	STA	Place name	BCS	Red. / Brn	N values	CBR	Expansion rate %	PI	NMC	S.L.	Eex
NTP 12	21+500		1.1-2.4		< 10			51			
NBH 04	22+040	Abeya	1.0-13.0		2-9			51	46	7.3	
NBH 05	22+080	Abeya	1.0-11.0		4-11			53	44		
NTP 13	23+000		0.6-3.0		< 10	2	8.4	51			128
NTP 14	24+000		1.6-2.5		< 10			57			
NTP 15	26+500		0.8-3.0		< 10	2	12.4	43	53	9	90
NBH 06	26+500		0.6-2.5		4-5			52	53	6.2	
NTP 16	27+500		0.7-2.7		< 10			71			
NTP 17	29+000		0.5-3.0		< 10			63			
NBH 07	29+300	Bogena	0.6-3.9		10			43	31		
NBH 08	29+390	Bogena	1.0-3.9		5-6			70	61		
NPT 18	30+000		1.1-3.0		< 10			59			

Note: BCS: Black Cotton Soil, Red: Red Soil, Brn: Brown Soil, SW(%) : Swell, PI: Plasticity Index
NMC(%): Natural Moisture Content, S.L(%).: Shrinkage Limit, Eex: Expansiveness

Table 1.2.4 Survey Result of Black Cotton Soil (Phase II)

Boring and Test pit	STA	Place name	BCS	Red. / Brn	N values	CBR	Expansion rate %	PI	NMC	S.L.	Eex
NTP 19	32+000		-	Red		9	1	43	35	14	81
NTP 20	34+500		-	Brn				46			
NBH 09	35+670	Getra									
NTP 21	36+000		0.0-1.3		< 10			50			
NTP 22	37+500		0.0-1.4		< 10			54			
NTP 23	38+500		0.5-2.7		< 10			32			
NTP 24	40+500		-	Red				28			
NTP 25	42+500		-	Red		9	1.2	28	31	17	33
NTP 26	43+500		-	Red				25			
NBH 10	44+060		-	Red	> 12			21	35	15	
NTP 27	45+500		-	L/Brn				24			
NTP 28	46+500		-	D/Brn				40			
NBH 11	47+420	Yeda	0.0-5.5		4-10			57	35	6.8	
NTP 29	48+000	Yeda	> 4.0		< 10			58			
NBH 12	48+900	Yeda	0.0-10		5-10			40	43	7.8	
NBH 13	49+200	Yeda	0.0-10		1-9			32	49	10.7	
NTP 30	49+500	Yeda	> 4.0		< 10	2	7.9	43	36	14	81
NBH 13-2	50+200	Yeda	0.0-2.4		4-10			54	37	2.5	
NTP 31	50+500	Yeda	0.0-2.7		< 10			44	46	13	85
NTP 32	51+500		-	Red				37			
NTP 33	53+000		-	L/Brn				22			
NBH 15	53+500	Ambesh	-	D/Brn							
NTP 34	55+000		-	Red				38			
NTP 35	56+500		-	D/Brn		4	3.8	31	41	14	49
NTP 36	57+500		-	Red				39			
NBH 16	57+890	Chemoga	-	L/Brn	2-8			31	45		
NBH 17	58+020	Chemoga	-	L/Brn	> 11			40	35		
NTP 37	59+000		-	Red				36			
NTP 38	60+500		-	Red				23			
BH 19	61+000	Wiseta	-	Red	2			27	44		

Note: BCS: Black Cotton Soil, Red: Red Soil, Brn: Brown Soil, SW(%) : Swell, PI: Plasticity Index
NMC(%): Natural Moisture Content, S.L(%).: Shrinkage Limit, Eex: Expansiveness
Red: ReD/Dish silty clay, L/Brn: Light brown silty clay, D/Brn: Dark brown silty clay

Figure 1.2.1 shows the plan and profile along the Project road, the sections of two phases and the distribution of BCS.

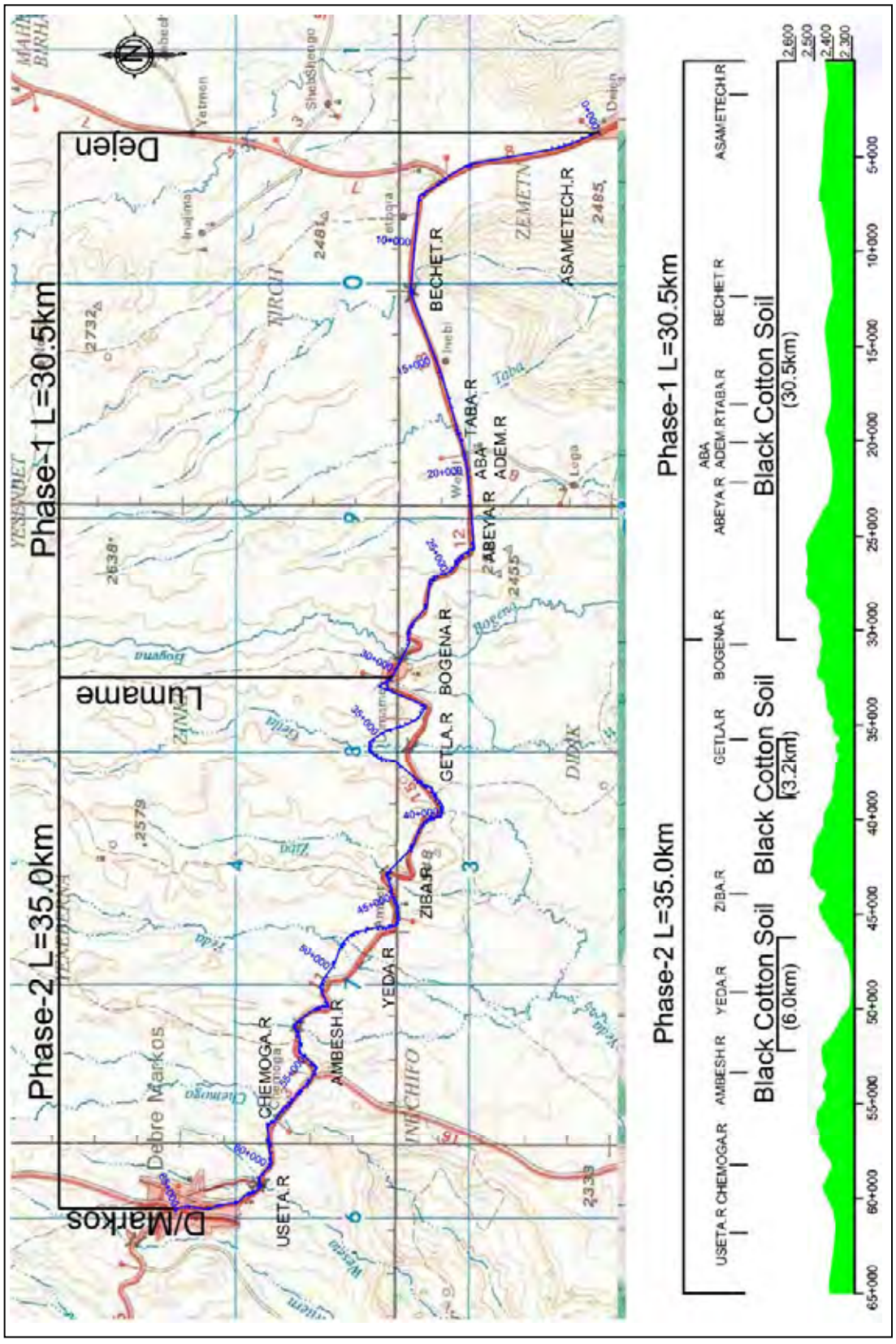


Figure 1.2.1 Plan/Profile of the route and Distribution of Black Cotton Soil

1.2.3 Environmental and Social Considerations

(1) Legal Framework of Environmental and Social Considerations

1) Environmental Impact Assessment

The Environmental Impact Assessment (hereinafter referred to as "EIA") process is a requirement of the Environmental Impact Assessment Guideline document (2000/ Environmental Protection Authority (hereinafter referred to as "EPA")). The specific process and conditions for conducting EIA are explained in the "Environmental Procedures Manual (2001/ ERA)"

According to this procedure, the road development project is recognized under "economic infrastructure and services/transport," with actual classification carried out based on the project's characteristics such as project scale and location. It is concluded that the Project is categorized as "Schedule-2" and is still under process for the approval of an environmental license.

The "Schedule-2" is defined in the guideline and process of environmental approval as shown below:

Table 1.2.5 Project Classification (Economic Infrastructures and Services/Transport)

Category	Definition / Target Project
Schedule 1 (Required EIA)	Projects which may have adverse and significant environmental impacts, and may, therefore, require full EIA. - Major urban roads - Rural road programmes - Rail infrastructure and railways - Airports with a basic runway length of 2,100 m or more - Trans-regional and International high way
Schedule 2 (After the review of IEIA, the necessity for EIA is determined)	Projects whose type, scale or other relevant characteristics have potential to cause some significant environmental impacts but not likely to warrant an environmental impact study. - **Upgrading or rehabilitation of major rural roads** - Airports with basic runway length less than 2,100 m
Schedule 3 (No further environmental assessment required)	Projects which would have no impact and does not require environmental impact assessment - Upgrading involving only minor realignment, no extension and no new bridges for all road classes - Rehabilitation, including reconstruction, where the widening is only a small percentage of the existing width of the travel area of all road classes - Periodic and routine maintenance of all road classes - Traffic management projects for all road classes

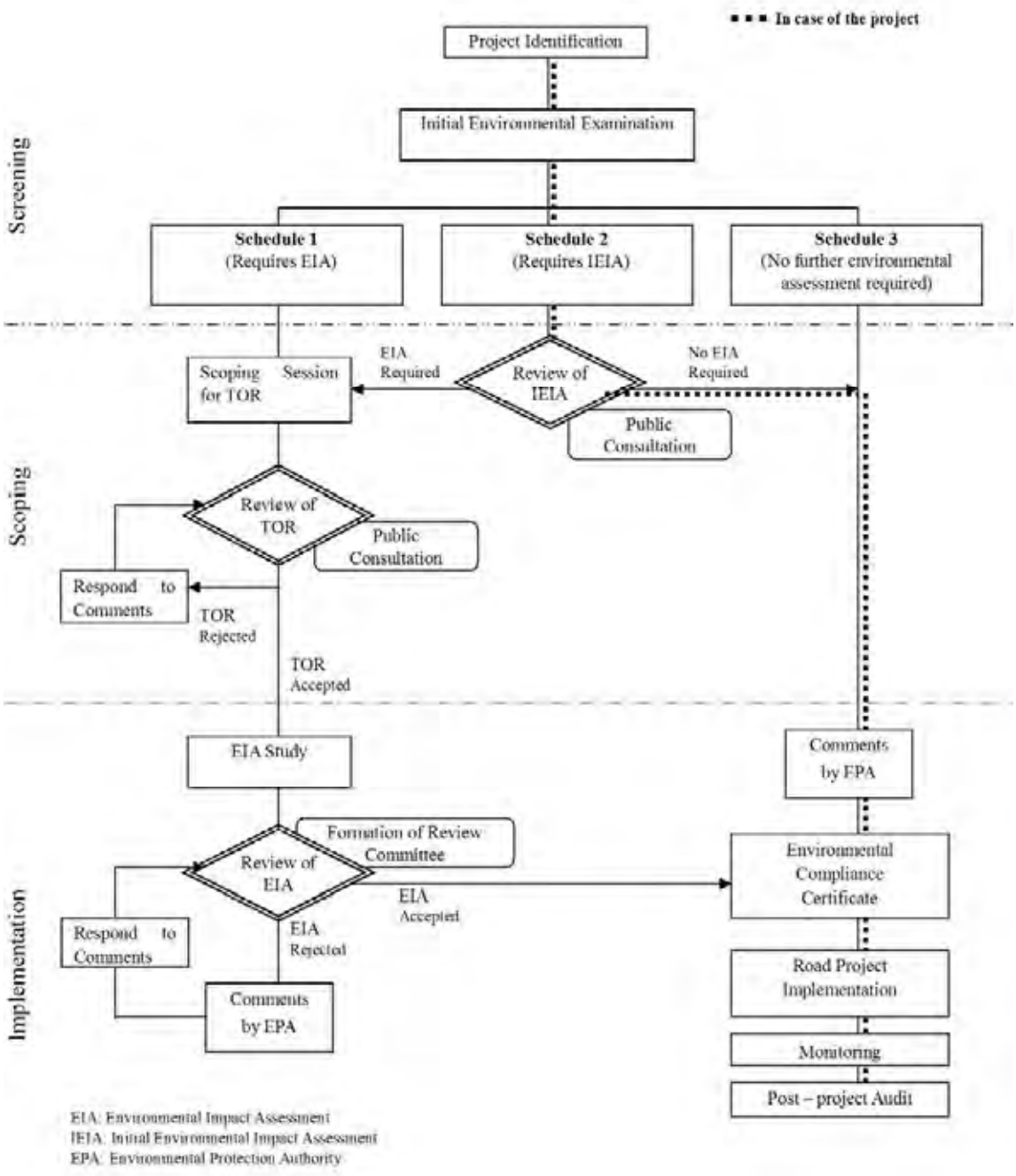
Note: Environmental Impact Assessment Guideline Document (2000/ EPA)
Environmental Procedures Manual (2001/ ERA)

2) EIA Approval Process

ERA carries out required EIA activities based on the alignment in detailed design which was prepared by ERA (hereinafter referred to as "ERA D/D"). The approval process is shown in Figure 1.2.2.

However, the alignment of ERA D/D was revised in JICA's Preparatory Survey from the social consideration point of view, thus the JICA Survey Team confirmed the followings regarding EIA process conducted by ERA and the current situation.

- A draft EIA report which has not been submitted to EPA was prepared.
- The issuance of Environmental Compliance Certificate is conducted from ERA instead of EPA since the predicted impacts of the Project are not serious



Source: Environmental Impact Assessment Guideline Document (2000/ EPA)
Environmental Procedures Manual (2001/ ERA)
Interview from ERA

Figure 1.2.2 Law-based EIA Approval Process

3) Land Acquisition and Resettlement Process

The Land Acquisition and Resettlement Process are conducted subject to the Resettlement/Rehabilitation Policy Framework (2002/ERA) and Proclamation No.455/2005. ERA has drafted the Resettlement Action Plan (hereinafter referred to as "RAP") based on the alignment of ERA D/D.

(2) Examination of Alternative Alignments

The project area is located in the Amhara Regional State which is in the northwestern part of the country. The major economic activity in the Project area is agriculture, thus most of the land is used for cropping and grazing.

The Project is the rehabilitation of the existing roads along the farmlands, and passing through small towns/villages, therefore the project is not expected to have adverse impacts to fauna and flora.

However, some mitigation measures are required from the social considerations point of view to the residents since some towns such as Dejen, Lumame, Amber, and Debre Markos are located along the road.

The locations of the towns are along the alignment shown below:

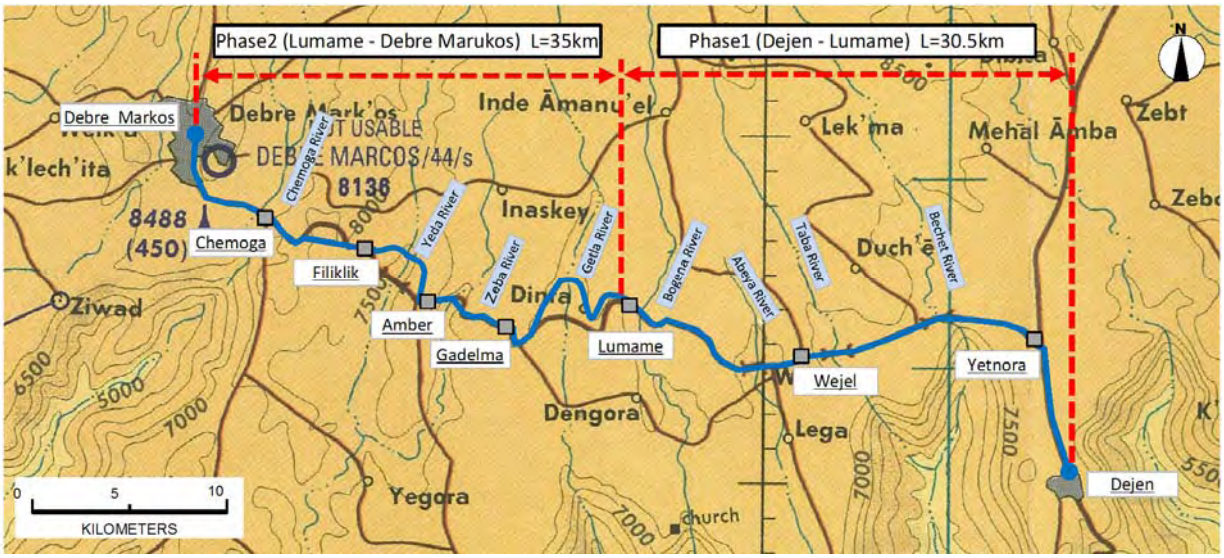


Figure 1.2.3 Locations of the towns along the alignment

A width of fifty meters has been adopted as the right of way (ROW) for the DS3 class road in ERA D/D. It was confirmed that there are many affected houses and some water supply facilities such as public wells and pond water within the ROW.

Therefore, the Survey Team proposed the improved alternative alignments which are considered to reduce the influence to houses and water supply facilities. Furthermore, the Survey Team proposed to decrease the ROW width and to acquire the only physically affected area (Corridor of Impact) to avoid or minimize social impacts.

Results of the examination of PAHs and PAPs in consideration of the alternative alignment are as shown in Table 1.2.6.

Table 1.2.6 Result of Alternative Analysis (Resettlement)

Sections			Width	DD Route by ERA	Proposed New Alignment	
				PAHs	PAHs	PAPs
Phase I	Sta.00+000-00+500	Dejen	12.0m	8	0	0
	Sta.06+800-09+100	Yetnora	12.0m	9	0	0
	Sta.18+600-20+200	Wejel	19.0m	24	1	5
	Sta.28+700-30+400	Lumame	19.0m	9	5*	0
	Sub-total			50	6	5
Phase II	Sta.30+400-39+300	Unpopulated Area	10.0m	3	2	8
	Sta.39+300-39+900	Gudalema	12.0m	1	0	0
	Sta.45+720-46+800	Amber	19.0m	ND	16	70
	Sta.46+800-52+000	Unpopulated Area	10.0m	1	2	10
	Sta.52+000-52+900	Filiklik	12.0m	ND	0	0
	Sta.58+000-59+400	Chemoga	12.0m	11	0	0
	Sta.59+400-60+900	Unpopulated Area	10.0m	9	0	0
	Sta.60+900-61+700	Debre Markos	13.0m	84	1	5
	Sta.61+700-64+200		19.5m		6	29
	Sta.64+200-65+500		20.0m		8	37
	Sub-total			109	35	159
Total (Dejen – Debre Markos)				159	41	164

*: Kiosk
Source: Draft Resettlement Action Plan Report (2010/ ERA) and field survey by JICA Survey Team

Public Well (At St.8 km: Yetnora)

Pond Water (At St.46.5 km: Amber)

Figure 1.2.4 Impacts Avoided (Existing Public Water Supply Facilities)

(3) Adverse Environmental and Social Impacts (Results of Scoping)

The relationship between impact factors by stages and impact items are shown in the table below. Some impacts are predicted in the social, natural and public pollution scope. However, most of these impacts are negligible and not significant. Items to be analyzed are picked up from the scoping matrix in the table below.

Table 1.2.7 Scoping Matrix for the Project (Road Improvement)

Impact Item				Factor							
				Planning Phase	Construction Phase						Post Const.
	No	Likely Impacts	Overall Rating	Land Acquisition and Compensation	Construction of base camp	Development of borrow pits, quarry sites and detour	Alteration to ground by cut land, filling, drilling, tunnel, etc.	Operation of Construction Equipment and Vehicles	Influx of construction workers	Generation of construction waste such as removal of asphalt concrete	Increase of through Traffic
Social Env.	1	Resettlement	**B**	B							
	3	Land use and utilization of local resources	**B**		B	B					
	5	Social institutions such as local decision-making institutions	**B**	B							
	10	Water Usage or Water Rights and Common Rights	**B**		B						
	11	Sanitation	**B**						B		
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS	**B**						B		
	13	Accidents	**B**					B			B
Natural Env.	15	Soil Erosion	**B**			B	B				
	23	Air pollution	**B**			B		B			
	24	Water pollution	**B**		B	B	B				
	26	Wastes	**B**		B					B	
	27	Noise and Vibration	**B**			B		B			

Rating:
A: Serious impact is expected
B: Some impact is expected
No rating item: Few adverse impacts are expected or negligible

Table 1.2.8 Rating Reasons

Impact Item			Rating	Reasons of Rating
Social Environment	1	Resettlement (or Loss of Properties)	B	Expected numbers of affected structures are reduced from 159 to 40 due to mitigation measures. Thus this project does not give serious negative impacts on this item basically.
	2	Local economy such as employment and livelihood, etc.		Economic activities in agricultural area must be stimulated due to construction of all-weather road with paved surface. Thus this project does not give negative impacts on this item basically.
	3	Land use and utilization of local resources	B	New road alignment follows current road alignment as much as possible from the social considerations point of view, not to affect existing local resources such as forests and agricultural fields along the road. During construction, temporary facilities and sites such as borrow pits, quarry sites and detours are planned to use existing facilities and sites. Additionally, the location of these facilities and sites are considered to be away from proximity of schools, medical facilities and residential area.
	4	Social institutions and local decision-making institutions		This project does not give serious negative impacts on this item basically
	5	Social infrastructures and services	B	In some areas, replacement of power poles is required. However impacts for public water supply facilities and wells will not be affected by the project. Thus it is not likely to give significant adverse impacts on this item.
	6	Poor, indigenous and ethnic people, gender		There are not any indigenous and ethnic people in the project site. Thus this project does not give negative impacts on this item basically.

Impact Item			Rating	Reasons of Rating
Social Environment		and children rights		
	7	Misdistribution of benefits and damages		This project does not give serious negative impacts on this item basically
	8	Cultural heritage (ex. burial grounds)		There are not any cultural heritages in the project site. Thus this project does not give negative impacts on this item basically.
	9	Local conflict of interests		This project does not give serious negative impacts on this item basically
	10	Water Usage, Water Rights or Common Rights	B	Although there are not any water rights in the project site, construction of new water facilities such as wells for base-camps must acquire permission from the local authority. Furthermore construction activities may affect the existing water supply system in the town; however these water pipes must be replaced within a short period of time. Thus this is not likely to give significant impacts.
	11	Sanitation	B	Influx of construction workers may cause sanitation risks such as an increase in discharge of waste water (sewage) for domestic use in base-camps. However these predicted adverse impacts shall be mitigated by the contractor's management of base-camps. Therefore it is not likely to give significant impacts.
	12	Hazards (Risks) Infectious diseases such as HIV/AIDS	B	During the construction of facilities, there is a possibility that they may contract sexually transmitted diseases (STDs) through sexual relations with prostitutes within the area. However, this impact shall be mitigated through the Contractor's periodic health/safety education to workers and villagers.
	13	Accidents	B	During construction, operation of construction machines and vehicles has risks of traffic accidents. Traffic safety will be secured due to alignment improvement, expansion of the road and setting up walkways in the residential area. But on the other hand, increased speeding may cause fatal accidents.
Natural Environment	14	Topography and Geographical features		This project does not give negative impacts on this item basically
	15	Soil Erosion	B	Alteration to ground by cut land, filling, drilling and development of borrow pits may cause soil erosion.
	16	Underground water		This project does not give serious negative impacts on this item basically
	17	Hydrological Situation		This project does not give serious negative impacts on this item basically
	18	Coastal Zone		There are no coastal zone in the project area
	19	Flora, Fauna and Biodiversity		Most planned sites are categorized agricultural areas, and there are not any areas such as national parks, conservation areas, migration corridors and habitats of considerable species. Thus the project does not give adverse impacts on this item.
	20	Meteorology		This project does not give serious negative impacts on this item basically
	21	Landscape		This project does not give serious negative impacts on this item basically
	22	Global Warming		This project does not give serious negative impacts on this item basically
Pollution	23	Air Pollution (dust)	B	Although construction machines and vehicles may cause dust during and post construction, it is not likely to give a significant impact.
	24	Water Pollution	B	During construction, alteration to ground by cut land, filling, drilling and development of borrow pits may cause turbid water. Additionally domestic water will be discharged. However it is not likely to give significant impacts.
	25	Soil Contamination		This project does not give serious negative impacts on this item basically
	26	Wastes	B	Although concrete wastes and soil wastes will be generated by the demolition of existing facilities and earthwork, these wastes will be buried in a designated dumping site, thus there are not significant adverse impacts on this item.
	27	Noise and Vibration	B	Although operation of construction machines and vehicles give traffic and construction noise, it is not likely to give significant impact due to the limited scale, time and duration. It is predicted that traffic noise and vibration levels will be the same as the current level.
	28	Ground Subsidence		This project does not give serious negative impacts on this item basically
	29	Offensive Odors		This project does not give serious negative impacts on this item basically
	30	Bottom sediments		This project does not give serious negative impacts on this item basically

(4) Mitigation Measures and Monitoring Items for the Project

Proposed mitigation measures and monitoring items by stage are as follows: monitoring shall

be carried out by environmental specialists from the contractor and supervisor, and the results of monitoring shall be submitted to ERA. This condition will be included in instructions to tenders.

Table 1.2.9 Proposed Mitigation Measures and Monitoring Items for the Project

Item		Mitigation Measures by Phase	Monitoring Items
Social Environment	1. Resettlement	**[Pre-Construction stage]** 1-1. Update of RAP - Implementation of additional inventory of loss and population census in re-alignment section, declaration of cut-off date and holding stakeholder meetings 1-2. Implementation of RAP - Implementation of Detailed Measurement Survey (DMS) and Replacement Cost Survey (RCS) - Land acquisition after implementation of negotiation, contract and compensation - Implementation of livelihood restore program as required 1-3. Monitoring after resettlement	- Interview of opinions from stakeholders
	3. Land use and utilization of local resources	**[Pre-Construction stage]** 1-1. Mitigation measures for borrow pits and quarry sites - Temporary facilities and sites such as borrow pits, quarry sites and detours are planned to use existing facilities and sites. Additionally location of these facilities and sites are considered from proximity of schools, medical facilities and residential area. - Operation of borrow pits and quarry sites based on excavation plans - Implementation of planting trees and grasses around borrow pits and quarry sites to mitigate impacts such as dust and noise - Implementation of a restore program post operation based on owner feedback	- Confirmation for implementation of mitigation measures at borrow pits and quarry sites
	5. Social infrastructures and services	**[Pre-Construction stage]** 5-1. Identification and replacement of existing social infrastructures such as power poles and water supply	- Consultation with ERA
	10. Water Usage, Water Rights or Common Rights	**[Construction Stage]** 10-1. Acquisition of water use permission regarding construction of wells in camp sites from local authority	- Consultation with ERA
	11. Sanitation 12. Hazards (Risks) Infectious diseases such as HIV/AIDS	**[Construction Stage]** 11,12-1. Implementation of educational activities regarding healthcare for construction workers and inhabitants in the project area (cooperation with Federal HIV / AIDS Prevention and Control Office, NGO) 11,12-2. Implementation of periodical medical checks	- Interview regarding morbidity from local medical office
	13. Accident	**[Construction Stage]** 13-1. Implementation of educational activities regarding traffic safety control for construction workers and inhabitants 13-2. Arrangement of traffic controllers in the residential area where it is not a planned detour 13-3. Record of accident cases 13-4. Installation of traffic safety facilities such as zebra crossing and sign boards in the town sections **[Post Construction]** 13-5. Traffic safety campaign by police	- Interview regarding traffic accident cases from the police station and medical office
Natural Environment	15. Soil Erosion	**[Pre-Construction stage]** 15-1. Planting and installation of berm in embankment for embankment stabilization **[Construction Stage]** 15-2. Implementation of construction working in dry season 15-3. Use of topsoil for planting trees on embankment 15-4. Implementation of mitigation measures for borrow pits and quarry sites 15-5. Implementation of educational activities regarding soil erosion for construction workers **[Post Construction]** 15-6. Implementation of periodical maintenance by local residents	- Confirmation of embankment stabilization by visual observation during construction - Confirmation for implementation of mitigation measures at borrow pits and quarry sites by visual observation post construction

Item		Mitigation Measures by Phase	Monitoring Items
Pollution	23. Air Pollution	**[Construction Stage]** 23-1. Sprinkling of water for prevention of dust in residential areas 23-1. Implementation of mitigation measures for borrow pits and quarry sites (see "3. Land use and utilization of local resources ")	- Confirmation for sprinkling of water by visual observation during construction
	24. Water Pollution	**[Construction Stage]** 24-1. Implementation of mitigation measures for prevention of turbid water (see "15. Soil Erosion") 24-2. Set up of treatment facilities for sedimentation of turbid water and discharged water from the base camp	- Same as "15. Soil Erosion"
	26. Wastes	**[Construction Stage]** 26-1. Implementation of adequate construction waste management - Contractor shall report contents and volume of construction waste to ERA, then the Contractor shall follow ERA's disposal methods	- Consultation with ERA
	27. Noise and Vibration	**[Construction Stage]** 27-1. Adjustment of work time in residential area (limited work time during the daytime) Additionally consideration of religious praying time as required 27-2. Implementation of mitigation measures for borrow pits and quarry sites	- Confirmation of working time in residential areas

Note: All mitigation measures shall be monitored by a contractor, thus these items to be monitored shall be included in instruction to tenderers

(5) Consultation

A series of stakeholder meetings were conducted on the EIA process (scoping phase) and formulated on basic consensus from stakeholders and local authorities that participated.

A summary of stakeholder meetings is shown in Table 1.2.10.

According to ERA, these stakeholder meetings were held for the residents along the Project road and for local authorities respectively. It was confirmed that the residents along the road understood and agreed with project activities through interviews in the Preparatory Survey.

The JICA Survey Team proposed the rehabilitation of existing National Highway No.3 in Debre Markos instead of the alignment prepared during ERA D/D because the latter affects many houses. ERA has approved the idea put forward by JICA Survey Team, and ERA will inform it to Debre Markos Town Administration.

Table 1.2.10 Summary of Stakeholder Meetings

Item	Description
Objectives	• Provision of information regarding the project activities, and acquisition of supplemental information regarding social and natural environment matter • Formulation of basic consensus from stakeholders and relevant local authorities
Participant/ Methodology	• Stakeholder meetings were for mainly two parties, one is inhabitants along the road and another is local authority. These meetings were held separately.
Date/ Venue	• 3rd Nov. 2009: At Debre Markos Town Administration • 4th Nov. 2009: At 3 venues (Aneded Woreda Office, Dejen Woreda, Water Resource Office)
Major Agenda	• The attitude of the local community towards the project • Anticipated positive/ negative impacts of the project • The requirement of community participation at different stages of project activities • The means to avoid and/or mitigate anticipated adverse impacts of the proposed project • The experience of the local community in similar development projects
Min Opinions	• Receiving fair compensation • Minimizing land acquisition • Ensuring adequate land allocation and livelihood restoration

Source: Draft Resettlement Action Plan Report (2010/ ERA) and interviews conducted by JICA Survey Team

(6) Key Issues

1) Items to be monitored in RAP and EIA Process

The following key items on the process of RAP and EIA activities were confirmed between ERA and the JICA Survey Team. As for the issue of Environmental Compliance Certificate and Update of RAP, ERA shall report to JICA in accordance with the environmental monitor form.

a. EIA Approval Process

- Since the approved alignment reduces and mitigates the predicted social impacts, the current draft EIA is valid.
- ERA will prepare a supplementary EIA report with the current draft EIA report reflecting the output from the JICA Survey Team and issue the Environmental Compliance Certificate by May, 2011.

b. Updating and Implementation of RAP

- Additional inventory of loss, population census (hereinafter referred to as “simple survey”) and the declaration of a cut-off date will be carried out by ERA.
- This simple survey will be carried out based on the information regarding affected properties provided as a result of the Preparatory Survey.
- The announcement of a cut-off date for both Phase-1 and 2 will be executed by ERA concurrently. In principle, the Cut-off date is fixed even if the RAP process goes beyond four years. There are not any conflicts regarding fixing a cut-off date with stakeholders according to ERA’s previous experiences so far.
- ERA will secure the required budget for Resettlement Action Plan. All of the land

belongs to the government. And alternative land for the affected persons is provided by the local government.

- Compensation for affected properties shall be carried out with replacement costs without depreciation based on types of structures such as brick, mud houses and so on. Provision of alternative land or payment of compensation equivalent to amount of crop for 10 years base on the average of 5 years should be conducted in compensation for the property lose (farmland).
- In case of temporally use of land for construction yards, plants and camp, affected land will be restored to original state in principle; in addition income for the duration of temporally use should be compensated. When restoration to original state is impossible, compensation for 10 years should be conducted in the same way as mentioned above.
- Each public utility companies for power, gas, water supply and etc belong to the government. Accordingly, both budgeting and actual works such as relocation should be carried out by each companies based on ERA's requirement.

2) Schedule of Land Acquisition and Compensation

It is confirmed that the Ethiopian Government has the responsibility to carry out the land acquisition and compensation activities by its own expenses.

With regard to the land acquisition process conducted after the Preparatory Survey, ERA has two options as follows:

Option -1: During the detailed design stage, ERA and a hired consultant will conduct simple surveys such as loss of inventory and population census of affected houses and lands, then relevant bodies such as the ROW Branch of ERA, Administration, Municipality and Agriculture Bureau will revise existing RAP based on the implementation of a Detailed Measurement Survey (DMS) and Replacement Cost Survey (RCS). The ROW Branch with the above mentioned members will institute contracts with property owners and obtain required land.

Option -2: At the beginning of the construction stage, hired consultant(s) and contractor(s) will conduct simple surveys such as loss of inventory and population census of affected houses and lands, and then a report of simple surveys will be submitted to ERA. Relevant bodies such as ROW Branch of ERA, Administration, Municipality and Agriculture Bureau will revise existing RAP based on the implementation of DMS and RCS. The ROW Branch with the above mentioned members will institute contracts with the property owners and obtain the required land. In ERA's experiences, the process for 30 cases of resettlement takes two to three weeks only.

According to an on-going road project which was funded by the African Development Bank, DMS and RCS was already carried out in the first 40 km of the section out of 100 km of the

road length, and basic consensus was formulated with stakeholders for a smooth project implementation.

The Survey Team will request to execute the land acquisition and compensation activities for the Project in accordance with the Option-1 in a similar way of Africa Development Bank's Project.

CHAPTER 2　CONTENTS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2.1 Basic Concept of the Project

RSDP is continuously carried out since 1997 in Ethiopia, and RSDP IV is going on from 2010 July as a five-year plan currently. The improvement of the road between Addis Ababa and Dejen (about 223km) has been implemented as Japanese Grant Aid Project and part of RSDP in three phases as follows;

- The Project for Rehabilitation on Trunk Road Phase I; RSDP I
- The Project for Rehabilitation on Trunk Road Phase II; RSDP II
- The Project for Rehabilitation on Trunk Road Phase III; RSDP III

The Project (Phase IV) is scheduled to be completed during RSDP IV (July 2010 ~ June 2015).

Table 2.1.1 shows the outline of the Project as divided into two phases. A huge amount of borrow material is required for countermeasure of the BCS in Phase I (refer Figure 1.2.1), while the borrow material is required for embankment in Phase II. The road across the Abeya river section will be embanked to secure traffic during rainy season to avoid overhead flooding, and also the new alignments in Getla and Yeda river section will not be inundated because it is planned to shift the alignments upstream direction by 1.7km and 1.0km respectively.

Table 2.1.1 Outline of Project

Category		Phase I	Phase II
Construction Period (Plan)		27 month	22 month
Road Length (km)		30.5	35.0
Pavement (Thousand m^2)		262	300
Earthwork	Cut (Thousand m^3)	168	310
	Fill (Thousand m^3)	287	1,034
	Replacement (Thousand m^3)	631	199
Bridge	Construction (Including Box Culvert) (Bridge)	4	9
	Repair (Bridge)	1	1
Drainage、etc (LS)		1	1

2.2 Outline Design of the Requested Japanese Assistance

2.2.1 Design Policy

The Project will contribute to social and economic development, and agriculture improvement in Ethiopia.

In some locations of the road, floods have frequently occurred in rainy season. In addition, Black Cotton Soil (expansive soil) is found extensively in the Project area. Thus design for the Project should be executed based on the following basic plan proposed by site survey and discussion with ERA to conduct appropriate countermeasures against the above issues and so on.

2.2.1.1 Basic Policy of the Road Design

(1) Applicable Design Standards

The following manuals issued by ERA in 2002 are applied in the design.

- Geometric Design Manual
- Drainage Design Manual
- Pavement Design Manual Vol.1: Flexible Pavements and Gravel Roads
- Pavement Design Manual Vol.2: Rigid Pavements
- Pavement Rehabilitation and Asphalt Overlay Manual
- Bridge Design Manual
- Site Investigation Manual
- Standard Detail Drawings
- Standard Technical Specifications

The Road Design Manual is intended for use in the design of all roads and bridges in Ethiopia. The purpose of the manual is to give guidance and recommendations to the engineers responsible for the design of roads and bridges.

(2) Alternative Alignment Plan

1) Basic Concept of Alternative Alignment Plan

From ERA Detail Design (D/D), the study for the re-alignment at 7 locations between Dejen and Debre Markos had been conducted. The planned realignment at Getla is to avoid an impact due to the reservoir of the New Getla dam and the realignment at Yeda is to avoid the flood during rainy season. The realignment plans at other 5 locations by ERA D/D were reconsidered to reduce the number of affected houses, to secure traffic safety, to protect the public water facilities and to reduce the earthwork quantity. The results of alternative alignment plans are shown as follows:

2) Route Selection in Debre Markos Town

According to the ERA D/D, the number of affected houses in Debre Markos goes up to 86. This number may affect the implementation schedule for the Project causing delay. For this reason, rehabilitation of existing A3 is proposed based on the following studies and accepted by ERA.

Outline of Alternative Routes in Debre Markos

Alt.1:ERA D/D

At entrance of Debre Markos, it diverts from existing A3 to unpaved town road and rejoins A3 in the city center via two new roundabouts.

Length: 4,100m
No. of Bridges: 2
Land Use: Residential and Commercial
Road Width planned by D/D = 21.5m

Alt.2: Existing A3

Existing A3 in Debre Markos is paved.
Length: 4,100m
No. of Bridges: 1
Land Use: Residential and Commercial

Legend

: Alt.1
: Alt.2

Figure 2.2.1 Outline of Alternative Route in Debre Markos

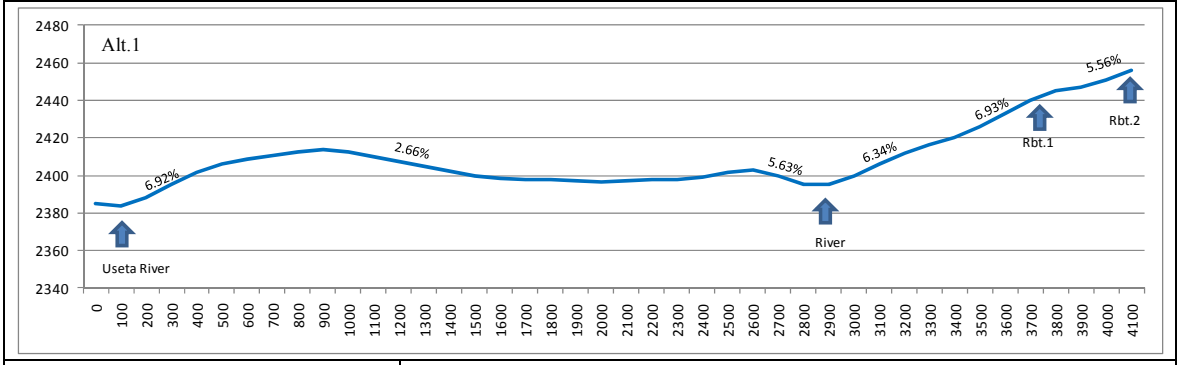
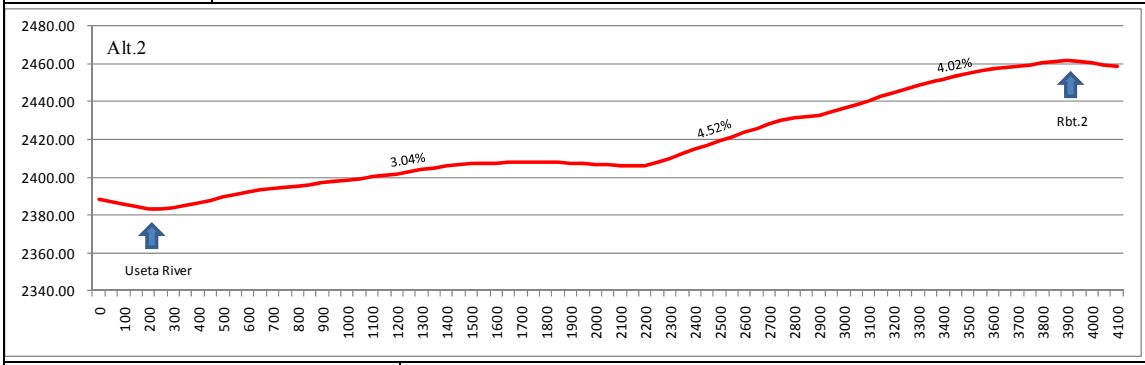
The following table shows comparison of the number of affected houses. In case of existing A3, social impact with respect to affected houses is minimized.

Table 2.2.1 Number of Project Affected Houses (PAHs) in Both Cases

Section		Width	Number of PAHs (Alt.2)	Number of PAHs (Alt.1)	
				ERA･RAP	Counted by Survey Team
Debre Markos	60+800-61+600	13.0m	1	84	86
	61+600-64+100	19.5m	6		
	64+100-65+400	20.0m	8		

In addition, traffic safety, reliability and punctuality should be considered because target road functions as international trunk road. The following table shows characteristics on road function.

Table 2.2.2 Comparison of Characteristics of Each Alternative

<table>
<tr><td colspan="3"> 
</td></tr>
<tr><td>Average I</td><td>2.99%</td><td rowspan="3">Traffic jam with decrease in speed of heavy vehicles is a concern because both average grade and maximum grade are larger than Alt.2. In addition, traveling performance such as flatness is not so suitable.</td></tr>
<tr><td>Max. I</td><td>6.93%</td></tr>
<tr><td>Rise and Fall</td><td>29.9m/km</td></tr>
<tr><td>Traffic Safety</td><td colspan="2">Increase of risk of traffic accident will be a matter of concern at two right-angled turns in densely populated area of Debre Markos Town.</td></tr>
<tr><td colspan="3"> 
</td></tr>
<tr><td>Average I</td><td>1.52%</td><td rowspan="3">Characteristic as international trunk road is suitable because flatness, average grade and maximum grade are gentler than Alt.1.</td></tr>
<tr><td>Max. I</td><td>4.52%</td></tr>
<tr><td>Rise and Fall</td><td>22.1m/km</td></tr>
<tr><td>Traffic Safety</td><td colspan="2">Reduction of risk of traffic accident will be expected by installation of road safety facilities.</td></tr>
</table>

As mentioned earlier, the D/D route by ERA passes two new roundabouts located within a congested town area before connecting to the existing A3. However, the elevation difference of existing A3 and D/D route at connecting point at Rbt.2 is approximately 3m. This will result in a steep grade of more than 10% at Rbt.2 and more than 7% at Rbt.1. Consequently, these poor geometric features will constrain the trafficability of heavy trucks that commonly use this route. In addition, involuntary affected houses/persons will likely be increased with the construction of these roundabouts.

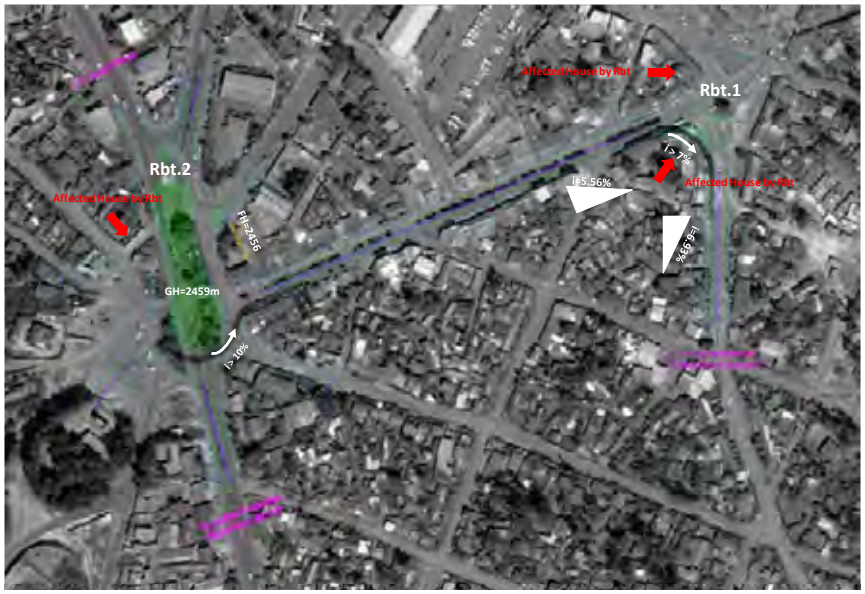


Figure 2.2.2 Technical Issues of End point in Debre Markos

3) Realignment at Chemoga Section

According to the ERA D/D, realignment was proposed at Chemoga section. 11 houses should be relocated from proposed route. However as can be seen from the following table, realignment plan by D/D does not have any advantage. Hence rehabilitation of existing road (A3) is applied based on the discussion with ERA and the site survey.

Design Condition: Urban/Peri-urban

- Design speed: 50km/h
- Min. Radius: 85m
- Transition curve: not required
- Max. Grade: 8.0%
- Min. Stopping Sight Distance: 55m

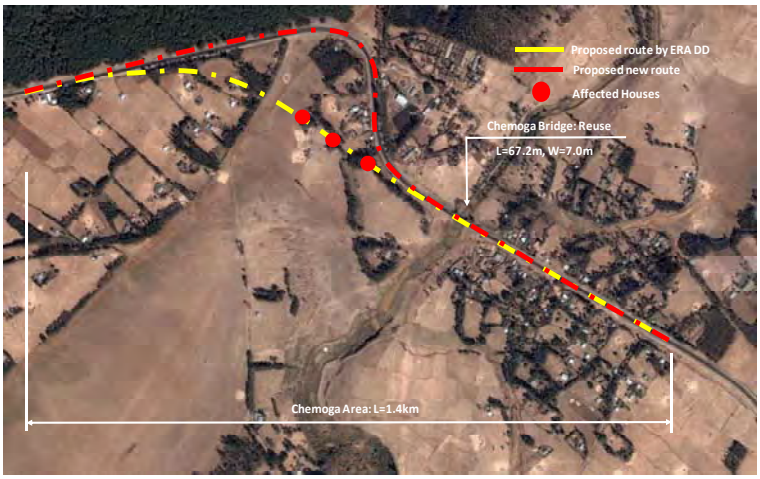
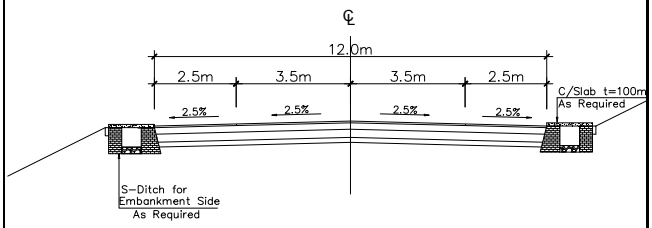
Location	Reasons & Interferences
	Chemoga Area 58.0 – 59.4km (L=1.4km) **Reason** - To reduce the number of affected houses **Number of PAHs** - 11 houses

Figure 2.2.3 Realignment Plan at Chemoga Section

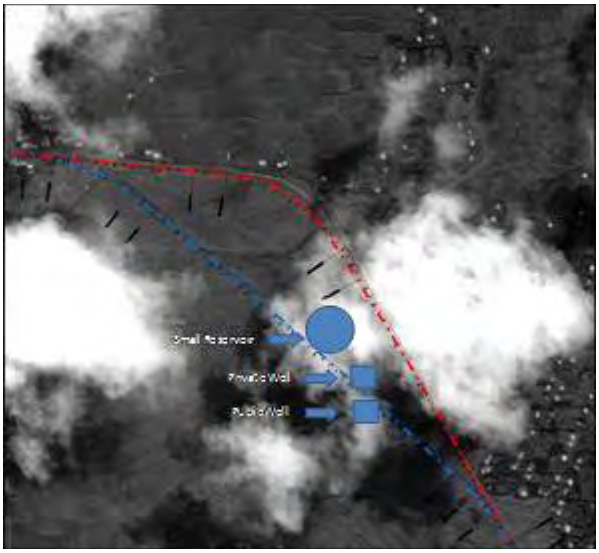
Table 2.2.3 Comparison of Alignment at Chemoga Section

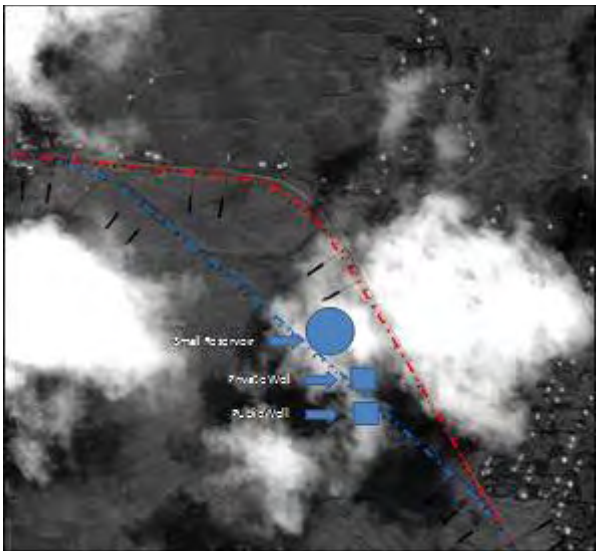
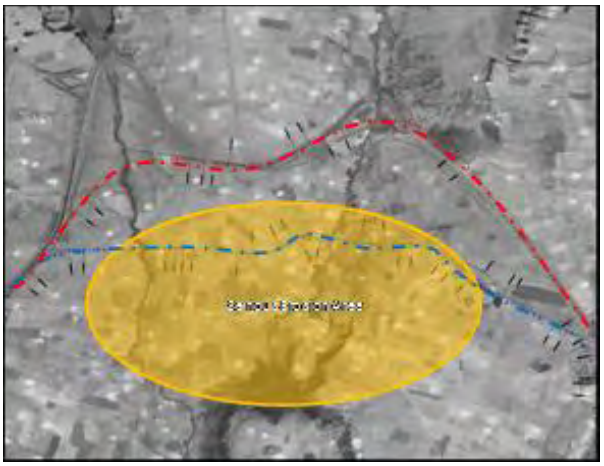
		ERA D/D	Existing A3
Geometric	Min. Radius	270m	100m
	Max. Grade	8.0%	5.8%
	Applicable design speed	50km/h	50km/h
	Regulatory Speed	30 – 50km/h	
	Calculated Sight Distance	111m > 55m	68m > 55m
Applicable Cross Section			
No. of affected houses		11	0
Land required	Road reserve	New land is required because of new road construction.	Width of upgraded road will be within existing road reserve area.
	Diversion during construction stage	It is not required because of construction of a new road.	Diversion with 6m will be provided by use of a part of ERA's land.

4) Other Realignments

In addition to 2 sections mentioned above, the following realignment plans are applied from the aspects of by-passing of eroded area with high embankment, impact to public water and inadequate/undesirable geometric parameter.

Table 2.2.4 Other Realignment Section Proposed by the Survey Team

Location Map	Reasons & Interferences
	7.4km – 8.7km: Yetnora **Reason** - To avoid the following interferences - To reduce the number of affected houses - Possible to improve horizontal alignment by applying the existing alignment **Interference** - Two wells - Small reservoir - 9 houses : Proposed alignment by ERA D/D : Improvement of the existing alignment

Location Map	Reasons & Interferences
	44.0km: Ziba Br. **Reason** - To improve the alignment for traffic safety (response to high speed) **Interference: Nothing** : Proposed alignment by ERA D/D : Improvement of the Proposed alignment
	46.2 – 46.7km: Amber **Reason** - To avoid the following interferences - To reduce the number of affected houses - Possible to improve horizontal alignment by Survey Team **Interference** - Public water supply facility - Some houses : Proposed alignment by ERA D/D : Proposed alignment by Survey Team
	52.1 – 55.2km: Ambesh (Erodible Area) **Reason** - To avoid the serious erosion area and high embankment - Possible to improve horizontal alignment by Survey Team **Interference: -** : Proposed alignment by ERA D/D : Proposed alignment by Survey Team

(3) Typical Cross Sections in Debre Markos

1) Number of Affected Houses by Type of Cross Sections

Cross sections in Debre Markos should be determined from the following viewpoints:

- To minimize social impacts (minimization of affected houses)
- To respond to land use and expansion of the city area
- To consider traffic safety

The following figure shows the number of affected houses by types of cross section.

Outline of Alignment (A3)	Number of PAHs by Cross Sections					
	12.0m	13.0m	19.0m	19.5m	20.0m	21.5m
	2	3	3	3	4	5
	0	0	4	4	4	9
	0	0	5	6	10	16
	0	0	0	0	0	0
	1	1	1	1	1	1

Figure 2.2.4 Number of PAHs by Types of Cross Section

2) Applied Cross Sections in Debre Markos

The following typical cross sections were applied through the discussion with ERA. Requests from ERA are to install a median strip for traffic safety in the central area and secure a wide parking space in the entrance area of Debre Markos.

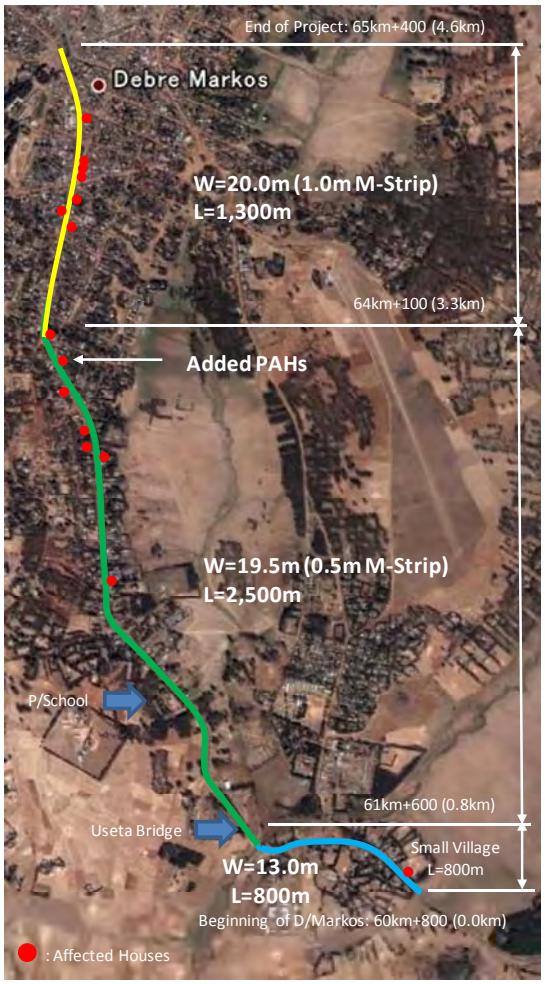
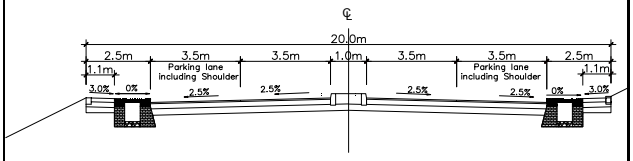
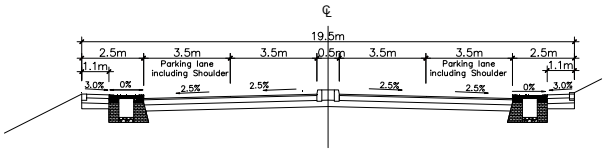
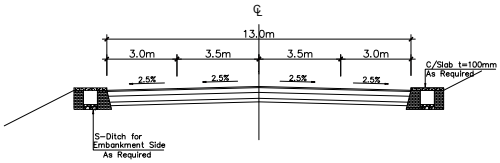
Section Plan for A3 in Debre Markos	Applicable Cross Sections
	63.3km –64.6km (End): L=1.3km  60.8km – 63.3km: L=2.5km  60.0km –60.8km: L=0.8km 

Figure 2.2.5 Number of PAHs by Types of Cross Section

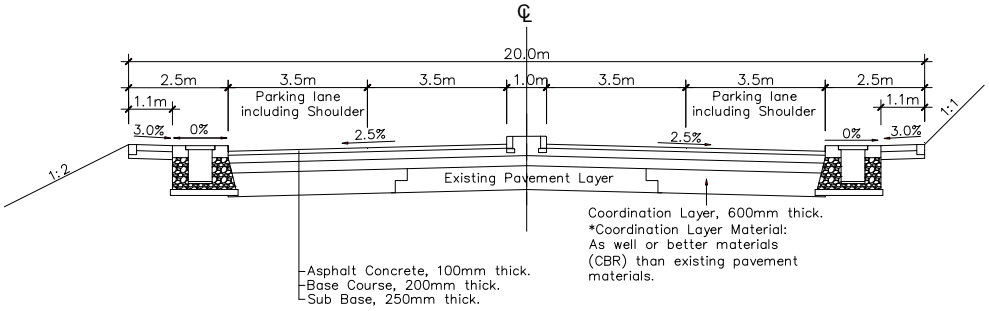
Finally, the following numbers are counted as PAHs and PAPs.

Table 2.2.5 Number of PAHs and PAPs in Debre Markos

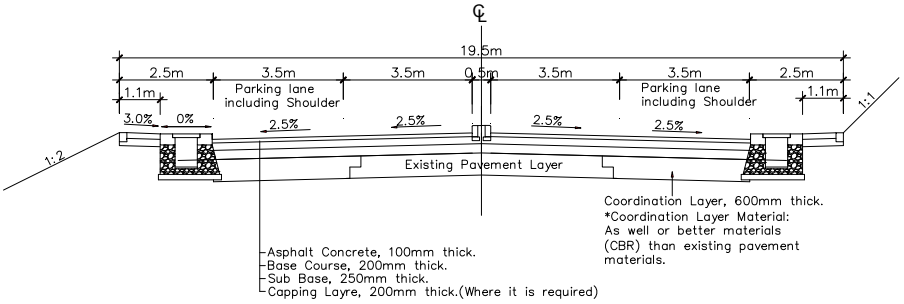
Section in Debre Markos	Width	Social Impact	
		PAHs	PAPs
60+800-61+600	13.0	1	5
61+600-64+100	19.5	6	29
64+100-65+400	20.0	8	37
Sub-Total (in Debre Markos)		15	71
Total (Dejen – Debre Markos)		41	164

(4) Applicable Typical Cross Sections

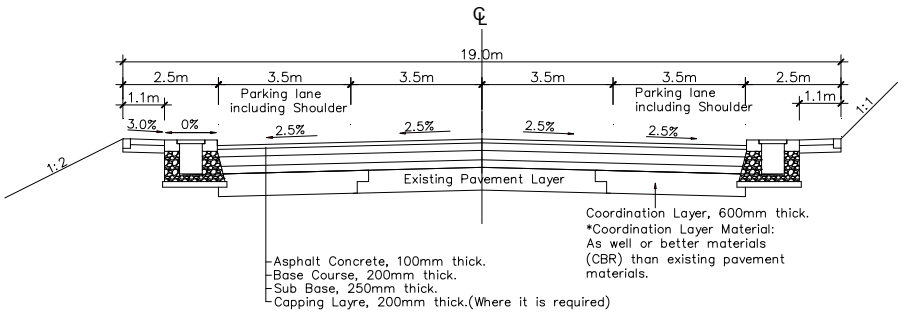
The following typical cross sections were proposed after the review of ERA D/D and decided based on discussion with ERA.



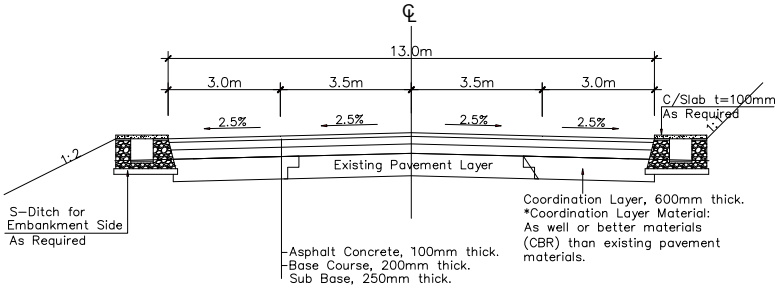
Debre Markos Town Center



Populated Area in Debre Markos

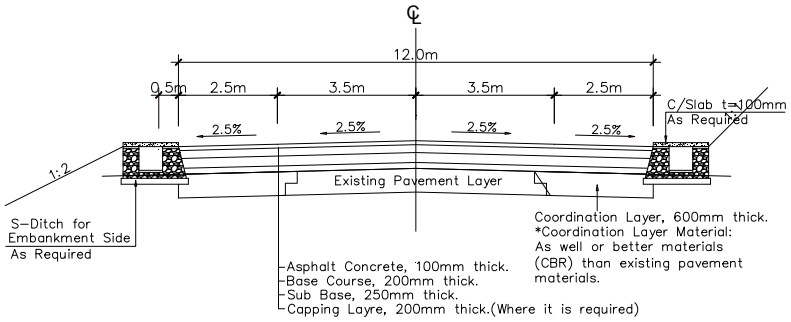


Wereda Towns
(Wejel, Lumame, Amber)

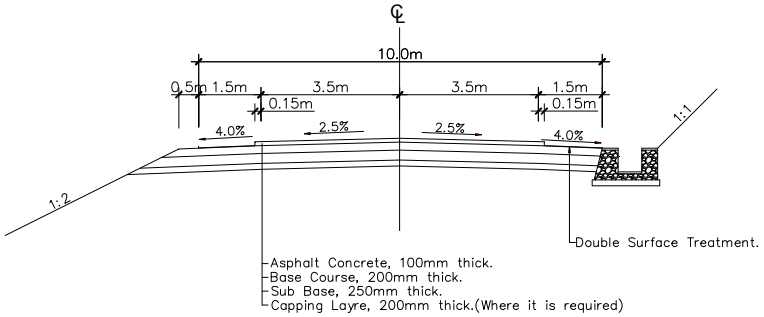


Entrance of Debre Markos

Figure 2.2.6 Applicable Typical Cross Sections(1/2)



Kebele Towns
(Dejen, Yit nora, Yegodina, Godelma, Filiklik, Chemoga)



Rural Section

Figure 2.2.7 Applicable Typical Cross Sections(2/2)

(5) Countermeasure for Expansive Soils

1) Standard and Case Example of ERA and Other Countries

Countermeasures for expansive soil/Black Cotton Soil (BCS) are provided in the manuals of some countries/organizations and introduced in the study reports. The table shows the examples of provisions or recommendations in the manuals and the results of the works.

Table 2.2.6 Manual and Case Example of Countermeasure against Expansive Soils

No	Name of manual	Description of the provision
1	ERA manual	It is usually considered sufficient to excavate the expansive soil to a depth of about 1m (even if some expansive soil remains under the backfill material, it will be confined and protected from moisture changes.) Such backfill material should exhibit strength (CBR) characteristics similar to those of the overlying embankment materials (preferably at least CBR on the order of 5, i.e. sub-grade strength class S3)
2	Zimbabwean Practice	Remove 700mm
3	Tanzanian practice	Remove 600mm
4	Kenyan manual	Recommends 1000mm
5	Indian case studies	Recommend removal of 1000mm
6	SATTC	Recommends 1000mm removal
7	Some U.S. state department procedure	Recommends removal of upto 1500mm
8	CPC study in Ethiopia	Recommends 900 to 1200mm
9	Addis Ababa-Tarmaber Rd project	Removed 800mm
10	Addis Ababa – Jima	Removed 500 – 1500mm Vertical barrier of LDPE sheeting (depth 2000mm)

Mitigation measures for expansive soils are mentioned as follows in the ERA's Manual:

(a) Realignment; this solution is possible only if the areas covered with expansive clays are of limited extent.

(b) Excavation and replacement; this simple procedure effectively eliminates the problems and is therefore recommended as much as possible. The investigations should focus on minimizing haulage of the materials, and this method will be economically viable only if suitable backfill material is available in the vicinity of the project road.

(c) Treatment with lime; treatment of expansive soils with hydrated lime can give good results. The addition of 4 to 6% of lime is usually required. This treatment is, however, costly, in particular because it is necessary to treat a substantial thickness of soil (minimum 30cm compacted thickness). Lime treatment would therefore be considered advantageous only where investigations failed to locate suitable backfill material.

(d) Minimizing Moisture Changes and Consequent Movements; if the above methods cannot be utilized, because of excessive costs or the absence of suitable backfill or replacement material, expansive clays may be used for fill and sub-grade. Special Practices are then necessary to avoid ingress of moisture into the road pavement that results in detrimental volume changes in the swelling soils. (Confining expansive clays under protective blankets, etc)

As the manual states, in case suitable backfill material is available, replacement procedure is applied as countermeasure for expansive soils. Since suitable backfill material is available in the vicinity of the project road, replacement method is preferable.

2) Fluctuation Area of Moisture Contents in Expansive Soil

The depth of moisture fluctuation is reported to be in the order of 2m to 3m, the following figure shows the model of moisture fluctuation mechanism. Cracks develop from ground surface to maximum depth of about 1.5m according to some investigation.

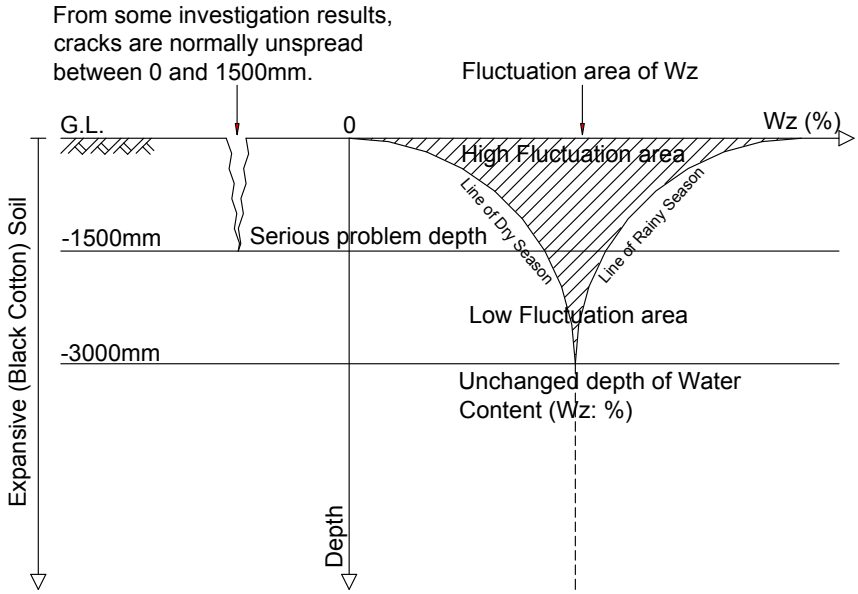


Figure 2.2.8 Fluctuation Area of Moisture Contents in Expansive Soil

And according to the ERA's Manual, seasonal wetting causes the road edges to wet and dry at a different rate than those under the surfacing. This mechanism in turn causes differential movements over the cross section of the road and associated crack developments, first occurring in the shoulder area, and subsequently developing in the carriageway (Figure 2.2.9).

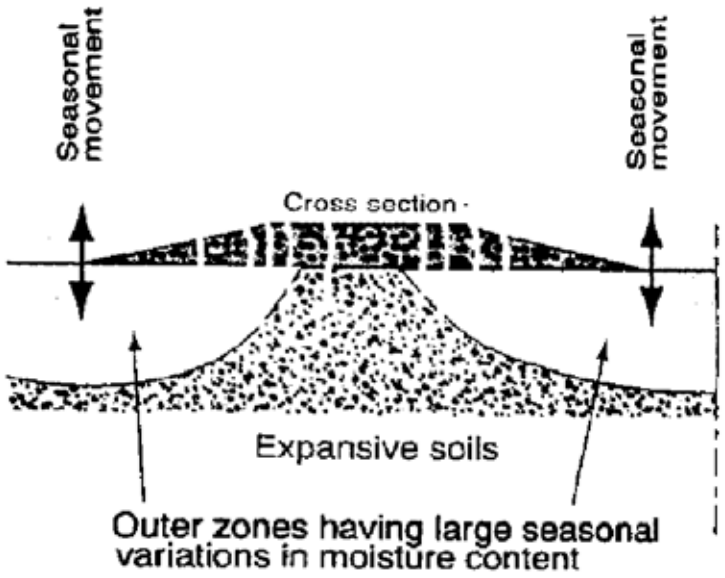


Figure 2.2.9 Moisture Contents in Expansive Soil

3) Countermeasure Comparison for Expansive Soil

The following figure shows the countermeasure for expansive soil which is proposed in ERA D/D. A 60cm thick layer as replacement and installation of earth drainage on both side were applied.

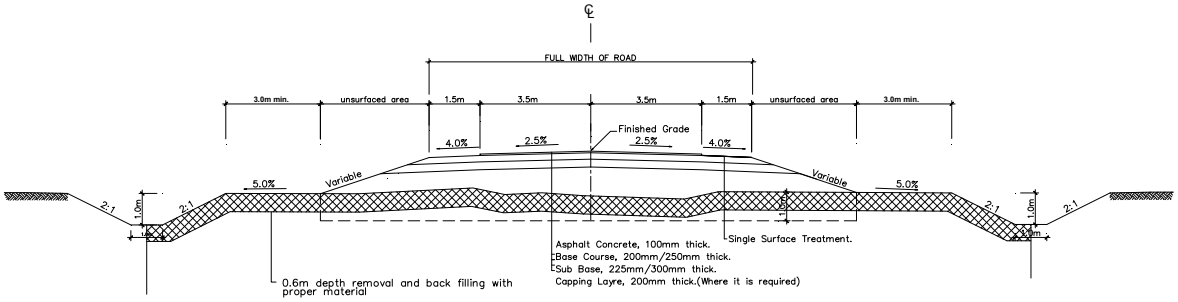


Figure 2.2.10 Applied Countermeasure in Detail Design by ERA

However, the countermeasure mentioned above is proved inadequate through the site survey and discussion with ERA. Therefore, the following countermeasures were compared and evaluated based on the site survey.

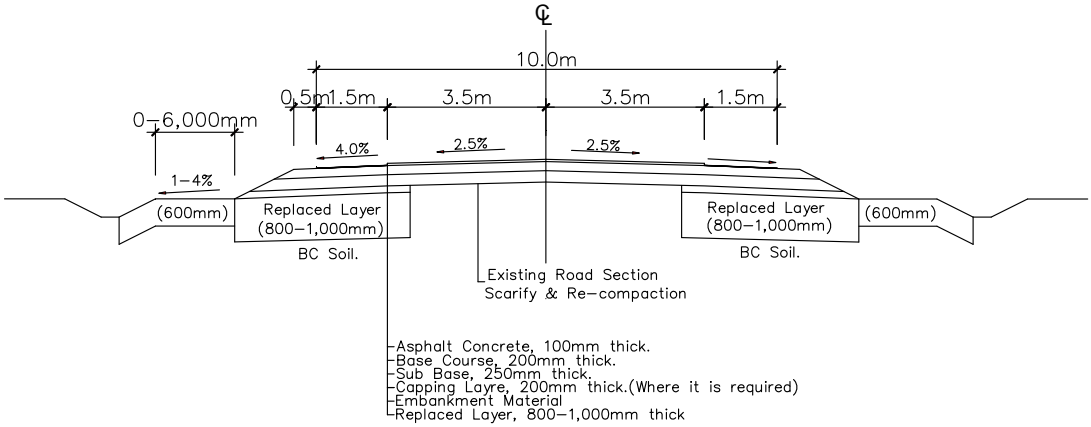
Alt.1: An idea which follows ERA's Manual
Alt.2: An idea which is a modification of Alt.1
Alt.3: An idea which intends to confine moisture content by vertical barrier

The following table shows advantages and disadvantages of the three Alternatives. Only Alternative-3 can be applied for countermeasure to expansive soils in Abeya and Yeda river area with deep BCS, therefore, Alternative-3 is recommended as the most appropriate procedure on the project road.

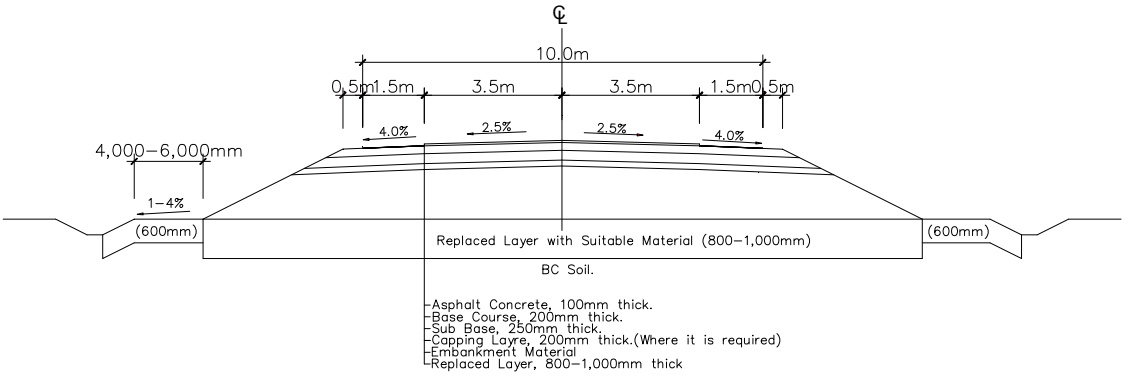
Table 2.2.7 Comparison of replacement methods and recommendation

No	Section	Replacement thickness			Application to Abeya & Yeda	Measures to gap between existing road and widened part	Side protection to moisture change	Recommendation
		Under embankment		Slope protection				
		Carriage way	Toe					
1	Realignment	1m		0.6m (L; ～6m)	Not suitable	—	Enough	
	Rehabilitation of existing road	—	1.0m	0.6m (L; ～6m)	—	Not enough	Enough	
2	Realignment	1.5m		By thickness	Not suitable	—	Enough	
	Rehabilitation of existing road	—	1.5m	By thickness	—	Enough	Enough	
3	Realignment	1.0m	～3.0m	By thickness	Suitable	—	Enough	Recommendable
	Rehabilitation of existing road	—	1.5m	By thickness	—	Enough	Enough	

Note: The maximum thickness of soil replacement is 1.5m according to many Manuals and experiences.



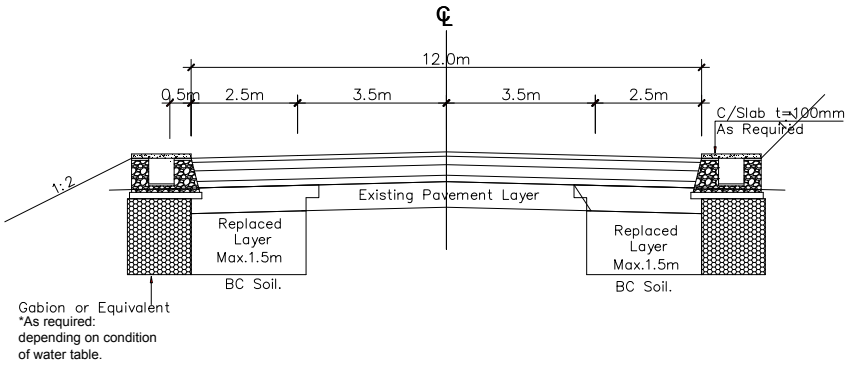
Existing Pavement Section in Rural Area



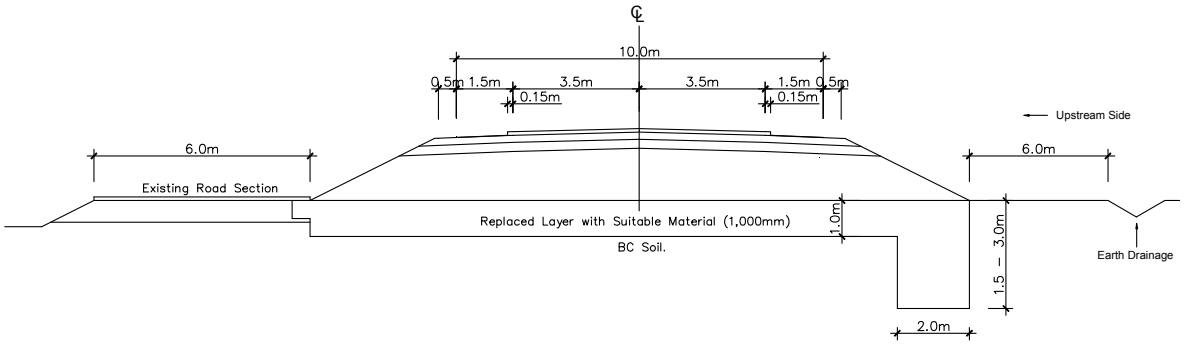
New Road Section (Bypass) in Rural Area

Figure 2.2.11 Countermeasure Concepts based on ERA Design Manual

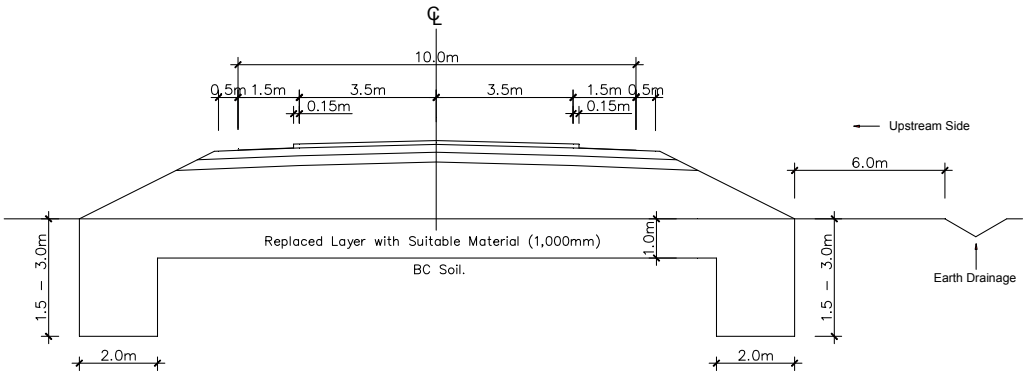
*Alternative 2, the replacement thickness is changed from 1.0 to 1.5 in Figure 2.2.11



Existing Road Section in Town Area: Type A



Existing Road Section in High Embankment (Rural) Area: Type B



New Road Section (Bypass) in Rural Area: Type C

Figure 2.2.12 Countermeasure Concepts Proposed by the Study Team

4) Application of sealing sheet

The new countermeasures with the vertical wall on both sides of the road against the BCS in the Project road are proposed in Figure 2.2.13. To secure the function of the vertical wall, sealing sheets are applied in the low land area such as Abeya and Yeda river, and in the areas where is seen to be not well drained subject to land form (refer the shaded region in Table 2.2.21 and 2.2.22).

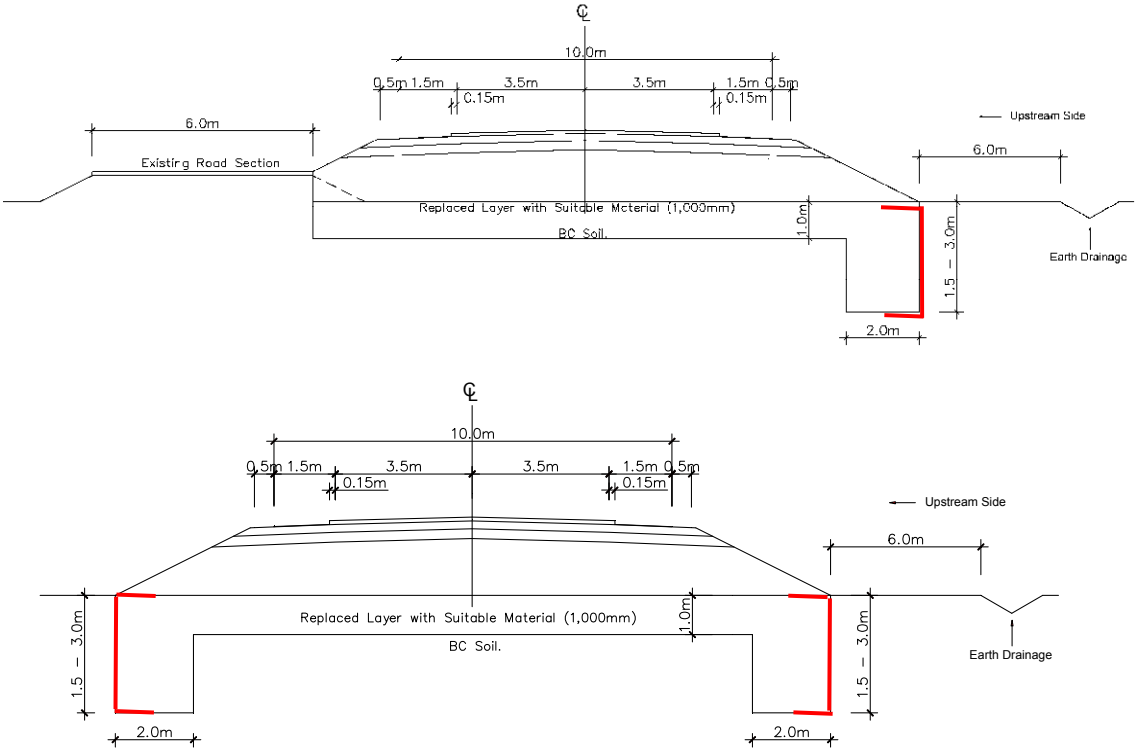


Figure 2.2.13 Sealing Sheets

(6) Countermeasure for Flood Area

On the flood area, it is important to keep the road body from exposure to water. This road body is called *design depth*. The design depth is defined as the depth from finished road level to the depth at which load bearing strength of the soil no longer has an effect on the pavement's performance in relation to traffic loading.

Table 2.2.8 shows case example from other countries. The design depth of 1.2m is determined based on these cases. The finished road level should be set at 1.2m above the flood level obtained. The following figure shows the design depth in relation to the main structural components of pavement and earthworks and it therefore gives the design depth.

Table 2.2.8 Standard for the Design Depth (i.e. Tanzania, S.A., Japan)

Tanzania Standard			S.A. Standard		Japanese Standard
Road Type	Design Depth (m)		**Road Class**	Design depth	
	General	Heavy Load			
Paved Trunk	0.8	1.2	**A**	1.0 – 1.2	1.0m from bottom of sub-base
			B	0.8 – 1.0	
Others	0.6	1.0	**C**	0.8	
			D	0.7	

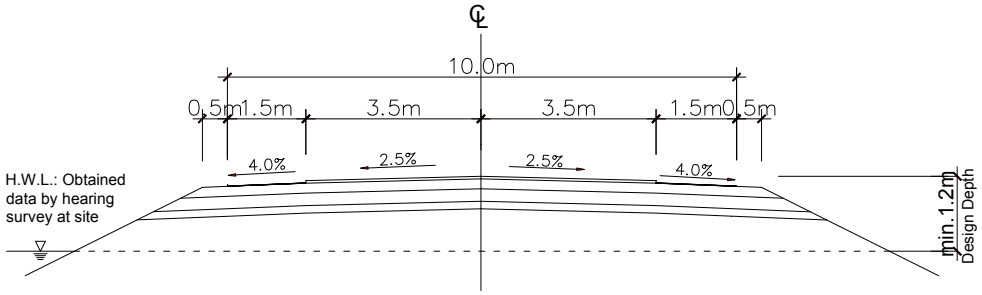


Figure 2.2.14 Determination of Finished Road Level on Flood Area

(7) Width of Land Acquisition

Width of land acquisition is determined based on the concept of Corridor of Impact (COI). COI is necessary area for construction activities and means the minimum area needed for resettlement and compensation.

2.2.1.2 Basic Policy of the Bridge Design

(1) Design Method

Based on the ERA Bridge Design Manual, Load and Resistance Factor Design (LRFD) are applied. The fundamental limit states and load factors are shown in Table 2.2.9 and Table 2.2.10

Table 2.2.9 Load Combination and Load Factors

Limit State	Dead Load	Live Load
STRENGTH 1	γp	1.75
SERVICE 1	1.00	1.00

Table 2.2.10 Load Factors for Permanent Load

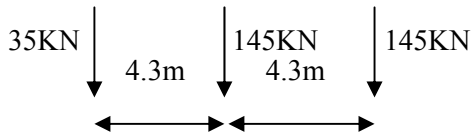
Type of Load	Load Factor γp
Dead Load of Structural Components (DC)	1.25
Wearing Surface, Utilities (DW)	1.50
Active Earth Pressure (EH)	1.50
At-rest Earth Pressure (EH)	1.35
Earth Surcharge (ES)	1.50

As practical procedures, when it is confirmed that the design results based on the Japanese Bridge Design Standards is equal and/or sufficient to cover the design based on the ERA design methods, the Japanese design methods are used instead of using ERA design methods with the approval of ERA engineers.

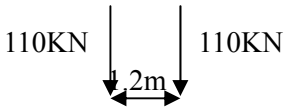
(2) Design Load

Design vehicle load is HL-93 stipulated in ERA Bridge Design Manual, which consists of design truck or design tandem, and design uniform load as shown below.

i） Design Truck



ii） Design Tandem



iii） Design Uniform Load

Uniformly distributed load is 9.3KN/m in the longitudinal direction. Distribution width is 3.0 m in the transverse direction.

iv） Design Live Load for Overhanging Deck Slab

For the overhanging length of 1.8 m and shorter, live load is 15KN/m. The location of the live load shall be 0.3 m from the parapet.

v） Pedestrian Load

For walkway with 0.6 m and wider, pedestrian load is 4.0KN/m^2.

vi） Impact

Impact is set to be 33% of live load effects. Impact is added to the Design Uniform Load.

vii） Design Wind Speed

Basic design wind speed 10 m above the ground is 40m/s.

viii） Temperature Change

Temperature change for the design of concrete structure is 5℃～35℃.

ix） Parapet/Barrier

Type of Parapet/Barrier is the type used in the ERA Standard Drawings or the type approved by ERA engineers.

(3) Material Standard

Every bridge to be constructed has relatively short span so that the reinforced concrete bridge is the appropriate type which features that it is easy to obtain materials in Ethiopia, cost-effective, and easy in maintenance. The reinforced concrete structures are also the appropriate type in terms of technology transfer to Ethiopia.

Table 2.2.11 Comparison by Materials

Material and Type		Feature	Evaluation
Concrete Bridge	Reinforced Concrete Bridge	Appropriate for short span Technically simple Easy to obtain materials Easy to construct and supervise In general, not expensive Appropriate structural type for technology transfer	○
	Pre-stresses Concrete Bridge	Appropriate for longer span than Reinforced concrete Light dead weight than Reinforced concrete Technically complicated than Reinforced concrete Need to import some materials Difficult in construction and supervision In general, more expensive than Reinforced concrete	×
Steel Bridge		No need of importing materials Difficult to construct and supervise In general, more expensive than concrete bridge Costly in maintenance than concrete bridge Easy to repair and modify	×

Material Standards of concrete and reinforcement bar are shown in the following tables.

Table 2.2.12 Material Standards of Concrete

Grade	28-day Compression Strength	Max. Size of Coarse Aggregate	Applicable Part
C25	20 MPa	20 mm	Except main structure
C30	24 MPa	20 mm	Main structure

Note: 28-day compression strength is the minimum test result with 150 mm cylinder.

Table 2.2.13 Material Standards of Reinforcement Bar

Grade	Yield Strength	Tensile Strength	Applicable Part
300	300 MPa	500 MPa	Main structure
420	420 MPa	620 MPa	Main structure

(4) Carriageway Width

The carriageway width of every bridge is decided based on the ERA design manuals in consideration of continuity with its approach road and expected number of pedestrians crossing the bridge. The carriageway in the rural area is set to be 8.0m(0.5m+3.5m+3.5m +0.5m). However, the carriageway width of the Aba Adem Bridge which is located in Wejel and the Wiseta Bridge in Debre Markos is widened to 10.0m(1.5m+3.5m+3.5m+1.5m) and 12.0m(2.5m+3.5m+3.5m+2.5m) respectively in consideration to the expected number of pedestrians.

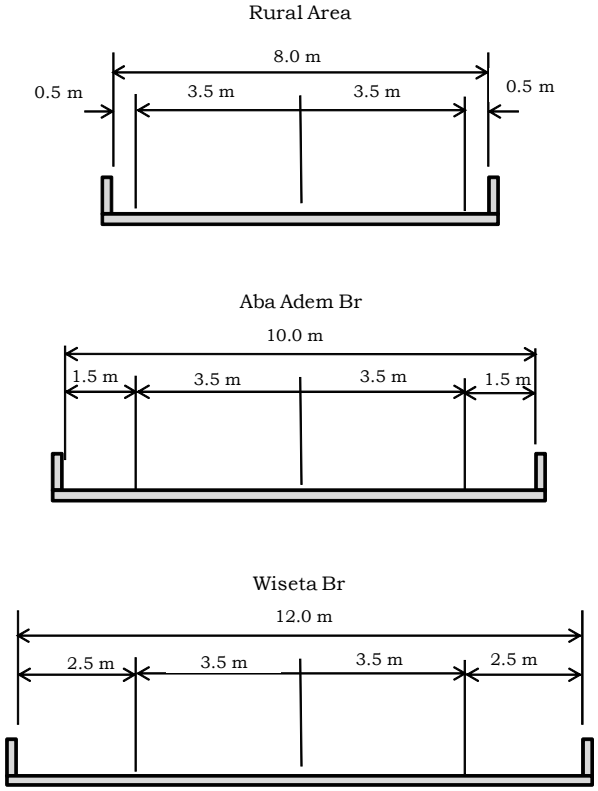


Figure 2.2.15 Carriageway

(5) Policy

Bridge planning is developed based on the following polices in consideration of present situations in Ethiopia.

- Save construction cost as much as possible
- Use locally available materials and equipment as much as possible
- Consider technical situations in Ethiopia
- Consider maintenance work after completion
- Materialize durable structure
- Consider technology transfer and capacity building

2.2.2 Basic Plan

2.2.2.1 Geometric Design Parameters

(1) Applicable Parameter

Geometric design standard was prepared as a part of the Road Design Manual in Ethiopia. This design standard is basically adopted for this project as well as ERA D/D. In case essential parameters are not stipulated in design standard, the Survey Team will refer to other design standards and manuals (such as SATTC and Japanese Road Geometric Standard).

Observations during the field survey indicate that the Study Road lies in various topographical conditions. Thus, the Survey Team finally recommends the following geometric standard based on the design standard and previous design.

Table 2.2.14 Geometric Design Parameters

Road Class (DS3: Paved)

Design Element	Unit	Flat	Rolling	Mountainous	Escapment	Urban/Peri-Urb	Remarks
Design Speed	km/h	100	85	70	60	50	
Min. Stopping Sight Distance	m	205	155	110	85	55	
Min. Passing Sight Distance	m	375	340	275	225	175	
% Passing Opportunity	%	50	33	25	0	20	
Min. Horizontal Curve Radius	m	395	270	175	125	85	
Min. Length of Curve	m	300	300	300	300	300	Tangent Angle of 5° or less (ERA Standard)
	m	350	260	190	150	100	Japanese Standard: Design Speed x 6sec.
Transition Curves Required	-	Yes	Yes	No	No	No	
Max. Radius for use of a Transition Curve	m	1450	1050	-	-	-	SATCC: 0.145 x V^2
Spiral Length	m	R=400:L=123, R=500:L=98, R=600:L=82, R=700:L=70, R=800:L=62, R=900:L=55, R=1,000:L=49, R=1,100:L=45, R=1,200:L=41, R=1,300:L=38, R=1,400:L=35	R=300:L=100, R=400:L=75, R=500:L=60, R=600:L=50, R=700:L=43, R=800:L=38, R=900:L=34, R=1,000:L=30	-	-	-	SATCC: 0.0702V^3/ (RC) C: Rate of increase in centripetal acceleration (m/s3); 1<C<3 (1.438 is recommended.)
Max. Gradient (desirable)	%	3.0	4.0	6.0	6.0	6.0	
Max. Gradient (absolute)	%	5.0	6.0	8.0	8.0	8.0	
Min. Gradient (desirable)	%	0.5	0.5	0.5	0.5	0.5	
Min. Gradient (absolute)	%	0.3	0.3	0.3	0.3	0.3	Japanese Standard
Crest Vertical Curve (k-value)	k	105	60	31	18	12	
Sag Vertical Curve (k-value)	k	51	36	25	18	12	
Max. Superelevation (e)	%	8.0	8.0	8.0	8.0	4.0	
Normal Crossfall	%	2.5	2.5	2.5	2.5	2.5	
Shoulder Crossfall	%	4.0	4.0	4.0	4.0	4.0	
Right of Way	m	COI	COI	COI	COI	COI	Corridor of Impact (Construction Limit)

***Normal Wereda towns and Kebele towns are included in Urban/Pre-Urban.**

(2) Minimum Gradient

ERA's standard stipulates minimum gradient of 0.5%. However, securing of min. 0.5% in flat area would mean a substantial increase in construction cost with the commensurate increase in affected area. In addition flat areas applied 0.3% min. gradient are currently being used as grazing land and/or livestock corridor. Thus min. gradient of 0.3% on AASHTO and Japanese standard is used in absolute necessity.

However, gradient of drainage structures excluding unsupported gutter should be 0.5% and above in accordance with the ERA's standard.

Table 2.2.15 Embankment Material Volume Increase with Difference of Gradient

Station						Gradient & Length				Total Increase Volume (m3)	Remark
						Sec.A	Sec.B	Sec.C	Sec.D		
0km+000	-	30km+540	0 + 260 - 1 + 500	1,240	0.50%	2.83%	0.30%	0.42%	1.76%	9,790.89	Asametech
						220	400	340	280		
			1 + 770 - 5 + 700	3,930	0.50%	1.58%	0.30%	0.88%		54,953.08	
						1,730	620	1,580			
			10 + 85 - 11 + 100	1,015	0.50%	3.65%	0.36%	1.09%		6,409.80	
						306	376	333			
			14 + 150 - 19 + 515	5,365	0.50%	1.25%	0.32%	0.30%	0.30%	14,552.32	Taba
						220	400	340	280		
			20 + 130 - 22 + 500	2,370	0.50%	1.74%	0.30%	0.66%	0.30%	29,613.77	Abeya
						1,130	300	280	660		
			25 + 945 - 26 + 990	1,045	0.50%	0.65%	0.36%	4.13%		5,414.74	Yegodena
						500	325	220			
Sub Total				**14,965**						**120,735**	
30km+540	-	65km+400	30 + 815 - 32 + 320	1,505	0.50%	5.45%	0.36%	4.59%		16,550.69	Rumame Behind of H.S.
						260	720	525			
			38 + 820 - 40 + 730	1,910	0.50%	5.45%	0.30%	2.90%		15,683.36	Godelma
						1,020	440	450			
			47 + 420 - 49 + 825	2,405	0.50%	2.60%	0.35%	0.59%		63,144.89	Yeda
						500	1,310	595			
Sub Total				**5,820**						**95,379**	
Total										**216,114**	

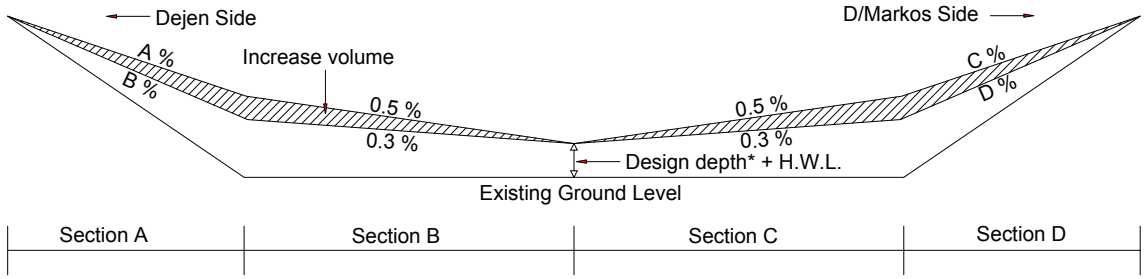


Figure 2.2.16 Embankment Material Volume Increase with Difference of Gradient

2.2.2.2 Pavement Design

(1) Traffic Volume and Equivalent Factors

Traffic volume and axle load survey were done by ERA D/D. Therefore, these surveyed data by ERA D/D are applied in this survey.

Table 2.2.16 Traffic Volume and Vehicle Equivalent Factors (ERA D/D)

Vehicles	Sedan	4WD	Small Bus	Large Bus	Small Truck	Medium Truck	Large Truck	Trailer	Total
Traffic Volume in 2009	30	213	146	114	145	72	57	73	852
Equivalent Factor	-	-	-	2.29	-	2.76	7.25	12.26	-

(2) Pavement Design

Pavement design method and conditions which were used in ERA D/D were basically applied with little modifications in this survey. Design conditions and pavement composition in ERA D/D are as follows:

- Design Life: 15years
- Sub-grade Strength Class: S2 (0km – 53km), S3 (53km – 65km)

Table 2.2.17 Total Axle Load

Vehicle Category	Base year Traffic	T_c	EF	CESA
Large Bus	72	675853.48	2.29	1547704.47
Medium Truck	45	403331.17	2.76	1113194.03
Heavy Truck	36	322664.93	7.25	2339320.78
Truck and Trailer	46	412294.08	12.26	5054725.42
			Total	10,054,944.70
Applying lane distribution factor of 90% for single lane i.e. .9*10054944.7				9,049,450.23 (Class T6)

Based on ERA's manuals, for traffic classes of T6, the required pavement layers with asphalt concrete surfacing, crushed granular road base and granular sub-base for the design period of 15 years are as shown in table below.

Table 2.2.18 Pavement Composition based on the ERA's Design Standard

Station	Sub-grade class	Pavement Layers (mm) for 15 years & traffic class T6			
		AC	Base course	Sub- base	G.C
0km-53km	S2	100	200	225	200
53km-65km	S3	100	200	250	-

Detail design report by ERA D/D had finally recommended the following pavement layers because uncertainties such as the traffic volume and analysis as well as the sub grade soil testing and evaluation should be considered.

Table 2.2.19 Proposed Pavement Composition by ERA D/D

Station	Sub-grade class	Traffic class	Pavement Layers (mm) for 15 years & traffic class T6			
			AC	Base course	Sub- base	G.C
0km-53km	S2	T6	100	200	225	200
53km-65km	S3	T6	100	250	300	-

However, in line with the policy of Japanese ODA, minimum requirements based on technical theory is acceptable. Thus the Survey Team recommends the following pavement layers:

Table 2.2.20 Proposed Pavement Composition by the Survey Team

Station	Sub-grade class	Traffic class	Pavement Layers (mm) for 15 years & traffic class T6			
			AC	Base course	Sub- base	G.C
0km-53km	S2	T6	100	200	250*	200
53km-65km	S3	T6	100	200	250	-

* 225mm of sub-base required by the manual will be changed to 250mm in consideration of construction accuracy and ease of supervision.

2.2.2.3 Design of Countermeasure for Expansive Soil

The Survey Team recommends the following measures based on the field survey, soil testing and visit to similar projects. Countermeasure types A, B, and C are drawn in Figure 2.2.12(P 2-16).

Table 2.2.21 Applicable Countermeasures for Phase I

Station	Town	BCS*(m)	N-Value	Counter -measures	Station			Replacement Thickness (m)
-	Dejen	-	-	Type A	0+000	-	0+500	1.5
1+500	-	0.8-2.0	< 10	Type C	0+500	-	1+540	2.0
4+000	-	0.6-2.6	< 10	Type B	1+540	-	5+800	2.5
5+060	-	1.0-2.5	8-9	Type B				
5+500	-	0.5-1.9	< 10	Type B				
-	-	-	-	Type C	5+800	-	6+800	3.0
-	Yitnora	-	-	Type A	6+800	-	8+100	1.5
-	Yitnora	-	-	Type C	8+100	-	8+300	3.0
8+500	Yitnora	0.95-2.7	2-6	Type A	8+300	-	9+220	1.5
9+500	-	0.8-2.8	< 10	**Type C**	**9+220**	**-**	**9+500**	**3.0**
10+500	-	0.0-2.0	3-10	**Type B**	**9+500**	**-**	**12+100**	
11+400	-	0.0-4.0	4-9	**Type B**				
11+500	-	0.5-3.1	< 10	**Type B**				
12+500	Bechet	0.5-2.5	1-6	**Type C**	**12+100**	**-**	**12+600**	**2.5**
13+500	-	0.7-2.5	< 10	**Type B**	**12+600**	**-**	**17+700**	
14+560	-	0.6-2.0	8	**Type B**				
15+500	-	0.8-2.5	< 10	**Type B**				
16+500	-	0.9-2.6	< 10	**Type B**				
17+500	-	0.6-2.4	< 10	**Type B**				
18+500	Taba	0.0-3.0	1-4	**Type C**	**17+700**	**-**	**18+680**	**3.0**
19+500	Wejel	0.5-2.4	< 10	Type A	18+680	-	20+160	1.5
20+000	Wejel	0.0-2.1	3-4					
20+090	Wejel	0.5-3.5	9-14					
-	Aba Adem	-	-	Type C	20+160	-	21+100	2.5
-	Aba Adem	-	-	Type C				
21+500	-	1.1-2.4	< 10	**Type B**	**21+100**	**-**	**23+300**	**3.0**
22+040	Abeya	1.0-13.0	2-9	**Type B**				
22+080	Abeya	1.0-11.0	4-11	**Type B**				
23+000	-	0.6-3.0	< 10	**Type B**				
24+000	-	1.6-2.5	< 10	Type C	23+300	-	24+500	
-	Yegodina	-	-	Type A	24+500	-	24+800	1.5
25+500	-	0.8-3.0	< 10	**Type C**	**24+800**	**-**	**26+700**	**3.0**
26+500	-	0.6-2.5	4-5					
-	Yegodina	-	-	Type A	26+700	-	27+200	1.5
27+500	-	0.7-2.7	< 10	Type C	27+200	-	28+200	3.0
-	-	-	-	Cut Section	28+200	-	28+560	-
-	-	-	-	Type C	28+560	-	28+700	3.0
29+000	Lumame	0.5-3.0	< 10	Type A	28+700	-	30+531	1.5
29+300	Lumame	0.6-3.9	10	Type A				
29+390	Lumame	1.0-3.9	5-6	Type A				
30+000	Lumame	1.1-3.0	< 10	Type A				

* BCS: Black Cotton Soil

Table 2.2.22 Applicable Countermeasures forPhase II

Station	Town	BCS*(m)	N-Value	Measures	Station			Replacement Thickness (m)
36+000	Getra	0.0-1.3	< 10	**Type C**	**35+850**	**-**	**37+770**	**1.5**
37+500	Getra	0.0-1.4	< 10	**Type C**				
38+500	Getra	0.5-2.7	< 10	**Type C**	**37+770**	**-**	**38+850**	**3.0**
47+420	Yeda	0.0-5.5	4-10	**Type C**	**47+420**	**-**	**50+730**	**3.0**
48+000	Yeda	> 4.0	< 10	**Type C**				
48+900	Yeda	0.0-10	5-10	**Type C**				
49+200	Yeda	0.0-10	1-9	**Type C**				
49+500	Yeda	> 4.0	< 10	**Type C**				
50+200	Yeda	0.0-2.4	4-10	**Type C**				
50+500	Yeda	0.0-2.7	< 10	**Type C**				

* BCS: Black Cotton Soil

2.2.2.4 Bridge Design

(1) Bridge Length

The bridge length is decided in consideration of road alignment, configuration of ground, soil condition, location of bearing layer, and the amount of clearance required under the superstructure.

(2) Planning

1) Structure Type

Either type of the reinforced concrete slab and reinforced concrete girder is selected depending on the span length. The reinforced concrete slabs and girder bridges are both technically reliable structural types and they have been commonly constructed in Ethiopia. Accordingly it is easy to obtain construction materials and equipment local market. It is also easy to employ experienced workers across the country. Ethiopian workers and engineers can have opportunity to learn the improved bridge construction technology and quality control methods during the construction stage.

Table 2.2.23 Structure Type

Type	Applicable Span
Reinforced Concrete Slab	5～10m
Reinforced Concrete Girder	Longer than 10m, shorter than 20m

When the bearing layer is located very deep under the ground surface, it is difficult to construct substructures because necessary construction machines are most likely not available in Ethiopia. Accordingly in the area where thick black cotton soil of low strength deposits, the box culvert made of reinforced concrete is a reasonable alternative to a bridge whose substructures need to be constructed on the strong ground to support all the loads acting on the bridge. The culvert needs no special foundation and its wide base floor can effectively distribute all the loads to the ground. The areas of thick deposit of black cotton soil experience

floods during the rainy season. In such areas the box culvert has an advantage to provide clearance for water flow thanks to its thin members. While on the other hand, the depth of bridge girder tends to lessen the height of clearance.

Table 2.2.24 Comparison of Bridge and Culvert

Structure	Feature
Bridge	Longer span to cross wide river and waterway Large clearance under the superstructure Concentration of all the loads at abutments and piers Need of strong bearing layer Need of maintenance of bearing supports and expansion joints
Culvert	Short span for small river and waterway No bearing supports or expansion joints In general, no special foundation No need of strong bearing layer Adaptability to ground settlement

2) Substructure

The soil condition along the Dejen and Debre Markos Route features that highly weathered soil and/or black cotton soil of low strength cover the basalt which exists widely across the area. Except Abeya and Yeda areas where black cotton soil deposits are very deep, basalt exists in relatively shallow depth from the ground surface. The direct foundation is the most reasonable and reliable type to such conditions because of its simple construction procedure.

Table 2.2.25 Type of Substructure

Type	Feature	Evaluation
Direct Foundation	Appropriate for shallow foundation Structurally Simple Easy in construction Easy to obtain materials and equipment In general, cost-effective	○
Caisson Foundation	Appropriate for deep foundation Structurally complicated Complicated in construction Necessity of special equipments Expensive to construct	×
Pile Foundation	Appropriate for deep foundation Structurally Simple Necessity of Pile driving machines Complicated in quality control and supervision	×

3) Bridge Planning

Among the existing bridges along the Dejen and Debre Markos route, some bridges which are located along the new road alignment are used on conditions that they have no serious deterioration and defects, they have sufficient strength and durability, and they have carriageway width to meet the ERA Design Manuals.

Table 2.2.26 Usable Existing Bridges

	Bridge	Length (m)	Carriageway (m)	Type	Major repair
Phase I	Taba	13+13	7.3	RC Girder	No
Phase II	Bogena	13.1	7.0	RC Girder	Deck, Parapet
	Chemoga	67.0	7.0	Masonry Arch	Deck, Parapet

New bridges will be constructed if existing bridges are not located along the new road alignment, do not have sufficient strength and durability due to severe deterioration and defects, and do not have carriageway width to meet the ERA design Manuals. Table 2.2.27 shows the 13 bridges and culverts to be constructed with their dimensions and types. Table 2.2.28 shows the comparison of existing and new bridges.

Table 2.2.27 New Bridges

	Bridge	Length (m)	Carriageway (m)	Type	Type of Substructure
Phase I	Asamatech	10	8.0	RC Slab	Direct Foundation
	Bechet	17+17	8.0	RC Girder	Direct Foundation
	Aba Adem	15	10.0	RC Girder	Direct Foundation
	Abeya	3@4.5	10.0	RC Culvert	—
Phase II	Yekeyet	2@4.5	10.0	RC Culvert	—
	Getla	15+15	8.0	RC Girder	Direct Foundation
	Mintkat	15	8.0	RC Girder	Direct Foundation
	Ziba	15	8.0	RC Girder	Direct Foundation
	Yeda-A	2@4.5	10.0	RC Culvert	—
	Yeda-B	2@4.5	10.0	RC Culvert	—
	Yeda-C	5@4.5	10.0	RC Culvert	—
	Ambesh	2@4.5	10.0	RC Culvert	—
	Wiseta	10+10	12.0	RC Slab	Direct Foundation

Table 2.2.28 Comparison of Existing and New Bridges

	Bridge	Existing Bridge			New Bridges		
		Length (m)	Carriageway (m)	Type	Length (m)	Carriageway (m)	Type
Phase I	Asamatech	5.0	7.0	RC Girder	10	8.0	RC Slab
	Bechet	10+11+10	6.0	RC Arch	17+17	8.0	RC Girder
	Taba	13+13	7.3	RC Girder			
	Aba Adem	12.0	6.0	RC Arch	15	10.0	RC Girder
	Abeya	7+7+7	6.0	RC Girder	3@4.5	10.0	RC Culvert
	Bogena	13.1	7.0	RC Girder			
Phase II	Yekeyet	7.8	5.5	Masonry Arch	2@4.5	10.0	RC Culvert
	Getla	13.1	7.0	RC Girder	15+15	8.0	RC Girder
	Mintkat	7.0	6.0	Masonry arch	15	8.0	RC Girder
	Ziba	11.0	5.5	RC Girder	15	8.0	RC Girder
	Yeda-1	4@5.0	7.0	RC Girder	2@4.5	10.0	RC Culvert
	Yeda-2	4@5.0	7.0	RC Girder	2@4.5	10.0	RC Culvert
	Yeda-3	6+6+6	7.0	RC Girder			
	Yeda-4	3.5+4	7.0	RC Girder	5@4.5	10.0	RC Culvert
	Ambesh	8.0	6.0	Masonry Arch	2@4.5	10.0	RC Culvert
	Chemoga	67.0	7.0	Masonry Arch			
	Wiseta	12.3	5.0	RC Girder	10+10	12.0	RC Slab

2.2.2.5 Intersection Arrangement and Traffic Safety Facilities

(1) Intersection Arrangement

Installation of queue lane and/or channelization should be considered at the following two intersections:

1) 61km+300: Diverging point of A3 and road which was proposed as new trunk road in ERA's DD

2) 64km+750: Diverging point of A3 and city trunk road (the largest scale intersection in the town)

Figure 2.2.17 Points for Intersection Arrangement

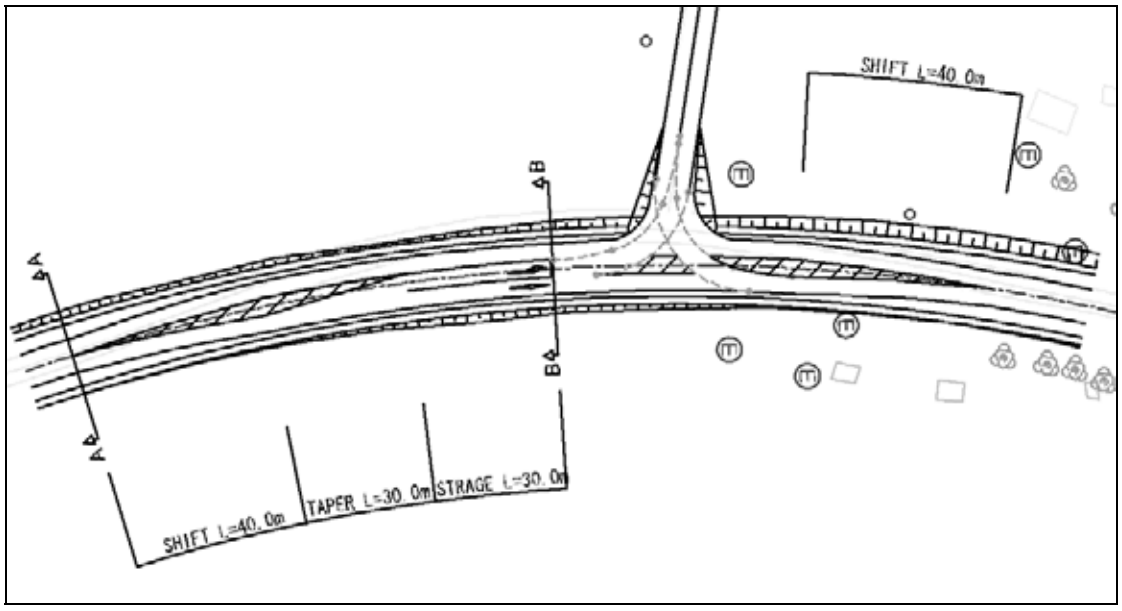


Figure 2.2.18 Intersection Arrangement (61km+300)

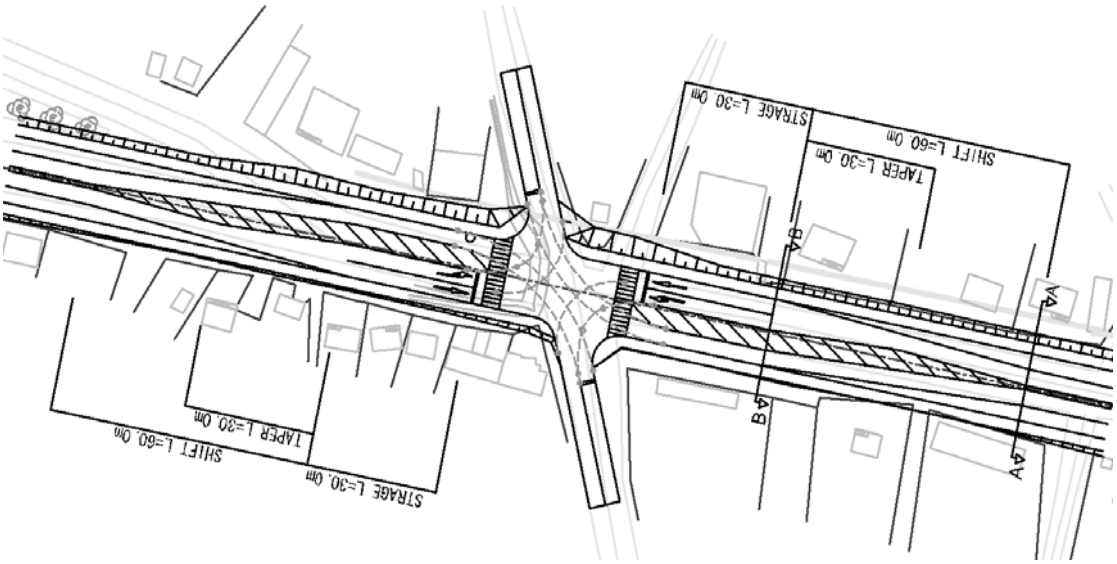


Figure 2.2.19 Intersection Arrangement (64km+750)

(2) Guide Post

Setting of guide posts is considered as safety posts.

(3) Traffic Sign

The following road traffic signs shall be considered for introduction in the Project:

- Restriction signs (overtaking prohibition, speed restrictions)
- Hazard warning signs (sharp curve warnings, steep slope warnings)

(4) Marking

As lane marking, centerlines and shoulder lines should be installed. In addition zebra line for pedestrian crossing will also be installed in populated sections.

2.2.3 Outline Design Drawings (refer Appendix 5)

DRAWINGS		PK	SCALE	Page
Plan and Profile	(1 /45)	0+000 - 1+500	1:5,000	A - 5 - 2
Plan and Profile	(2 /45)	1+500 - 3+000	1:5,000	A - 5 - 3
Plan and Profile	(3 /45)	3+000 - 4+500	1:5,000	A - 5 - 4
Plan and Profile	(4 /45)	4+500 - 6+000	1:5,000	A - 5 - 5
Plan and Profile	(5 /45)	6+000 - 7+500	1:5,000	A - 5 - 6
Plan and Profile	(6 /45)	7+500 - 9+000	1:5,000	A - 5 - 7
Plan and Profile	(7 /45)	9+000 - 10+500	1:5,000	A - 5 - 8
Plan and Profile	(8 /45)	10+500 - 12+000	1:5,000	A - 5 - 9
Plan and Profile	(9 /45)	12+000 - 13+500	1:5,000	A - 5 - 10
Plan and Profile	(10 /45)	13+500 - 15+000	1:5,000	A - 5 - 11
Plan and Profile	(11 /45)	15+000 - 16+500	1:5,000	A - 5 - 12
Plan and Profile	(12 /45)	16+500 - 18+000	1:5,000	A - 5 - 13
Plan and Profile	(13 /45)	18+000 - 19+500	1:5,000	A - 5 - 14
Plan and Profile	(14 /45)	19+500 - 21+000	1:5,000	A - 5 - 15
Plan and Profile	(15 /45)	21+000 - 22+500	1:5,000	A - 5 - 16
Plan and Profile	(16 /45)	22+500 - 24+000	1:5,000	A - 5 - 17
Plan and Profile	(17 /45)	24+000 - 25+500	1:5,000	A - 5 - 18
Plan and Profile	(18 /45)	25+500 - 27+000	1:5,000	A - 5 - 19
Plan and Profile	(19 /45)	27+000 - 28+500	1:5,000	A - 5 - 20
Plan and Profile	(20 /45)	28+500 - 30+000	1:5,000	A - 5 - 21
Plan and Profile	(21 /45)	30+000 - 30+531	1:5,000	A - 5 - 22
Plan and Profile	(22 /45)	30+531 - 32+000	1:5,000	A - 5 - 23
Plan and Profile	(23 /45)	32+000 - 33+500	1:5,000	A - 5 - 24
Plan and Profile	(24 /45)	33+500 - 35+000	1:5,000	A - 5 - 25
Plan and Profile	(25 /45)	35+000 - 36+500	1:5,000	A - 5 - 26
Plan and Profile	(26 /45)	36+500 - 38+000	1:5,000	A - 5 - 27
Plan and Profile	(27 /45)	38+000 - 39+500	1:5,000	A - 5 - 28
Plan and Profile	(28 /45)	39+500 - 41+000	1:5,000	A - 5 - 29
Plan and Profile	(29 /45)	41+000 - 42+500	1:5,000	A - 5 - 30
Plan and Profile	(30 /45)	42+500 - 44+000	1:5,000	A - 5 - 31
Plan and Profile	(31 /45)	44+000 - 45+500	1:5,000	A - 5 - 32
Plan and Profile	(32 /45)	45+500 - 47+000	1:5,000	A - 5 - 33
Plan and Profile	(33 /45)	47+000 - 48+500	1:5,000	A - 5 - 34
Plan and Profile	(34 /45)	48+500 - 50+000	1:5,000	A - 5 - 35
Plan and Profile	(35 /45)	50+000 - 51+500	1:5,000	A - 5 - 36
Plan and Profile	(36 /45)	51+500 - 53+000	1:5,000	A - 5 - 37
Plan and Profile	(37 /45)	53+000 - 54+500	1:5,000	A - 5 - 38
Plan and Profile	(38 /45)	54+500 - 56+000	1:5,000	A - 5 - 39
Plan and Profile	(39 /45)	56+000 - 57+500	1:5,000	A - 5 - 40
Plan and Profile	(40 /45)	57+500 - 59+000	1:5,000	A - 5 - 41
Plan and Profile	(41 /45)	59+000 - 60+500	1:5,000	A - 5 - 42
Plan and Profile	(42 /45)	60+500 - 62+000	1:5,000	A - 5 - 43
Plan and Profile	(43 /45)	62+000 - 63+500	1:5,000	A - 5 - 44
Plan and Profile	(44 /45)	63+500 - 65+000	1:5,000	A - 5 - 45
Plan and Profile	(45 /45)	65+000 - 65+469	1:5,000	A - 5 - 46
Typical Cross Sections	(1 /4)		1:100	A - 5 - 47
Typical Cross Sections	(2 /4)		1:100	A - 5 - 48
Typical Cross Sections	(3 /4)		1:100	A - 5 - 49
Typical Cross Sections	(4 /4)		1:100	A - 5 - 50
Countermeasure for BCS	(1 /2)		1:100	A - 5 - 51
Countermeasure for BCS	(2 /2)		1:100	A - 5 - 52
ASAMATECH Bridge	(1 /13)		1:100	A - 5 - 53
BECHET Bridge	(2 /13)		1:100	A - 5 - 54
ABA ADEM Bridge	(3 /13)		1:100	A - 5 - 55
ABEYA Box Culvert	(4 /13)		1:100	A - 5 - 56
YEKEYET Box Culvert	(5 /13)		1:100	A - 5 - 57
GETLA Bridge	(6 /13)		1:100	A - 5 - 58
MINT KAT Bridge	(7 /13)		1:100	A - 5 - 59
ZIBA Bridge	(8 /13)		1:100	A - 5 - 60
YEDA-A Box Culvert	(9 /13)		1:100	A - 5 - 61
YEDA-B Box Culvert	(10 /13)		1:100	A - 5 - 62
YEDA-C Box Culvert	(11 /13)		1:100	A - 5 - 63
AMBESH Box Culvert	(12 /13)		1:100	A - 5 - 64
WISETA Bridge	(13 /13)		1:100	A - 5 - 65

2.2.4 Implementation Plan

2.2.4.1 Implementation Policy

(1) Direct Cost

The construction sequence for the target road and bridges are shown in Figure 2.2.20. The construction of works is divided into two different sequences as road and bridge works. Main works of road are envisaged to be black cotton soil replacement work and pavement work.

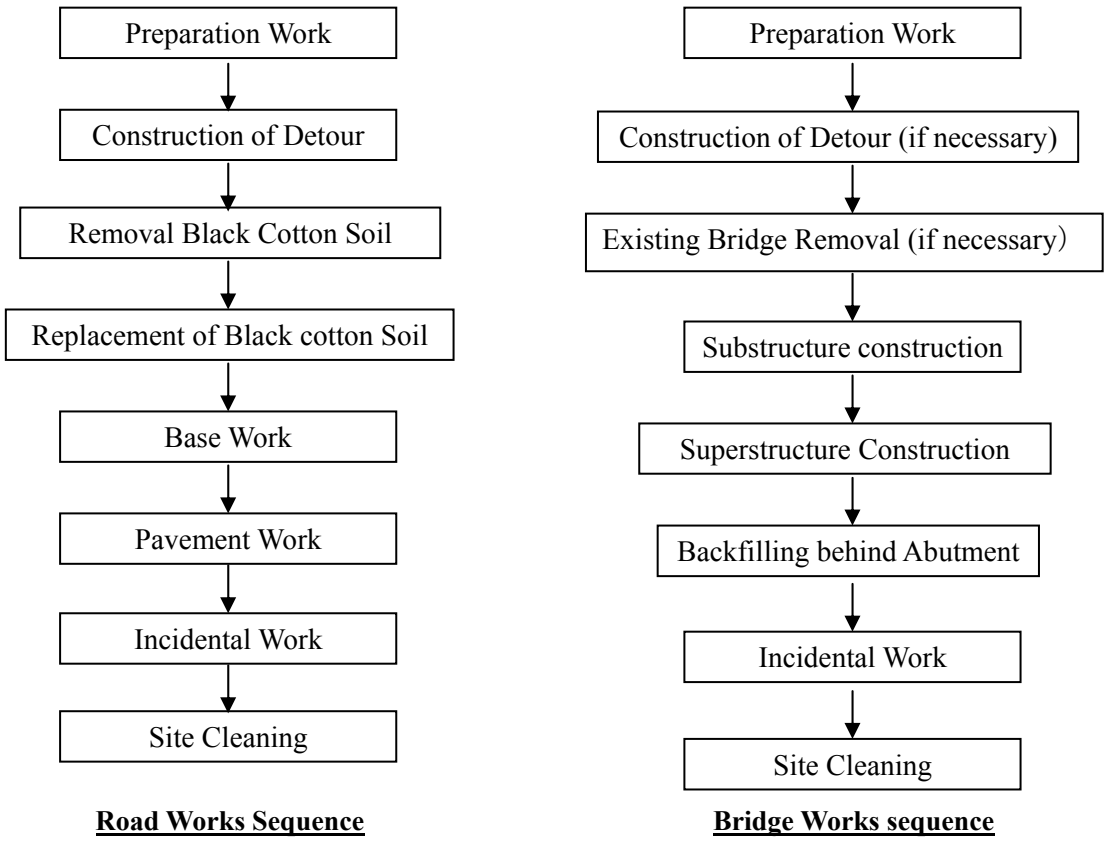


Figure 2.2.20 Construction Sequence

Earth work, pavement work and substructure work shall be done in the dry season, during the 8 months from October to May. As for superstructure work, it could be done even in the rainy season.

1) Countermeasure work for black cotton soil

As a countermeasure against cotton soil, replacement method is applied. However, it is uneconomical and not viable to replace all layer of black cotton soil.

The function of the replacement layer is that of the interception layer to control change of water content in the remaining layer of black cotton soil. In addition, to regulate/minimize the changes in the water content of remaining black cotton soil, replacement work should be done within 24 hours after excavation of black cotton soil. Therefore, the number of working parties must be considered for the above mentioned method to progress smoothly.

2) Road work

To maintain high work quality and safety during construction, the new road will be constructed along existing road basically and in the town areas, detours will be constructed. But in case a detour can not be constructed, experienced traffic controllers should be posted to keep traffic safety.

3) Detour plan

On this project route, there are Wejel, Lumame and Debre Markos towns. For the construction of the city area, detours will be established as much as possible to enhance safety of the construction. Detour plans for above mentioned towns are shown in Figure 2.2.21 ~ Figure 2.2.23.

Wejel

The north side of the existing road has the town road which can secure a width of 5-15m, but, as for the west part, enough maintenance is necessary. The south side of existing road has also town road, but many houses lay along this road. Therefore, south side town road can not be used for detour.

Figure 2.2.21 Detour Plan of Wejel

Lumame

There is the road on which a width of 5-15m can be secured in the north side of the existing road. On Detour 1 route, a width of around 5m can be secured along the whole route but enough repairs are necessary on the western part. On Detour 2 route a width of more than 10m can be secured along the whole route but repair is necessary and detour distance is longer than Detour 1 route. On the southern side, there are many houses on the slope, and the road width is narrow and a lot of crank. Therefore, the southern side of existing road is unsuitable for use as a detour.

Figure 2.2.22 Detour Plan of Lumame

Debre Markos

ERA D/D route in Debre Markos Town can be used for detour purpose. It has almost 5 ~ 10m width of non-paved existing road. But, repairs are necessary to use it as a detour.

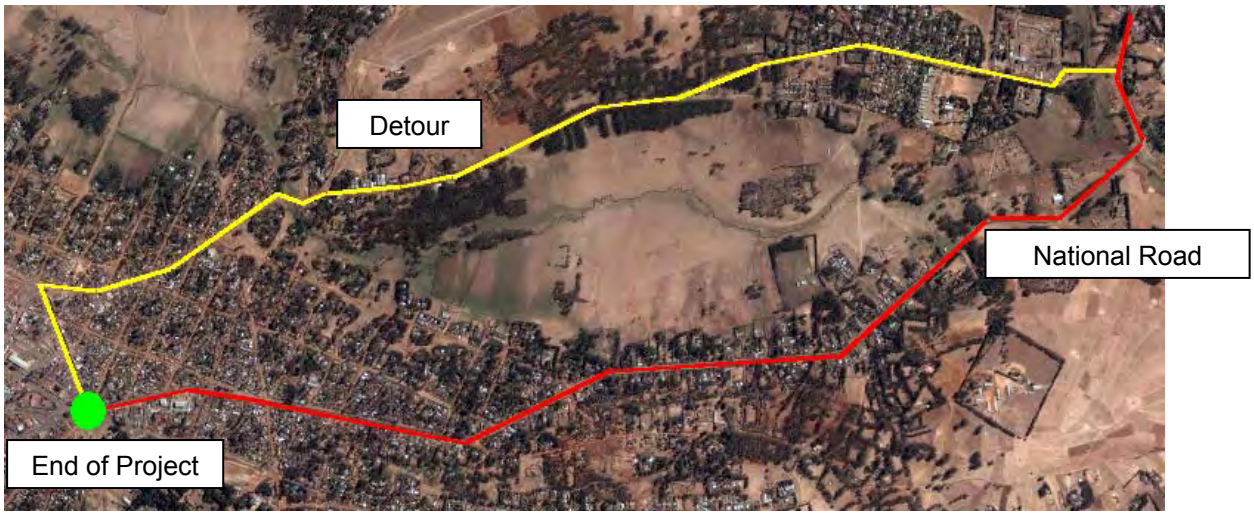


Figure 2.2.23 Debre Markos Detour Plan

4) Bridge and Culvert

There are 13 bridges including new construction, reconstruction bridges and large-scale box culverts, and 2 bridges which need to repairs.

6 bridges and culverts of Getla, Ziba, Yeda (3 culverts), Ambesh are located at re-routing section. Therefore, detours are not necessary for those 6 bridges and culverts.

Asamatech, Bechet, Abeya, Yekeyet, Mintkat and Wiseta bridges will also be newly constructed newly besides the existing bridge. Therefore, regarding these 6 bridges, detours are not necessary too.

Abba Adem Bridge is the only one to be reconstructed on the same place of existing bridge. Therefore, a detour is necessary. (Refer to Figure 2.2.21)

Bogena and Chemoga bridges will only need repairs such as handrail repair and bridge surface repair. Therefore, traffic can be controlled as it passes while repairing and consequently a detour is not necessary.

(2) Indirect Work

1) Ensuring construction yards include plants and camp

Since this is a large-scale project comprising road rehabilitation and reconstruction of bridges, large construction yards are required to accommodate plants, camps and construction material yards. Therefore, close cooperation with ERA is required to obtain the consent and cooperation of local people in finding sufficient space for the construction yard(s). Table 2.2.29 shows the candidate places for construction yard by purpose.

Table 2.2.29 Candidate Locations for Camp, Office and Construction Yards

Usage	Candidate Location
Phase 1	
Base Camp (Office, Accommodation, Storehouse, Work shop) Asphalt Plant Crusher Plant Concrete Plant Yard for bridge/culvert	Yetnora（15,000m^2） Yetnora（4,000m^2） Yetnora（10,000m^2） Yetnora（1,500m^2） Each bridge/culvert sites (100m^2)
Usage	**Candidate Location**
Phase 2	
Base Camp (Office, Accommodation, Storehouse, Work shop) Asphalt Plant Crusher Plant Concrete Plant Yard for bridge/culvert	Filiklik（15,000m^2） Filiklik（4,000m^2） Filiklik（10,000m^2） Filiklik（1,500m^2） Each bridge/culvert sites (100m2)

2) Site acquisition and Transfer of the obstacles

Basically, land is national property, and, as for the inhabitants, only the right to use is accepted in Ethiopia. ERA has the responsibility for acquisition of needed land and transfer of the public facilities such as electricity/water service obstructing on the occasion of construction and restore. Therefore, ERA shall discuss with relevant organization and resolve any matters that arise thereof. In this project, it is enough to consider that telephone poles or well / water services are the main obstacles.

(3) Procurement of Main Materials

Main contents of this project are road work including black cotton soil replacement and bridge work including culvert that is not special work. Therefore all the main materials excluding bitumen can be procured within Ethiopia, although some are originally imported from other countries, as shown in Table 2.2.30.

Table 2.2.30 Procurement Countries

Materials	Local	Japan	Other Country	Remarks
Cement	○			
Concrete Admixture		○		
Reinforcement Bar	○			
Structural Steel	○			
Bitumen			○	Middle Eastern Countries
Crusher Stone, Sand	○			
Wood for Formwork	○			
Scaffolding	○			
Precast Concrete	○			
Expansion Joint		○	○	
Bearing		○	○	

(4) Equipment for the Project

In many construction projects, the company which got project had imported from out side of Ethiopia. Recently, the domestic suppliers have large size construction equipment/machinery and there are established leasing companies for construction machinery as a result of the building construction boom in the capital Addis Ababa. In addition, the maintenance section of ERA became an independent entity, and those construction equipment/ machinery may be leased out.

(5) Transport and Packing Plan

1) General

Construction equipment, machineries and materials from third country or Japan will land at the Djibouti Port. Then, it will be transported by truck to site. Land transportation route is shown in Figure 2.2.24.

Figure 2.2.24 Transportation Route from Djibouti Port to Site

2) Land transportation

Construction equipment, machineries and materials which are supplied domestically are transported to the site via Addis Ababa. Distance from Addis Ababa to Dejen is almost 220km with 5 or 6 hours on the road which was already rehabilitated.

Especially, the section between Goha Tsiyon and Dejen is about 1,400m altitude difference and about a 7% grade. Therefore, particularly amble time is necessary for the transportation of the large-sized machine to pass at this road section.

3) Sea transportation

Construction equipment, machineries and materials which are from outside Ethiopia are land at the Djibouti Port. After landing, from Djibouti to Addis Ababa, it will be transported by land. The normally necessary days to the site are as follows.

- Djibouti to Adds Ababa 2 days
- Addis Ababa to Site 1 day
- Custom clearance Minimum 2 days

Therefore, the total minimum days necessary from Djibouti to Site are between 5 and 7 days. From Japan to Site, it takes almost 3 months.

4) Import procedure

To import construction equipment, machineries and materials with exemption from taxation, the following procedure is necessary.

① Master list of import construction equipment, machineries and materials should be submitted to ERA and got approval from ERA.

② Based on above mentioned master list, the tax-free approval will be got from Ministry of Finance and Economic Development.

③ At time when the import goods are decided, the shipping documents should be submitted to the Ministry of Finance and Economic Development through ERA. A notice of exemption from taxation is issued to the customs and the applicant after Ministry of Finance and Economic Development's examination.

④ Imported construction equipment and machineries can be imported under the exemption from taxations on condition of re-exportation on project completion.

2.2.4.2 Implementation Condition

(1) Security Condition of the Site

Site situation is not bad. However, some robbery incidences very often occur. Therefore, 24 hours patrol or guard is necessary for site, base camp, temporary yard and plants similar to the Phase III project.

(2) Security Condition of around Djibouti Port

The neighboring country Djibouti is the port used for export/import by Ethiopia. Therefore, imported equipment, machineries and materials will land at the Djibouti Port.

However, Djibouti is located at the entrance of Red Sea Yemen whereby the pirates have haunted this area. Therefore, the pirate situation should be considered alongside the marine transportation.

2.2.4.3 Scope of Works

For the implementation of the project under the grant aid of the Government of Japan, the share of works to be undertaken by the Government of Japan and the Government of Ethiopia are as described hereafter.

(1) The share to be borne by the Government of Japan

① Transportation of equipment and material from Japan or Third Country to Djibouti Port.

② Transportation from Djibouti Port or procurement place to Site.

③ Construction of Road including Pavement, Bridge and Culverts. (Refer to 2.2.3 and Appendix >>> Outline Design Drawings)

④ Construction and removal of construction yard and detour road, and camp yard.

⑤ Procurement of the materials, equipment and labour required for the construction works.

⑥ Field management cost for the above construction works.

⑦ The consultant services, which are necessary to implement the works.

2.2.4.4 Consultant Supervision

(1) Detailed Design/Supervision

1) Basic policy of the detailed design

The basic policy of the detailed design is as follows:

Field studies during the detailed design will be conducted for reconfirmation of the site, supplementary studies related to the construction/estimation and additional survey based upon the basic design. Final discussion shall be held with the Government of Ethiopia on confirmation items related to the detailed design.

After completion of the detailed design, the context of the detailed design shall be explained to the Ethiopian side, and discussion will be held.

2) Basic policy of consultant supervision

The basic policy of the consultant supervision will be as follows:

Consultant office shall be located in the same area as the contractor's office.

In Addis Ababa, the Consultant would not have a liaison office and would visit ERA on a monthly basis to submit the monthly report by business trip from the Site.

For black cotton soil measurement and pavement works, those experts will be posted separately from a resident engineer.

Resident supervisor shall carry out the environmental impact monitoring.

It is necessary to establish a backup system for this project in Japan.

3) Consultant supervision

The supervisors dispatched to the site will perform the following construction supervision works with the leading local engineer to be employed in Ethiopia.

Approval of the Construction Plan, Schedule and Construction Drawing

Supervisor will inspect and approve the construction plan, schedule and shop drawings submitted by the contractor, in conformity with the contract document, contract drawings, specifications and others.

- Schedule Control
  Supervisors will receive the progress reports from the contractor, and give adequate and essential instructions necessary for the completion of the project.
- Quality Control
  Supervisors will examine and approve the quality of construction materials and

construction methods, in conformity with the contract drawings and specifications.

- Inspection of Completed Construction Works
  Through the inspection of the final sections, figures in plan and others, supervisors will confirm the completed construction works to the control criteria and certify the quantities.

- Monitoring of Environmental Impact
  Monitoring result of environmental impact should be reported to ERA.

- Issuing of Certification
  Supervisors will issue the certificates for the payment of the contractor, such as the completion of the construction and the expiration of warranty term etc.

- Submittal of Report
  Supervisors will inspect the monthly reports and final pictures prepared by the contractor and submit them to the Ethiopian authorities, JICA and others. Furthermore, the supervisors will prepare the final report after the completion of the entire construction and submit to JICA.

4) Procurement

Supervisor shall command procurement schedule not to delay the construction progress, because plants such as concrete, asphalt and crusher and bitumen for asphalt concrete should be imported from Japan and Middle Eastern countries.

2.2.4.5 Quality Control Plan

Table 2.2.31 shows the quality control plan for this project.

Table 2.2.31 Quality Control Plan

Type of Work	Control Item	Inspection, Testing and etc.	Frequency of Inspection/Testing
1) Earthwork, Asphalt Pavement (DBST), Subgrade, Base Course, Underground Structures	Material Control	CBR Test, Geotechnical Test (Specific gravity, Grain size, Moisture content, Liquid & Plastic limit, Density), Aggregate Test (Specific gravity, Grain size, Strength, Coefficient of water absorption), Bituminous material (Quality certificate, Componential analysis result)	Before implementation
	Routine Control	Soil Compaction Test, Bituminous material (Stability, Flow value, Void ratio, Marshall test, Temperature)	At implementation and mixing
2) Concrete Structure, Concrete Pavement	Batching Plant calibration	Weighing equipment, Mixing efficiency	Before implementation and once a month
	Material Control	Cement, Admixture (Quality certificate, Result of componential analysis), Aggregate test (Specific gravity, Grain size, Strength, Coefficient of water absorption, Alkali-aggregate reaction	Before implementation, the timing of changing material
	Concrete Trial Mix	Slump, Air content, Temperature, Chloride content, Sample Strength	Before implementation
	Daily Management	Fresh concrete (Air content, Slump, Temperature)	Witness inspection at placement
		Inspection (Consolidation, Curing method, Removal of laitance)	Witness inspection at placement
		Concrete Sample (Sample compressive strength test, Preparation of the concrete control chart)	Once a day, 7 and 28 days after placement

2.2.4.6 Procurement Plan

(1) Human Resources of the Construction Industry

1) General

Since many road rehabilitation projects, including trunk and rural roads, are being carried out in Ethiopia, there is high demand for human resources such as engineers, technicians and laborers in construction industry. Moreover, since it is difficult to employ experienced technicians such as carpenters, electricians and plasterers near the Project sites, they should be employed from Addis Ababa in addition to the foremen and machinery operators.

2) Engineers

Graduate Engineers from the civil engineering department of the Addis Ababa University and others have already acquired basic technical skills and a sufficient level of English language capability. Therefore, what they need most, it seems, is to get the opportunity for project and site experience.

3) Laborers from Third Countries

Laborers from third countries are not needed for this project. Because, this project does not employ special construction methods such as PC method, etc.

4) Labor Law of Ethiopia

General employment conditions are stipulated in the Labor Proclamation enacted in1993 (latest: Proclamation No.377/2003 issued 26th February, 2004) and the contractor has to comply with this law on the Project.

(2) Construction Equipment and Machinery

Plants (Crusher, Asphalt and Concrete) could not be leased from local market; therefore these plants including their accessories will be procured from Japan. The other construction equipment and machinery will be leased from local market such as from domestic construction companies and leasing companies. Therefore, the Japanese contractor will, as far as possible, not procure any equipment by importing from a third country and will endeavor to procure the heavy equipment from domestic firms.

2.2.4.7 Implementation Schedule

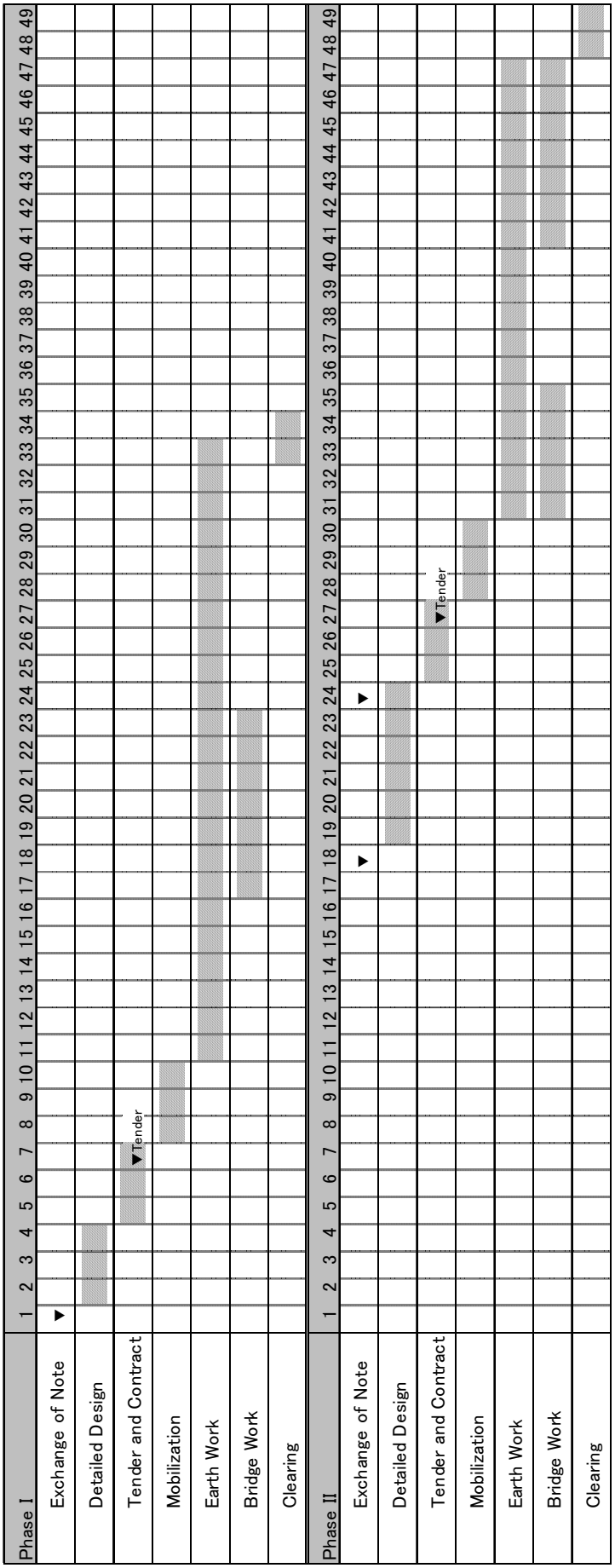
This project implementation schedule is

- Phase I Total month:33month
  (Detailed Design:3month, Tender and Contract:4month, Consutraction:27month)
- Phase I Total month:31month
  (Detailed Design:6month, Tender and Contract:3month, Consutraction:22month)

However, all works except superstructure and crushing stone product works will not be carried out during rainy season to avoid quality drop.

The implementation schedule is as shown in Table 2.2.32 Implementation Schedule.

Table 2.2.32 Implementation



2.3 Obligations of Recipient Country

The obligations of the Ethiopian side for the Project are listed below.

(1) General

① To set Banking Arrangement (B/A).
② To advise commission of Authorization to Payment (A/P) and make payment of the commission.

(2) Implementation Matters

① To secure land for the project sites, to lease temporary yards, to compensate for resettlement, and to remove/relocate obstructive utilities,
② To secure all the expenses and prompt execution of customs clearance at the port of disembarkation for unloading products purchased under the Grant Aid,
③ To accord Japanese nationals whose services may be required in connection with supply of the products and the services under the verified contracts,
④ To exempt Japanese nationals and the third party nationals entering Ethiopia to work on the project from customs duties, internal taxes and other fiscal levies which may normally be imposed in the recipient country with respect to the supply of the products and services under the verified contracts,
⑤ To provide electricity, water supply, drainage and other incidental facilities to the vicinities of the sites,
⑥ To remove existing bridges at Asamatech, Bechet, Abeya and Wiseta bridges immediately after completion of construction work covered by Japanese Grant Aid,
⑦ To maintain and use properly and effectively the facilities constructed under the Grant Aid,
⑧ To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities,

(3) Others

① To secure the budget for land acquisition, temporary yard leasing, compensation for resettlement, and tax exemption covered by the recipient country,
② To contract with a Japanese consulting firm for detailed design (D/D) and construction supervision,
③ To contract with a Japanese construction firm,

2.4 Project Operation Plan

2.4.1 Operation and Maintenance System

No additional organization will be required for maintenance works regarding this project because ERA is responsible and capable of all national roads maintenance works.

2.4.2 Operation and Maintenance Method

(1) Road

A standard schedule of periodical inspection and maintenance for the road is as shown in Table 2.4.1.

Table 2.4.1 Schedule of Periodical Inspection and Maintenance for the road

Items	Maintenance and Repair Works	Inspection Frequency
Road surface	Patching and smoothing	Every month
Shoulder and Slope	Surface treatment, vegetation, additional embankment	Every month
Side drainage	Removal of debris, earth deposits	Every month
Marking	Repainting	Every month
Guard post	Repainting and replacement	Every half year
Retaining wall	Repair of crack and stripping	Every year

1) Dry Season

In the dry season (October ~ May), inspection, cleaning and repair of pavement, shoulders, drainage and retaining walls shall be carried out.

① Pavement of road — Potholes, if their sizes are more than 20cm in diameter, shall be repaired by hot (or cold) mix method.

② Shoulders — Damaged shoulders results in damage to asphalt due to water flow via the broken shoulder during the rainy season. Damaged shoulders shall therefore be repaired promptly by DBST.

③ Drainage — Soil and stones deposited inside drainage facilities (Roadside drain and culvert) shall be cleaned and damage repaired.

④ Traffic safety facilities — Damaged safety posts, traffic signs and lane marks shall be repaired.

2) Cleaning of drainage facilities in the rainy season

Overflows from road drainage facilities clogged by soil and stone damage road pavement and erode slopes. Therefore, the inspection and cleaning of drainage facilities shall be executed without fail to ensure smooth drainage flows.

(2) Bridge and Culvert

Large-scale repair works will not be necessary until 20 to 30 years after completion of the bridges and culverts by the following operation and maintenance method mentioned in Table 2.4.2 unless the main structural members are deformed and damaged by vehicle collision.

It is important to keep records (date of inspection, location of inspection, result of inspection and name of inspector) of periodical checking in the road register and grasp the condition of damage in order to establish the repair schedule and its scale. Therefore, the periodical checking system must be established at an early stage.

Table 2.4.2 Schedule of Periodical Inspection and maintenance for bridge/culvert

Items	Maintenance and Repairing Works	Inspection Frequency
Drainage pipe	Cleaning of sediments	Every 3 months
Handrail	Repairing damages by traffic accidents	Every 3 months
Bearing	Removal of earth deposits	Every half year
Main Structure	Repair of damaged members	Every year

2.5 Project Costs Estimation

2.5.1 Initial Cost Estimation

(1) Cost Estimate

The total cost of the Project by the Japanese Grant Aid is summarized in Table 2.5.1. This cost estimate is provisional and will be further examined by the Government of Japan for the approval of Grant. In addition, this approximate project costs will not be quoted as the Maximum Amount of Japanese Grant Aid in the Exchange of Notes immediately just as they are.

Table 2.5.1 Approximate Project Costs

Phase	Items			Cost (Hundred Million JPY)
Phase I	Construction Facilities	Road	Earthwork, Pavement work and other related works	
		Structure	Bridge, Culvert works	
		Ancillary work	Drainage, Traffic Safety facilities, Other related works	
		Subtotal		
	Detailed Design and Construction Supervision			
	Total			
Phase II	Construction Facilities	Road	Earthwork, Pavement work and other related works	
		Structure	Bridge, Culvert works	
		Ancillary work	Drainage, Traffic Safety facilities, Other related works	
		Subtotal		
	Detailed Design and Construction Supervision			
	Total			

Note: The cost estimates in the above table are provisional and will be further examined by the Government of Japan for the approval of the Grant.

(2) Condition of Estimation

① Time of estimate : November 2010

② Exchange rate : 1US$ =JPY87.99 (at the above mentioned time)
1Birr= JPY5.9559 (at the above mentioned time)

③ Implementation period : Detailed design and construction period are shown in Table 2.2.32, Implementation schedule

④ Others : On Condition that the Project is implemented under Japan's Grant Aid Scheme, The above mentioned exchange rate is to be reviewed by Japanese Government.

(3) Cost Borne by Ethiopian Government Side

Approximate costs required for the undertaking of Ethiopian Government side are shown in Table 2.5.2. This cost estimate is provisional.

Table 2.5.2 Approximate Costs to be Borne by Ethiopian Government Side

Phase	Items	Cost (Million Birr)
Phase I	Cost of Environment Consideration	1.1
	Relocation cost	1.8
	Relocation cost of public utilities including telephone and electric poles	0.1
	Leveling of Temporary yards	0.4
	Refund of VAT / Import Tax / Bank Commission	72.2
	Total	75.6
Phase II	Cost of Environment Consideration	1.3
	Relocation cost	2.5
	Relocation cost of public utilities including telephone and electric poles	0.1
	Leveling of Temporary yards	0.4
	Refund of VAT / Import Tax / Bank Commission	81.8
	Total	86.1

Note : Birr = Ethiopia Birr

2.5.2 Operation and Maintenance Cost

The periodical inspection, minor repair/maintenance will be carried out under direct management of ERA. The normal cost for operation and maintenance per year after 7 years is estimated as shown below and the total cost for operation and maintenance accounts for 0.60% of the investment for maintenance in 2010/11 (810 million Birr) and so the implementation of enough maintenance can be carried out.

Table 2.5.3 Approximate Cost for Operation and Maintenance

Phase	Items	Frequency	Inspection Place	Work Contents	Approximate Cost (Birr)	Remarks
Phase I	Between Dejen and Lumame (30.5km)					
	Drainage	2 times per year	Side Ditch Culvert	Cleaning deposit	350,000	
	Road	1 time per year	Road Marking	Repaint	60,000	
	Traffic Safety Facilities	2 times per year	Shoulder Side slope	Repair erosion, Weeding	200,000	
	Total operation and maintenance cost per year until 7 years after completion				610,000	
	Pavement	Every year after 7 years	Pavement surface		1,010,000	0.4% of pavement work cost
	Drainage		Side ditch Culvert		530,000	0.7% of drainage and culvert works costs
	Total maintenance cost per year after 7 years				1,540,000	
	Total operation and maintenance cost per year after 7 years				2,150,000	
Phase II	Between Lumame and Debre Markos (35.0km)					
	Drainage	2 times per year	Side Ditch Culvert	Cleaning deposit	400,000	
	Road	1 time per year	Road Marking	Repaint	70,000	
	Traffic Safety Facilities	2 times per year	Shoulder Side slope	Repair erosion, Weeding	230,000	
	Total operation and maintenance cost per year until 7 years after completion				700,000	
	Pavement	Every year after 7 years	Pavement surface		1,400,000	0.4% of pavement work cost
	Drainage		Side ditch Culvert		640,000	0.7% of drainage and culvert works costs
	Total maintenance cost per year after 7 years				2,040,000	
	Total operation and maintenance cost per year after 7 years				2,740,000	

CHAPTER 3 Project Evaluation

CHAPTER 3 Project Evaluation

3.1 Recommendations

ERA should undertake adequate maintenance work of the Project road and bridges after they are open to the public in order to ensure that these structures produce the maximum intended benefits. Especially, efficient implementation of routine maintenance work such as daily inspection, light repairs of pavement, shoulders, drainage facilities, banking and cut slope and traffic safety facilities is important to maximize the life of a road structure. In addition, the regulation of overloaded vehicles should be strengthened since such vehicles seriously damage the pavement structure.

In order to secure the function of the Project road in an effective manner, the matters that ERA should consider to implement specially are recommended as explained below;

(1) To maintain sustained clean up of road drainage facilities

Accumulated sediment in drains such as side gutters, ditches and culverts will cause water to enter into the subgrade that will speed up of deterioration of subgrade, subbase course, base course and pavement. Thus, the cleaning of road drainage facilities is very important for protecting road structure. So, it is recommended that ERA should undertake all of the drainage cleaning work for the entire Project road before and during each rainy season.

(2) Regulation against overloaded vehicles

One major cause of pavement and structure deterioration is overloaded vehicles. Therefore, it is necessary for ERA to install a facility for weighing vehicles (weigh-bridge) to carefully and strictly regulate heavy vehicles.

3.2 Project Evalution

3.2.1 Quantitative Effect

(1) After the completion of the Project road, the average speed of vehicles which use it can be improved and consumable parts and fuel consumption costs of them can be reduced. The expected figures of shortened travel time and reduction of consumption cost are as shown in the table below;

Table 3.2.1 Improvement Effect of Time & Consumption Cost Reduction

Indicator		Current situation	After improvement	Improvement effect
Car (4WD)	Average speed	44.8km/hrs.	60.6km/hrs.	16km/hrs. ; improvement
	Driving time	87min.	64min.	23min. ; reduction
Heavy trucks	Average speed	30.0km/hrs.	50.0km/hrs.	20km/hrs. ; improvement
	Driving time	130min.	78min.	52min. ; reduction
	Transportation cost*	1.74USD/km**	1.32USD/km	24% ; reduction

Note* ：Fuel consumption cost/ Consumable parts cost of tires, tube and so on

** ：Source of survey results by USAID in 2001

(2) Since the Project road is rehabilitated to resolve the flooding problem during rainy season, the punctuality, reliability and stability of transportation can be improved. The improved condition is as shown in the table below;

Table 3.2.2 Improvement Effect of Closing due to Flooding

Indicator	Current situation	After improvement
Times of closing	About 10 times/year*	0 time/year

Note* ; Closing hours are 3～6 per one time

3.2.2 Qualitative Effect

(1) Since the countermeasure against the BCS which exist extensively in the area is implemented, the maintenance and repair cost for the deterioration due to BCS could be reduced.

(2) The rehabilitated of Route 3 which is an international corridor can improve the punctuality/timeliness and reliability/stability of transportation, and contribute to the activation and development of economy of Ethiopia.

(3) The improvement of credibility of transportation on the rehabilitated road can result in the easy access to medical/educational facilities and contribute to the reduction of poverty.

【APPENDIX】

1 Member List of the Survey Team

(1) For the first Survey

Job Title	Name	Occupation
Chief Consultant / Road Traffic Planner I	Dr. M. Tatsumi	Oriental Consultants Co., Ltd.
Bridge Designer	Mr. N. Takagi	Oriental Consultants Co., Ltd. （Nippon Engineering Consultants Co., Ltd.）
Environmental / River / Hydrological Analyst	Mr. Y. Kobayashi	Oriental Consultants Co., Ltd. （Landtech Japan Co.,Ltd.）
Topographic Surveyor (Geology)	Dr. A. Sakata	Oriental Consultants Co., Ltd. （Tiera Consultant Ltd.）
Construction Planning / Procurement planning / Cost estimator	Mr. H. Okita	Oriental Consultants Co., Ltd.
Coordinator / Sub Cost estimator	Mr. T. Maeda	Oriental Consultants Co., Ltd.

(2) For the second Survey

Job Title	Name	Occupation
Cooperation Policy	Ms. R HIRAI	Ministry of Foreign Affairs Third Country Assistance Planning Division International Cooperation Bureau
Team Leader	Mr. S UMENAGA	Japan International Cooperation Agency (JICA) Director, Transportation and ICT Division 3 Transportation and ICT Group Economic Infrastructure Department
Project Coordination	Mr. H YOKOI	Japan International Cooperation Agency (JICA) Director, Transportation and ICT Division 1 Transportation and ICT Group Economic Infrastructure Department
Chief Consultant / Road Traffic Planner I	Dr. M. Tatsumi	Oriental Consultants Co., Ltd.
Bridge Designer	Mr. N. Takagi	Oriental Consultants Co., Ltd. （Nippon Engineering Consultants Co., Ltd.）
Road Traffic Planner II	Mr. S. Mizuno	Eight-Japan Engineering Consultants Co.,Ltd.
Environmental / River / Hydrological Analyst	Mr. Y. Kobayashi	Oriental Consultants Co., Ltd. （Landtech Japan Co.,Ltd.）
Topographic Surveyor (Geology)	Dr. A. Sakata	Oriental Consultants Co., Ltd. （Tiera Consultant Ltd.）
Environmental Analyst	Mr. M. Nemoto	Eight-Japan Engineering Consultants Co.,Ltd.
Construction Planning / Procurement planning / Cost estimator	Mr. H. Okita	Oriental Consultants Co., Ltd.
Coordinator / Sub Cost estimator	Mr. T. Maeda	Oriental Consultants Co., Ltd.

(3) For Explanation of Draft Final Report

Job Title	Name	Occupation
Team Leader	Mr. M Shinkawa	Japan International Cooperation Agency (JICA) Semior Representative, Office Ethiopia
Planning Manager	Mr. K Odawara	Japan International Cooperation Agency (JICA) Financing Facilitation and Procurement Supervision Department
Chief Consultant / Road Traffic Planner I	Dr. M. Tatsumi	Oriental Consultants Co., Ltd.
Bridge Designer	Mr. N. Takagi	Oriental Consultants Co., Ltd. （Nippon Engineering Consultants Co., Ltd.）

2 Survey Schedule

(1) For the first Survey

No.	Date			Chief Consultant / Road Traffic Planner I	Bridge Designer	Road Traffic Planner II	Environmental / River / Hydrological Analyst	Topographic Surveyor (Geology)	Environmental Analyst	Construction Planning /Procurement planning /Cost estimator	Coordinator
				Dr. M. Tatsumi	Mr. N. Takagi	Mr. S. Mizuno	Mr. Y. Kobayashi	Dr. A. Sakata	Mr. M. Nemoto	Mr. H. Okita	Mr. T. Maeda
1	Jul	15	Thu	Narita → Addis Ababa			Narita → Addis Ababa				Narita → Addis Ababa
2		16	Fri	Courtesy Call to JICA and Japanese Embassy			Courtesy Call to JICA and Japanese Embassy				Courtesy Call to JICA and Japanese Embassy
3		17	Sat	Site Survey			Site Survey				Site Survey
4		18	Sun								
5		19	Mon	Courtesy Call to ERA and Explanation of IC/R			Courtesy Call to ERA and Explanation of IC/R	Explanation on Tender Request of Tender			Explanation on Tender Request of Tender
6		20	Tue	Collecting data			Collecting data				Collecting data
7		21	Wed	Tender Closing/ Evaluation Preparation for the Report on Tender result				Tender Closing/ Evaluation Preparation for the Report on Tender result			Tender Closing/ Evaluation Preparation for the Report on Tender result
8		22	Thu	Site Survey			Site Survey				Site Survey
9		23	Fri								
10		24	Sat								
11		25	Sun								
12		26	Mon								
13		27	Tue								
14		28	Wed	Preparation of Reports on the Result of Site Survey Technical Study, Data Collection and Arrangement			Preparation of Reports on the Result of Site Survey Technical Study, Data Collection and Arrangement				
15		29	Thu								Preparation of Reports on the Result of Site Survey Technical Study, Data Collection and Arrangement
16		30	Fri							Addis Ababa → Narita	
17		31	Sat							Collecting data	
18	Aug	1	Sun	Discussion among Survey Team			Discussion among Survey Team			Discussion among Survey Team	
19		2	Mon	Preparation of Reports on the Result of Site Survey Technical Study, Data Collection and Arrangement			Preparation of Reports on the Result of Site Survey Technical Study, Data Collection and Arrangement			Site Survey	Preparation of Reports on the Result of Site Survey Technical Study, Data Collection and Arrangement
20		3	Tue	Reporting to JICA, ERA and Japanese Embassy			Reporting to JICA, ERA and Japanese Embassy				Reporting to JICA, ERA and Japanese Embassy
21		4	Wed	Addis Ababa → Narita			Addis Ababa → Narita				Addis Ababa → Narita
22		5	Thu							Study on procurement of Materials and Equipment from the third Country	
23		6	Fri								
24		7	Sat								
25		8	Sun								
26		9	Mon					Reception of Deliverables			
27		10	Tue								
28		11	Wed					Confirmation of the deliverables			
29		12	Thu					Reporting to JICA		Reporting to JICA	
30		13	Fri					Addis Ababa → Narita		Addis Ababa → Narita	

(2) For the second Survey

No.	Date			Cooperation policy	Team leader	Project coordination	Chief Consultant / Road Traffic Planner I	Bridge Designer	Road Traffic Planner II	Environmental / River / Hydrological Analyst	Topographic Surveyor (Geology)	Environmental Analyst	Construction Planning /Procurement planning /Cost estimator	Coordinator
				MOFA	JICA	JICA	Consultant team							
				Ms. R. Hirai	Mr. S. Umenaga	Mr. H. Yokoi	Dr. M. Tatsumi	Mr. N. Takagi	Mr. S. Mizuno	Mr. Y. Kobayashi	Dr. A. Sakata	Mr. M. Nemoto	Mr. H. Okita	Mr. T. Maeda
1	Sep	12	Sun	Narita→										
2		13	Mon	→Dubai→Adds Ababa Courtesy call (EOJ & JICA office)										
3		14	Tue											
4		15	Wed	Discussion with ERA					Haneda→Osaka					
5		16	Thu						→Dubai→Adds Ababa					
6		17	Fri	Signing (M/M), Report to EOJ & JICA) Adds Ababa→			Signing (M/M), Report to EOJ & JICA)		Data collection					
7		18	Sat	→Dubai→Narita			Site survey							
8		19	Sun											
9		20	Mon											
10		21	Tue				Preparation of sub-contractor (topo survey)	Data collection	Preparation of sub-contractor (topo survey)	Data collection	Preparation of sub-contractor (topo survey)	Data collection		
11		22	Wed											
12		23	Thu				Tendering		Tendering		Tendering			
13		24	Fri				Report of tender result		Report of tender result		Report of tender result			
14		25	Sat				Data collection, Site survey, Data analysis, Decision of design policy (road)	Data collection, Site survey, Data analysis, Decision of design policy (bridge)	Topo & geo survey, Data collection, Site survey, Data analysis, Designing (road)	Data collection, Site survey, Data analysis, Analysis & decision of design condition	Data collection, Site survey, Topo & geo survey, Data analysis, Analysis & decision of design condition	Data analysis, Site survey, Data analysis Analysis environmental affairs		
15		26	Sun											
16		27	Mon										Narita→	
17		28	Tue										→Dubai→Adds Ababa	
18		29	Wed										Data collection, site survey, Unit cost survey, Procurement survey, Survey of local contractor Construction planning	
19		30	Thu											
20	10月	1	Fri											
21		2	Sat								Preparation of Field survey report			
22		3	Sun											
23		4	Mon								Adds Ababa→			
24		5	Tue								→Dubai→Osaka→Haneda			
25		6	Wed											
26		7	Thu											
27		8	Fri											
28		9	Sat											
29		10	Sun											
30		11	Mon							Preparation of Field survey report				
31		12	Tue											
32		13	Wed							Adds Ababa→				
33		14	Thu							→Dubai→Narita				
34		15	Fri											
35		16	Sat											
36		17	Sun											
37		18	Mon											
38		19	Tue											
39		20	Wed											
40		21	Thu				Internal meeting, Discussion with ERA					Internal meeting, Discussion with ERA		
41		22	Fri											
42		23	Sat				Preparation of field survey report					Preparation of field survey report		
43		24	Sun											
44		25	Mon				Report to ERA, EOJ, JICA Adds Ababa→						Adds Ababa→	
45		26	Tue				→Dubai→Osaka→Haneda						→Dubai→Osaka→Haneda	
46		27	Wed											
47		28	Thu											
48		29	Fri						Adds Ababa→			Adds Ababa→		Coordination btw. Team & ERA Coordination btw. Team & sub-contractor Data collection Data analysis
49		30	Sat						→Dubai→Narita			→Dubai→Narita		
50		31	Sun											
51	11	1	Mon											
52		2	Tue											
53		3	Wed											
54		4	Thu											
55		5	Fri											
56		6	Sat											
57		7	Sun											Preparation of field survey report
58		8	Mon											
59		9	Tue											Adds Ababa→
60		10	Wed											→Dubai→Osaka→Haneda

(3) For Explanation of Draft Final Report

No.	Date			Team Leader	Planning Manager	Chief Consultant ／Road Traffic Planner I	Bridge Designer
				Mr. M Shinkawa	Mr. K Odawara	Dr. M. Tatsumi	Mr. N. Takagi
1	Mar	4	Fri			NARITA→	
2		5	Sat			→DUBAI→ADDIS ABABA	
3		6	Sun			Data collection	
4		7	Mon			Courtesy Call to JICA	
5		8	Tue			Internal meeting, Discussion with ERA	
6		9	Wed			Site Survey	
7		10	Thu		NARITA→		
8		11	Fri	→DUBAI→ADDIS ABABA Discussion among Survey Team		Data collection Discussion among Survey Team	
9		12	Sat	Site Survey			
10		13	Sun				
11		14	Mon	Site Survey		Internal meeting, Discussion with ERA	
12		15	Tue	Discussion with ERA about Draft Final Report			
13		16	Wed	Signing (M/M)			
14		17	Thu	Courtesy Call to Japanese Embassy ADDIS ABABA→DUBAI→			
15		18	Fri		→NARITA		

3 List of Parties Concerned in the Recipient Country

(1) Ethiopian Roads Authority (ERA)

Mr. Zaid Wolde Gabriel	Director General
Mr. Bekele Negussie	Deputy Director General, Planning and ICT
Mr. Abdu Mohammed	Deputy Director General, Engineering and Regulatory Department
Mr. Gelaso Bore	Deputy Director General, Human Resource and Finance Department
Mr. Yoseph Kidane	Manager Engineering Service Procurement, Design & Technical Support Division
Mr. Daniel Mengestie	Director, Planning & Program Management Branch
Mr. Daniel Nebro	Team Leader, Quality Assurance, Inspection and Road Safety Manegement Team
Mr. Abebe Assefa	Engineer, Design and Technical Support Branch
Ms. Rahel	Engineer, Design and Technical Support Branch
Mr. Gashew	Manager, District Engineering Division (DED) Debre Markos
Mr. Aschalew	Highway Engineer, District Engineering Division (DED), Debre Markos
Ms. Hiwot	Regional Office Director
Ms. Bezawit	Regional Office
Ms. Meseret	Regional Office
Mr.Abdissa Megersa Debela	Team Leader, Environmental and Social Management Branch
Mr. Sisay Bekele	Finance Management Director (Finance Division Manager)

(2) Ethiopian Ministry of Finance & Economy (MOFED)

Mr. Tilahun Tadasse	Director, Bilateral Cooperatiton Directorate
Mr. Aklog Demissie	Senior Advisor, Legal Depertment

(3) Ethiopian Electric Power Corporation (EEPCO)

Mr. Alemayehu	Team Leader, Ethiopian Electric Power Corporation (EEPCO)

(4) Contractors of Survey

Mr. Zerihun Nuru	General Manager, Gondwana Engineering
Mr. Behailu Teferra	General Manager Highway Engineers and Consultants (HEC)

(5) Japanese Embassy

Mr. Daisuke KOMORI	Economic Division

(6) JICA Ethiopia Office

Mr. Koji OHTA	Chief Representative
Mr. Makoto SHINKAWA	Senior Representative
Ms. Momoko SUZUKI	Representative
Mr. Atsushi NAKAGAWA	Representative

(7) Addis Ababa University

Mr. Meselle Haile	A/Professor of Civil Engineering

(8) Relevant Contractor

Mr. Sharma	LEA International Ltd./General Manager

4 Minute of Discussion (M / D)

4.1 For the Survey （2010.9.16）

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR REHABILITATION OF TRUNK ROAD, PHASE IV
IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
(Second Field Survey)

In response to the request from the Government of the Federal Democratic Republic of Ethiopia (hereinafter referred to as "Ethiopia"), the Government of Japan decided to conduct a Preparatory Survey on the Project for Rehabilitation of Trunk Road, Phase IV (hereinafter referred to as "the Project") and entrusted the survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Ethiopia the Preparatory Survey Team for the field survey (hereinafter referred to as "the Team"), which is headed by Mr. Satoshi Umenaga, Director, Transportation and ICT Division 3, Economic Infrastructure Department, JICA, and is scheduled to stay in the country from September 13th to November 9th, 2010.

The Team held discussions with the officials concerned of the Government of Ethiopia and conducted a field survey at the Project sites.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Addis Ababa, September 16, 2010

Satoshi Umenaga
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Zaid Wolde Gabriel
Director General
Ethiopian Roads Authority
Federal Democratic Republic of Ethiopia

Witnessed by

Tilahun Tadesse
Bilateral Cooperation Sub Process Owner
Ministry of Finance and Economic Development
Federal Democratic Republic of Ethiopia

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the smooth traffic flow and safety of transport on the A3 trunk road between Dejen and Debre Markos through the rehabilitation of the road and bridges.

2. Project Site

The site is the section between Dejen and Debre Markos on the A3 trunk road shown in Annex-1.

3. Responsible and Implementing Organizations

The responsible ministry is the Ministry of Works and Urban Development.
The implementing organization is the Ethiopian Roads Authority (ERA).
The organization chart of the implementing organization is shown in Annex-2

4. Items requested by the Government of Ethiopia

4-1. The Ethiopian side requested the rehabilitation of the road and bridges between Dejen and Debre Markos on A3 Trunk Road. However, the Team explained that it would be significantly difficult to rehabilitate all the sections at one time due to budgetary constraint, and suggested the Ethiopian side that the Project be divided into the two phases, that is, Phase 1 of the section between Dejen and Lumame and Phase 2 of the section between Lumame and Debre Markos. Both sides agreed that the phasing implementation plan, however, the Ethiopian side mentioned that all of the sections need to be completed before the end of June, 2015 in response to the target year of its Road Sector Development Program IV (RSDP IV).

4-2. Alignment plan will be discussed by the Team and the Ethiopian side in response to the field survey which would be conducted by both sides and the result would be informed to JICA Ethiopia office by September 24, 2010.

4-3.Both sides confirmed that there was no duplication for the Project to be conducted by other donors.

5. Japan's Grant Aid Scheme

5-1.The Ethiopian side understands the Japan's Grant Aid Scheme and necessary

measures to be taken by the Government of Ethiopia. The Team explained the procedures for the Project described in Annex-3, 4.

5-2. The Ethiopian side will take the necessary measures, as described in Annex-5 for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. JICA Guidelines for Environmental and Social Considerations

6-1. The Team explained the outline of the JICA Guidelines for Environmental and Social Considerations (hereinafter referred to as "the JICA Guidelines"), and the Ethiopian side agreed to take the JICA Guidelines fully into consideration for EIA by the Ethiopian side.

6-2. The Ethiopian side agreed to arrange the budget allocation for land acquisition, resettlement and compensation for the Project Affected Persons (PAPs) as soon as possible, and to take necessary measures for PAPs and secure the land before the Invitation To Bid for the Project.

7. Schedule of the Study

7-1. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around March, 2011.

7-2. If the contents of the draft report are accepted in principle by the Government of Ethiopia, JICA will complete the final report and send it to the Government of Ethiopia by July, 2011.

8. Other Relevant Issues

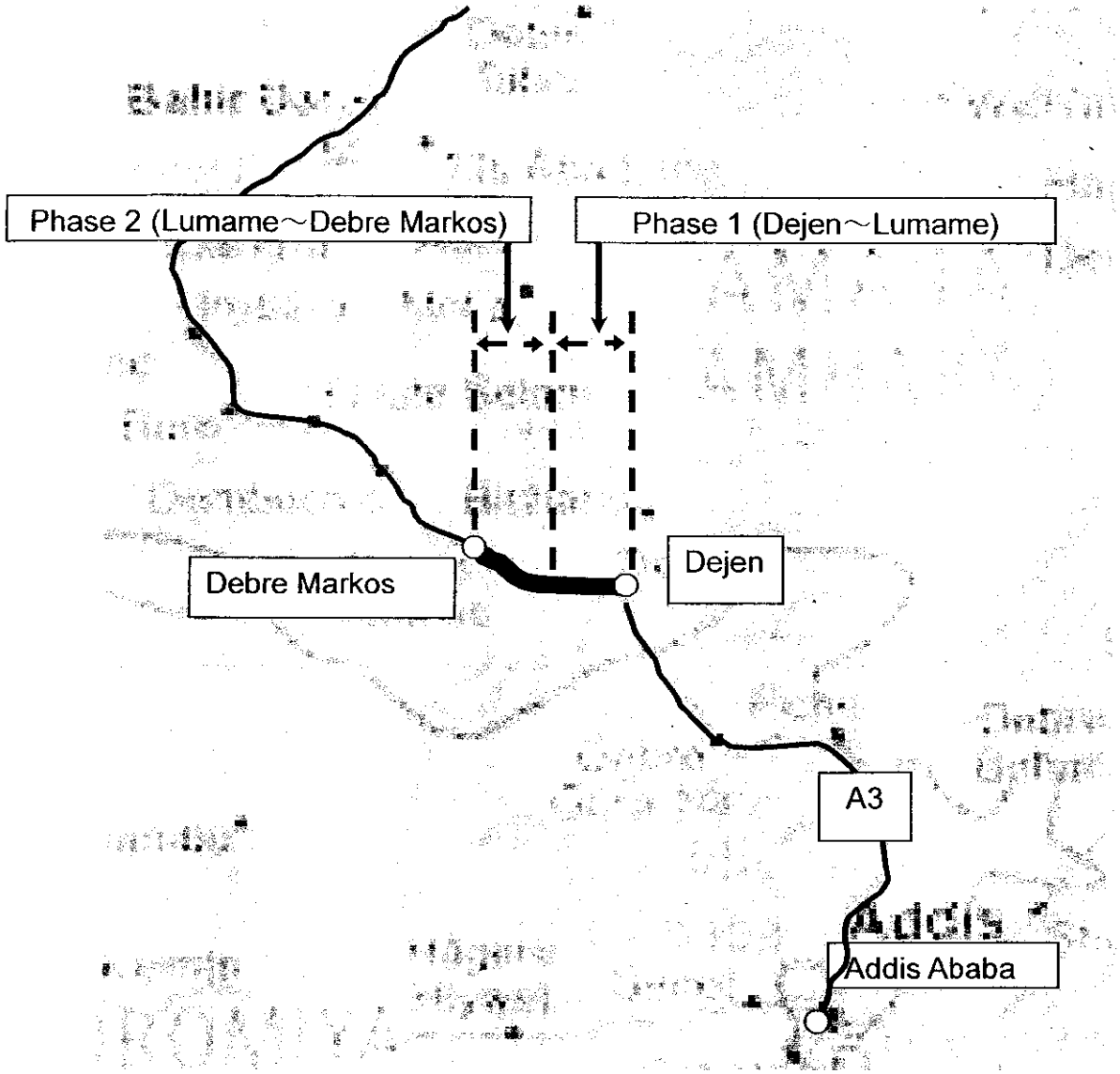
8-1. Both sides agreed that, in principle, the following undertakings shall be taken by the Ethiopian side at their own expenses;

- Improvement and/or repair of existing utilities (power lines, telecommunication lines, water lines, etc.), if necessary.
- Identification of underground utilities located within the site and exemption of contractor's responsibility in case of occurrence of any damage against unidentified utilities.
- To facilitate access to borrow pit(s) and quarry site(s).
- Securing of site for disposal of waste.
- To secure temporary yard(s).
- Maintaining the security at the sites for the Project.
- Coordination to relevant agencies regarding traffic control during construction.
- Public relations and dealing with any complaints raised by affected persons.

- Necessary arrangement for the tax exemption of import materials and equipment and timely refunding for the exemption of VAT for purchase of local products and services.
- Necessary arrangement and assistance for issuing of VISA for concerned persons.

8-2. The Ethiopian 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.

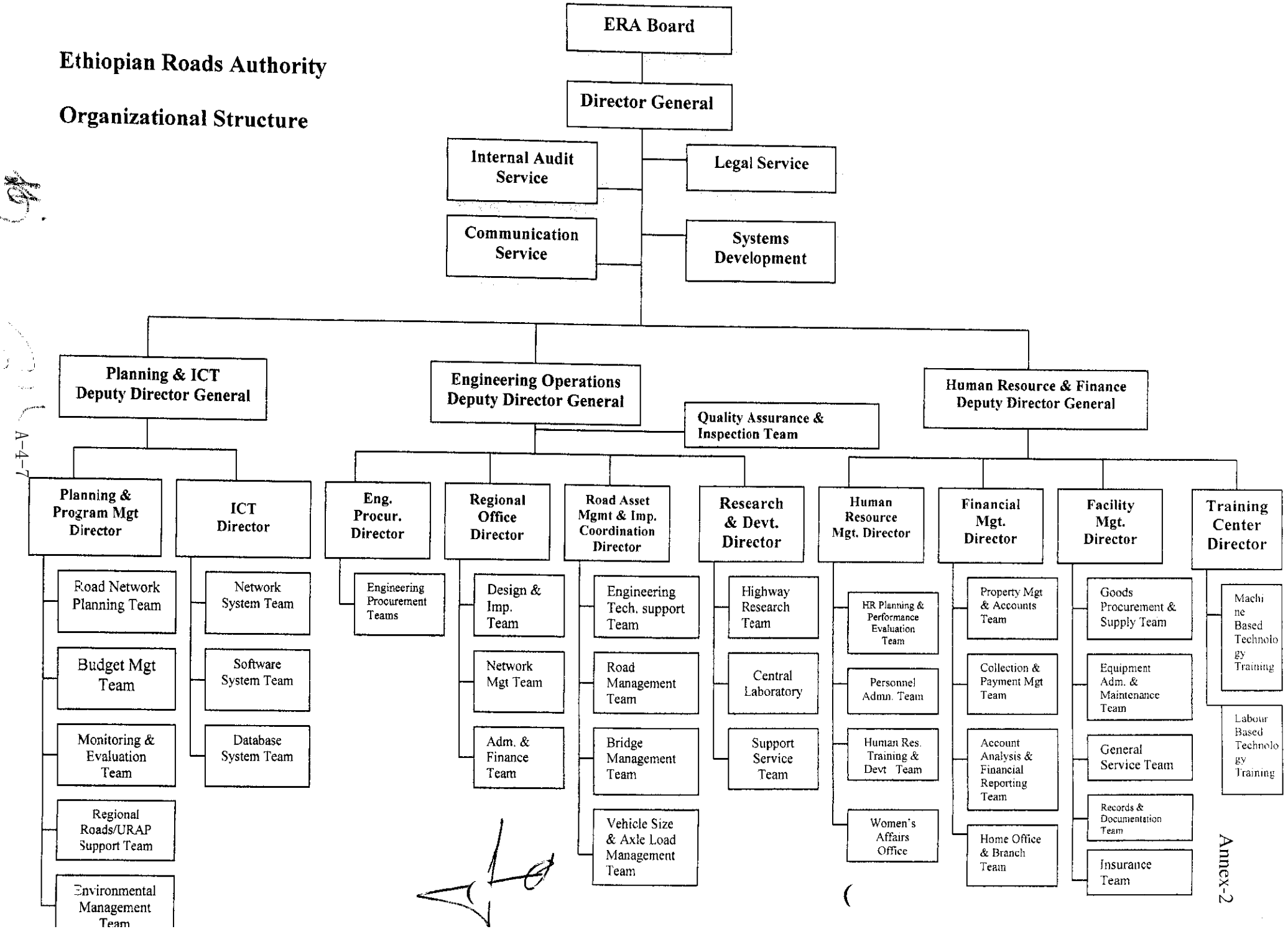
Annex-1 Project Site
Annex-2 Organization Chart (ERA)
Annex-3 Japan's Grant Aid
Annex-4 Flow Chart of Japan's Grant Aid Procedures
Annex-5 Major Undertakings to be taken by Each Government



Project Site

Ethiopian Roads Authority

Organizational Structure



A-4-7

Annex-2

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 singed 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 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.

(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)

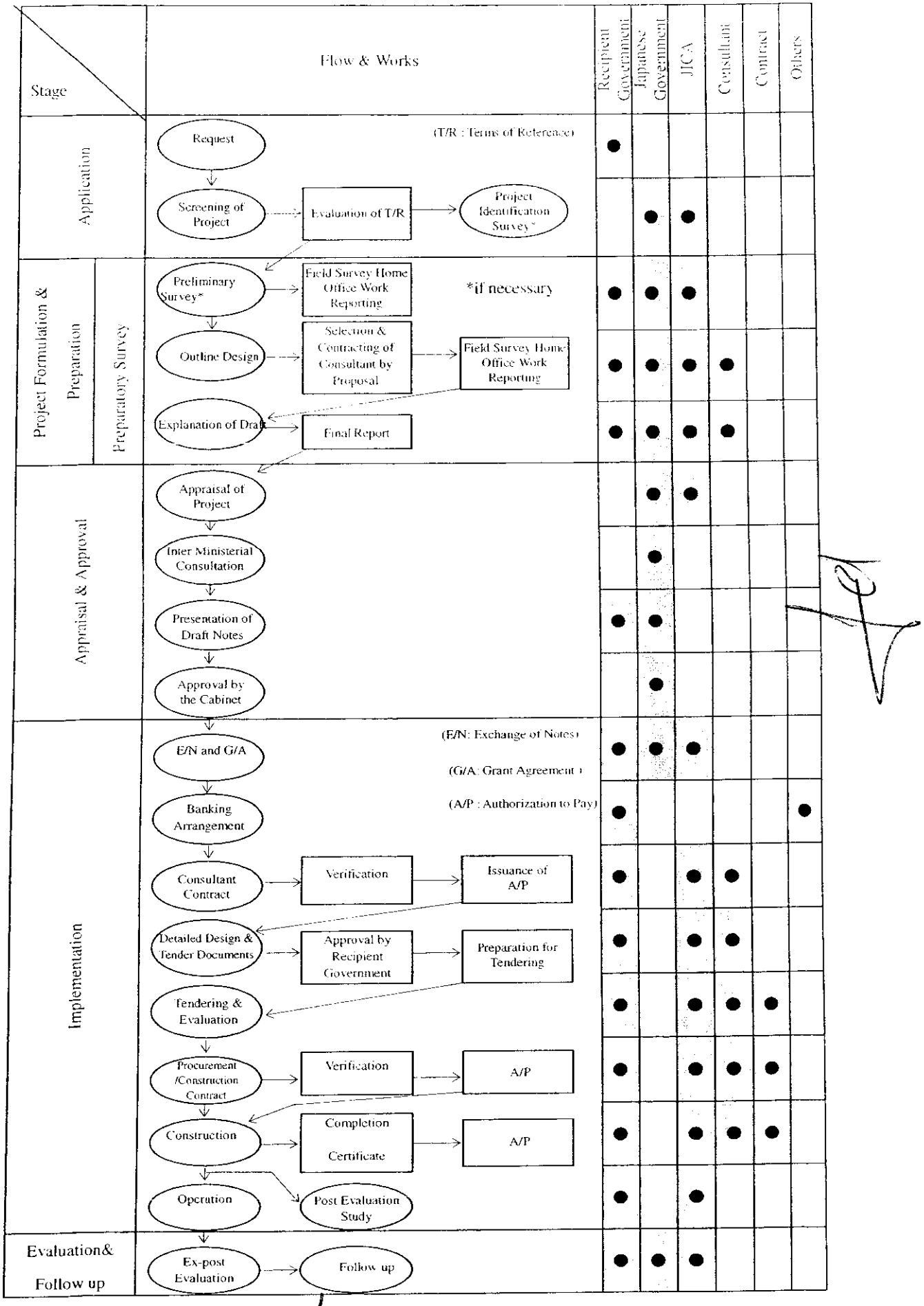
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment

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 socio-environmental guidelines.

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 lots of land necessary for the implementation of the Project and to clear the sites;		●
2	To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country		
	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		●
8	To give due environmental and social consideration in the implementation of the Project.		●

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

4.2 For Explanation of Draft Final Report (2011.3.16)

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR REHABILITATION OF TRUNK ROAD, PHASE IV
IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
(Explanation on Draft Final Report)

In July 2010 and September 2010, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team on the Project for Rehabilitation of Trunk Road, Phase IV to the Federal Democratic Republic of Ethiopia (hereinafter referred to as "Ethiopia"), and through discussions, field surveys and technical examination of the results in Japan, JICA prepared a Draft Final Report of the study.

In order to explain the Draft Final Report and to consult with the concerned officials of the Government of Ethiopia on its contents, JICA sent to Ethiopia the Preparatory Survey Team (hereinafter referred to as "the Team"). The Team is headed by Mr. Makoto Shinkawa, Senior Representative, JICA Ethiopia Office and is scheduled to stay from March 5 to March 17, 2011.

As a result of the discussions, both sides confirmed the main items described in the attached sheets.

Addis Ababa, March 16, 2011

Makoto Shinkawa
Senior Representative
JICA Ethiopia Office
Japan International Cooperation Agency
Japan

Zaid Wolde Gabriel
Director General
Ethiopian Roads Authority
Federal Democratic Republic of Ethiopia

Witnessed by

Tilahun Tadesse
Director, Bilateral Cooperation Directorate
Ministry of Finance and Economic Development
Federal Democratic Republic of Ethiopia

ATTACHMENT

1. After the explanation of the contents of Draft Final Report by the Team, the Ethiopian side agreed in principle to the project contents.

2. Cost Estimation

Both sides agreed that the Project Cost Estimation as attached in Annex-1 should never be duplicated or disclosed to any third parties before the signing of all the contract(s) with contractor(s) for the Project.

3. Japan's Grant Aid Scheme

The Ethiopian side understood the Japan's Grant Aid scheme and the necessary measures to be taken by the recipient country as explained by the Team and described in Annex-3, Annex-4 and Annex-5 of the Minutes of Discussions signed on September 16, 2010.

4. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Ethiopian side around July, 2011.

5. Environmental and Social Considerations

5-1. The Ethiopian side agreed to complete the EIA certification process for the newly proposed route in the Draft Final Report and inform the result to JICA Ethiopia office by the end of May, 2011.

5-2. Both sides agreed the contents of the Environmental Checklist as shown in Annex-2.

5-3. The Ethiopian side agreed that the monitoring for Environmental and Social considerations should be conducted by Ethiopian Roads Authority (hereinafter referred to as "ERA") in accordance with the Monitoring Plan for the Project described in the Preparatory Survey Report and EIA report. The results of the monitoring will be provided to JICA Ethiopia office by filling the Monitoring Form attached as Annex-3, bimonthly in the pre- construction phase and monthly in construction phase.

5-4. The Ethiopian side agreed that JICA will disclose the results of the monitoring conducted by ERA on JICA's website and report the results of the monitoring to the Advisory Committee for Environmental and Social Considerations established by JICA on a periodic basis.

6. Other Relevant Issues

6-1. The Project shall be divided into the two phases, that is, Phase 1 of the section between Dejen and Lumame and Phase 2 of the section between Lumame and Debre Markos.

6-2. The Ethiopian side promised to ensure necessary budget for land acquisition and facility relocation for the Project Affected Persons (PAPs) as soon as possible, and to take necessary measures for PAPs, relocate facilities and secure the land by the end of September 2011 for the Phase 1 section upon receiving the relocation information such as station, distance from the center line and type of building, by the end of March from the Japanese side, and by the end of April 2013 for the Phase 2 section.

6-3. The Ethiopian side promised to complete the relocation/resettlement work from the Project site before the contractor mobilization.

6-4. The Ethiopian side agreed the countermeasure and design against Black Cotton Soil proposed for the Project, which was carefully determined based upon ERA manual, knowledge available in Ethiopia, and related design criteria in Ethiopia and other countries. The Japanese side explained that the appropriate specification would be set in the Detailed Design for enhancing the reliability of the countermeasure, however, the Ethiopian side also agreed, in view of introducing this countermeasure in Ethiopia for the first time, that the Japanese side including the Japanese consultant and contractor involved in the Project in the future to be exempted from responsibilities for the future defects that may occur by applying the countermeasure except for improper construction work.

6-5. The Team expressed concern over the delay in custom clearance and tax exemption which would negatively affect the successful completion of the Project within the expected schedule. The Ethiopian side understood the concern and promised to take necessary arrangement for prompt custom clearance with custom duties exemption for import materials and equipment, and timely refunding for VAT for the local purchase of products and services.

6-6. The Ethiopian side shall bear the banking commissions as a condition for the Japan's Grant Aid to be implemented, and secure the sufficient budget to cover the following cost.
1) The commissions for the banking services based upon Banking Arrangement (B/A)
2) The advising commission of the Authorization to Pay (A/P)

6-7. The Ethiopian side shall secure enough budget and personnel necessary for the operation and maintenance of the road and the facilities constructed by the Project.

6-8. The Ethiopian side raised a concern on estimated cost of the project which is higher compared with other similar roads in the country. The Japanese side explained that the project needs countermeasure on Black Cotton Soil and huge volume of earthwork for embankment to be treated under this Project, and also explain to review the project cost during Detailed Design stage.

Annex-1 Project Cost Estimation
Annex-2 Environmental Checklist
Annex-3 Monitoring Form

<Confidential>

Project cost to be borne by Japan's Grant Aid

(1) Cost to be borne by Japanese side

Phase	Items			Cost (Hundred Million JPY)
Phase I	Construction Facilities	Road	Earthwork, Pavement work and other related works	
		Structure	Bridge, Culvert works	
		Ancillary work	Drainage, Traffic Safety facilities, Other related works	
		Subtotal		
	Detailed Design and Construction Supervision			
	Total			
Phase II	Construction Facilities	Road	Earthwork, Pavement work and other related works	
		Structure	Bridge, Culvert works	
		Ancillary work	Drainage, Traffic Safety facilities, Other related works	
		Subtotal		
	Detailed Design and Construction Supervision			
	Total			

Note: The cost estimates in the above table are provisional and will be further examined by the Government of Japan for the approval of the Grant.

(2) Cost to be borne by Ethioplan side

Phase	Items	Cost (Million ETB)
Phase I	Cost of Environment Consideration	
	Relocation cost of public utilities including telephone and electric poles	
	Leveling of Temporary yards	
	Refund of VAT / Import Tax	
	Total	
Phase II	Cost of Environment Consideration	
	Relocation cost of public utilities including telephone and electric poles	
	Leveling of Temporary yards	
	Refund of VAT / Import Tax	
	Total	

Note: ETB = Ethiopian Birr

(3) Estimation Conditions

The conditions at the point of estimation in November 2010 are as follows.

1) Exchange rate: USD1.0 = JPY87.11, ETB1.0=JPY5.9559

2) Implementation period: The Project intends to be executed approximately 37 months for Phase-I and 32 months for Phase-II being set aside for the detailed design, tender assistance and construction work as shown in the implementation schedule.

3) Other: The Project will be implemented in accordance with the grant aid scheme of the Government of Japan.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
1 Permits and Explanation	(1) EIA and Environmental Permits	① Have EIA reports been officially completed? ② Have EIA reports been approved by authorities of the host country's government? ③ Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? ④ In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	A1: Yes. ERA will prepare a supplementary EIA report with a current draft EIA report based on the output from the JICA Survey Team and issue the Environmental Compliance Certificate by May, 2011. A2: No, not yet. Environmental Compliance Certificate will be issued by ERA as authorized entity because predicted impacts are not serious. A3: No information at the moment A4: No information at the moment
	(2) Explanation to the Public	① Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? ② Are proper responses made to comments from the public and regulatory authorities?	A1:Stakeholder meetings (SHMs) were convened in accordance with the EIA process. And participated stakeholders agreed with a plan. Exchange information and discussions between ERA and Debre Markos Town Administration should be monitored for smooth implementation of a series of resettlement activities. A2:, SHMs were held for inhabitants along the target road and for local authorities respectively, most opinions were about receiving fair compensation, minimizing land acquisition, ensuring adequate land allocation and livelihood restoration. These minutes of meetings were compiled in RAP report.
2 Mitigation Measures	(1) Air Quality	① Is there a possibility that air pollutants emitted from various sources, such as vehicle traffic will affect ambient air quality? Does ambient air quality comply with the country's ambient air quality standards? ② Where industrial areas already exist near the route, is there a possibility that the project will make air pollution worse?	A1: Ethiopia does not have any criteria for air pollution. In addition, air pollution level will be in the same range of existing road because traffic volume increase with this project is not assumed. A2: Industrial area is not located along the project area.
	(2) Water Quality	① 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? ② Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater? ③ Do effluents from various facilities, such as stations and 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 that do not comply with the country's ambient water quality standards?	A1: Outflow of soil will be minimized by construction work in dry season and slope protection. A2: Road surface water in residential area should be properly treated by drainage facilities such as side ditch. It is therefore any pollution by road surface water is not assumed. A3: Parking stations and service stations are not planned. Hence water pollution by these facilities is not supposed.
	(3) Noise and Vibration	① Do noise and vibrations from vehicle and train traffic comply with the country's standards?	A1: Ethiopia does not have any criteria for noise level and vibration level. In addition, noise level and vibration level will be in the same range of existing road because traffic volume increase with this project is not assumed.
3 Natural Environment	(1) Protected Areas	① 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?	A1: No, there are not any conservation areas in the project area.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
3 Natural Environment	(2) Ecosystem	① Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? ② Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? ③ If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? ④ Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? ⑤ Is there a possibility that installation of 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? ⑥ In cases where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	A1: There are not any precious natural areas in the site. A2: There are not any designated and protected habitats for considerable species. A3: This project is basically road rehabilitation, not new road construction. Most construction sites are categorized agricultural areas, thus the project does not give adverse impacts on this item. A4: Most construction sites are categorized agricultural areas, and there are not any areas such as migration corridors and habitats of considerable species. Livestock can move along the road same as the present situation. And also they can across the road, because gentle slope (1:2 or more) is adopted. A5: This is not basically a new road construction project, thus the project does not give adverse impacts on this item. Cutting of forest is minimized and limited to plantation. A6: This is not basically a new road construction project. Most construction sites are categorized agricultural areas, thus the project does not give adverse impacts on this item.
	(3) Hydrology	① Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	A1: This project is basically road rehabilitation, not new road construction. Tunnels are not planned. Road facilities such as bridges and culverts are designed at same lication and proper size. Therefore, there are not likely to be serious impacts to underground water and hydrological situation.
	(4) Topography and Geology	① Is there a soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? ② 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? ③ 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?	A1,A2: There are not any landslide areas in the site. Slope is secured 1:2 or more, and protection work such as planting trees and installation of berm in embankment will be adopted as required. A3: Soil errosion will be minimized because earth work in dry season, mitigation measures for borrow pits and slope protection are adopted.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(1) Resettlement	① Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? ② Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? ③ Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? ④ Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? ⑤ Are agreements with the affected persons obtained prior to resettlement? ⑥ Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? ⑦ Is a plan developed to monitor the impacts of resettlement?	A1: Some new alignments and COI (Corridor of Impact) concept were recommended by JICA Survey Team, and if this concept is adopted, the number of affected houses will reduce from 159 to 41. A2: SHMs were held in EIA and RAP process (Scoping phase: 3rd, 4th Nov. 2009). A3: Compensation for affected properties shall be carried out with replacement costs out of consideration of depreciation in RAP. A4: SHMs were held for inhabitants along the target road and for local authorities respectively. These minutes of meetings were compiled in RAP report. A5: A series of SHMs were conducted on the EIA process and formulated on basic consensus from participated stakeholders and local authorities. As for the resetting of cutoff date, exchange information and discussions between ERA and Debre Markos Town Administration will be conducted. A6: ERA will secure a required budget for a series of Land Acquisition and Resettlement Action Plan. Relevant bodies such as ROW Branch of ERA, Administration, Municipality and Agriculture Bureau will revise existing RAP based on implementation of Detailed Measurement Survey (DMS) and Replacement Cost Survey (RCS). The ROW Branch with the above mentioned members will create contracts with the owners and obtain the required land. According to an on-going road project which was finded by the African Development Bank, DMS and RCS was already carried out, and basic consensus was formulated with stakeholders for a smooth project implementation. ERA has sufficient capacity and budget secured to implement of land acquisition and resettlement. A7: Monitoring plan was prepared in current EIA report.
	(2) Living and Livelihood	① Where roads or railways 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? ② Is there a possibility that the project will adversely affect the living conditions of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary? ③ Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? ④ Is there a possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increases in traffic congestion and traffic accidents)? ⑤ Is there a possibility that roads and railways will cause impede the movement of inhabitants? ⑥ Is there a possibility that structures associated with roads (such as bridges) will cause a sun shading and radio interference?	A1: This is not basically a new road construction project. Therefore the project does not give adverse impacts to existing transportation system and the associated workers. A2: No, there is not. A3: Distribution of infectious diseases such as STDs is predicted during construction. Thus educational activities and medical checks are planned for construction workers and inhabitants during construction. A4: This project does not raise any adverse impacts to road traffic in the surrounding area. A5: No, there are no serious impacts because large scale structures such as flyover are not planned. Traffic safety will be secured due to alignment improvement, widening of the road and setting up walkways in the residential area. A6: No, there are no serious impacts because large scale structures such as flyover are not planned.
	(3) Heritage	① Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	A1: No, there are not any precious cultural heritages in the site. Some religious facilities are identified along the road, but these are considered in alignment plan and avoided basically.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(4) Landscape	① Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	A1: No, there are not any considerable landscapes in the site.
	(5) Ethnic Minorities and Indigenous Peoples	① Where ethnic minorities and indigenous peoples are living in the rights-of-way, are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples? ② Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples?	A1 ,A2: No ethnic minorities or indigenous peoples are living in the ROW, thus the project does not give adverse impacts on this item.
5 Others	(1) Impacts during Construction	① Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? ② If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? ③ If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? ④ If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	A1: Mitigation measures for public pollution were planned in environmental management and monitoring plan in current draft EIA report. Generally, in residential area, construction works are carried out in the day time and water is splinked for earth works. A2: Most construction sites are categorized agricultural areas, and cutting of forest is minimized and limited to plantation. Thus the project does not give adverse impacts on natural environment. A3: During construction, temporary facilities and sites such as base camp, borrow pits and detours will cause some impact. Appropriate mitigation measures will be conducted. A4: Environmental education such as accident and health care for workers were planned in environmental management and monitoring plan in current draft EIA report.
	(2) Monitoring	① Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? ② Are the items, methods and frequencies included in the monitoring program judged to be appropriate? ③ Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? ④ Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	A1: In principle, monitoring of noise level and dust level should be carried out. A2: Monitoring items and methodology were adequately indicated in environmental management and monitoring plan in current draft EIA report. A3 ,A4: Monitoring shall be carried out by environmental specialists from the contractor and supervisor, and the results of monitoring shall be reported to ERA. This condition will be indicated in TOR for construction.

MONITORING FORM

ERA shall implement environmental monitoring based on the following monitoring form. And in construction phase, the contractor shall monitor and report following items to ERA.

1. Pre-construction phase (Bimonthly)

(1) EIA Approval, Land Acquisition and Resettlement Process

	Monitoring Item	Responsibility	Methods	Monitoring period	Results (Progress*)
1	Issue of Environmental Compliance Certificate, and conditionality. Its countermeasures and their implementation by ERA	ERA	- Preparation of a supplemental EIA report with current draft EIA report based on the output from JICA Survey Team, and issue a Environmental Compliance Certificate	After Preparatory Survey (By May 2011)	
2	Update of Resettlement Action Plan (RAP)	ERA	- Implementation of additional inventory of property loss and population census in re-alignment section, declaration of cut-off date and holding of stakeholder meetings	After Preparatory Survey (Immediately)	
3	Implementation of Land Acquisition and Resettlement	ERA	- Implementation of Detailed Measurement Survey and Replacement Cost Survey - Land Acquisition after implementation of negotiation, contract and compensation	Before Construction phase	
4	Monitoring after Resettlement	ERA	- Interview to involved resident and stakeholders	Before Construction phase	
5	Relocation of public utilities such as power poles, and complaints by local people	ERA	- Interview to involved resident and stakeholders	Before Construction phase	

* Interview to Environmental and Resettlement sections

2. Construction phase (Monthly)

(1) Soil Erosion, Water Pollution

	Monitoring Item	Methods	Places	Standards	Monitoring period	Results (Situation)
1	Confirmation of Embankment stabilization (Outflow of soil)	visual observation	Embankment slope and cut slope	Good / Bad	Once/ After completion	
2	Implementation of mitigation measures at borrow pits and quarry sites	visual observation	Borrow pits and quarry sites	Good / Bad	Once/ After use	

(2) Sanitation, Infectious diseases such as HIV/AIDS

	Monitoring Item	Methods	Places	Standards	Monitoring period	Results (Situation)
1	Health check of construction workers	Interview in regard to morbidity*	Local medical office	Good / Bad	Quarterly	

* Comparison with the Pre-construction condition (If necessary)

(3) Accident

	Monitoring Item	Methods	Places	Standards	Monitoring period	Results (Situation)
1	Occurrence situation of traffic accidents	Interview in regard to traffic accidents*	Police station	Occurred / Not	Monthly	

* Comparison with the Pre-construction condition (If necessary)

(4) Air Pollution (Dust)

	Monitoring Item	Methods	Places	Standards	Monitoring period	Results (Situation)
1	Confirmation of watering	visual observation*	Residential area	Implemented/ Not	Monthly	

* Interview to inhabitants (If necessary)

(5) Noise and Vibration

	Monitoring Item	Methods	Places	Standards	Monitoring period	Results (Situation)
1	Confirmation of working time (Limited work time during the daytime)	visual observation*	Residential area	Limited / Not	Monthly	

* Interview to inhabitants (If necessary)