KYRGYZ REPUBLIC
MINISTRY OF TRANSPORT AND COMMUNICATIONS (MOTC)

PREPARATORY SURVEY OF THE PROJECT FOR AVALANCHE PROTECTION ON BISHKEK-OSH ROAD IN THE KYRGYZ REPUBLIC

FINAL REPORT

MARCH 2015

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CTI ENGINEERING INTERNATIONAL CO., LTD
KOKUSAI KOGYO CO., LTD

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PREFACE

In response to the request of the Government of Kyrgyz Republic, Japan International Cooperation Agency (JICA) has decided to conduct the Preparatory Survey of the Project for Avalanche Protection on Bishkek-Osh Road in the Kyrgyz Republic and entrusted the survey to CTI Engineering International Co., Ltd. in joint venture with Kokusai Kogyo Co., Ltd.

The JICA Survey Team held a series of discussions with the officials concerned in the Government of Kyrgyz Republic and conducted field investigations to confirm the validity of the Project for Japan's Grant Aid. Based on the results of the discussions and field investigations, along with further studies in Japan, the Survey Team has finalized this report.

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 in the Government of Kyrgyz Republic for their close cooperation with the Survey Team.

March, 2015

Akira NAKAMURA
Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

SUMMARY

1. BACKGROUND OF THE PROJECT

The road network in the Kyrgyz Republic (hereinafter referred to as “Kyrgyz”) has been assuming the vital role on trade and passenger transport with the neighboring countries as the major economic infrastructure of Kyrgyz.

Bishkek-Osh Road (hereinafter, the “BO Road"), with 672 km in total length, is the most important road in Kyrgyz. However, it passes through precipitous mountains and it is very susceptible to disaster triggered by avalanche and snow drift.

It has been reported that there are about 70 of such hazardous locations affected by avalanche along the BO Road where DEP has been obliged to engage in the removal of debris to keep the smooth flow of traffic. Although most of the hazardous locations where small scale avalanche occurs can be opened to traffic within a few hours, the project site at STA. 246km of the BO Road is at high risk to massive avalanche because it is located on conical slope topography.

A large scale avalanche occurred in 2012, killing 10 people and blocking the road to all traffic for one week. For about one month later, traffic was allowed but only for a limited time of the day. Other than the above, large avalanches have been affecting transportation in the project site every year. In consideration of this situation, measures against avalanche to ensure traffic safety and road stability during the winter season are deemed to be urgent.

The Government of Kyrgyz (GOK) had set the road sector as one of the priority areas in its middle and long-term plans (2013-2017) and has started to focus on ensuring access to the surrounding area and domestic markets. In accordance with this policy, the GOK has designated this avalanche protection project as an emergency project of highest priority and requested the Government of Japan (GOJ) to extend Japanese Grant Aid for “The Project for Avalanche Protection on Bishkek-Osh Road in Kyrgyz Republic” (hereinafter called “the Project”). Since Japan has defined the “correction of regional disparities and transportation infrastructure maintenance” as one of the priority areas for the Kyrgyz Country Assistance Policy and continued support to the road sector, the request from the GOK satisfies the policy of the GOJ.

This Project is aimed at ensuring traffic safety during winter season by the construction of a Snow Shed at STA. 246km of the BO Road, and consequently contributing to the enhancement of accessibility in Kyrgyz and/or accessibility to its neighboring countries.

2. CONTENTS OF THE SURVEY

For this Preparatory Survey, two (2) site investigation surveys were conducted in Kyrgyz. One of them was conducted in the snow season (from March to April, 2014) and the other in the non-snow season (from June to July, 2014). During these periods, the JICA Survey Team made consultations with the officials concerned in the GOK about the required type of Snow Shed, road alignment,

vertical alignment, cross section, pavement structure, environmental and social considerations, natural conditions, traffic, supply of construction materials and equipment procurement, operation and management and so on.

The outline design of road alignment (including approach road), snow shed design, construction plan and initial cost estimation was subsequently conducted in Japan based on the survey results at the site. The GOJ including the JICA Survey Team held consultation meetings and reached an agreement on the outline design and the obligations of the GOK from the 7th to the 13th day of December 2014.

The Arch-Culvert Type of Snow Shed with cast-in-place concrete is to be applied for the Project. The Snow Shed is to be developed by shifting the road alignment for about 30 meters from the roadside toward the mountain side and the excavation later refilled with earth. Thus, impulsive load by large scale avalanche could be avoided and safety on the BO Road during the winter season would be secured. The Snow Shed of 350 meters in length is appropriate, according to the results of hearing survey and numerical avalanche simulation. However, 460 meters has to be applied to avoid the influence of avalanche at another hazardous location which is about 110 meters in length adjacent to the objective site. The finally proposed plan is as summarized in the following table.

Table 1 Scope of the Japanese Grant Aid Project

Item		Specifications
Location		STA. 246km of Bishkek-Osh Road
Road Width	Inside the Snow Shed	Roadway: 7.0m (3.5m*2) Roadside: 1.0m (0.5m*2) Sidewalk: 1.5m (0.75m*2) Total: 9.5m
	Approach Road	Roadway: 7.0m (3.5m*2) Roadside: 1.0m (0.5m*2) Sidewalk: 4.0m (2.0m*2) Total: 12.0m
Structure Type		Arch-Culvert Type
Project Length		Snow Shed: 460m Connecting Road (Bishkek side): 190m Connecting Road (Toktogul side): 360m Total: About 1,010m
Pavement		Inside the Snow Shed: Concrete Pavement (t=18cm) Approach Road: Asphalt Pavement (Surface Course: t=6cm, Base Course: t=8cm, Upper Sub-base: t=20cm, Lower Sub-base: t=25cm)
Lighting		Inside the Snow Shed and at both portals
Others		Gravity Retaining Wall (L=208m); Leaning Type Revetment Works (L=73m); Prevention Fence for Falling Stones (L=155m); Drainage (about 3,500m); Maintenance Road (L=1,146m); U-turn Space (2,632m^2)
Applicable Criteria		The Design Standard of the Kyrgyz Republic

3. PROJECT EVALUATION

(1) Relevance

Implementation of the Project under Japanese Grant Aid has been determined to be valid for the following reasons.

- As described above, the BO Road is the most important road in the road network of Kyrgyz because it is the main arterial road and the only route connecting to the capital city of Bishkek and the second largest city of Osh. Therefore, it is expected that the Project will benefit a considerable number of the people in Kyrgyz and the neighboring countries as the international arterial road, and will also contribute to the stabilization and speedup of goods transportation.
- The effect of the Project is the improvement of transportation network including the BO Road as international road, stabilization and facilitation of road traffic in winter season, and revitalization of society and economy. These would consequently contribute to the improvement of people's living condition that is serious issue in Kyrgyz.
- Operation and management after the Project can be implemented by the GOK under its own budget and staff without very advanced skill and technology.
- Negative environmental impacts of the Project are small.
- The Project could be implemented without difficulty under Japan's Grant Aid.
- There is a strong necessity for the Project to utilize Japanese technology in design and construction since Kyrgyz has no experience in constructing a Snow Shed using special construction methods.

(2) Quantitative Effects

The expected quantitative effects of the Project are the reduction of impassable days due to avalanche at STA. 246km of the BO Road, the increase of traffic volume in winter season, and the reduction of maintenance cost (snow removal cost) at the occurrence of avalanche.

Table 2 Achievement Indicators of the Project

Indicators	Reference Value (Actual Value in 2012)	Target Value (2021) (After 3 years in Service)
Impassable days by avalanche at the 246km point of Bishkek-Osh Road (day/year)	7	0
Average daily traffic in winter season (Dec-Mar) between Bishkek and Toktogul (vehicle/day of 24 hours)	About 1,650	2,000※
Maintenance cost for snow removal at the 246km section of Bishkek-Osh Road when avalanche occurs (million KGS)	2.3	0

※ Daily traffic in winter season based on the first survey is 2,058 vehicles/day on weekdays, 2,234 vehicles/day on holidays, and 2,108 vehicles on average. Although snowmelt was observed, the volume of snow was not much at the time of survey. Therefore, the difference of 3,000 vehicles

between the volume in summer season and that in winter season is presumed to be due to the decline of social and economic activities in the whole region in winter season. The average daily traffic from December to March decreased further to 1,600 vehicles and the reason is presumed to be the condition of the road surface which was not as good as the condition during the first survey. Therefore, the target value at the 246km point should be set to between 1,600 and 2,108 vehicles/day, because the risk of road surface freezing, etc., remains even if the Snow Shed is constructed.

The target value is estimated as follows:

Table 3 Average Daily Traffic in Winter Season (December to March)

Season (December to March)	2011	2012	2013
The Average Daily Traffic in Winter Season	1,130	1,686	1,644

[Basis of Estimation]

- Traffic in December: 2,100 vehicles/day (based on the traffic survey result of the first survey)
- Traffic in January: 1,474 vehicles/day (assuming that traffic volume is average)
- Traffic in February: 1,623 vehicles/day (assuming that traffic volume is average)
- Traffic in March: 2,100 vehicles/day (based on the traffic survey result of the first survey)

According to the above estimation, the average daily traffic in winter season is 1,820 vehicles and this value is assumed as the volume at the time of completion of the Project, assuming further that the rate of traffic increase is 4%; i.e., 1,820 vehicles x 1.04^3 = 2,047 vehicles

From the above results, the target value of the average daily traffic in winter season is set to 2,000 vehicles/day. The increase of traffic volume in December and March, in particular, is highly expected since these periods have fewer events to disturb traffic other than the avalanche.

(3) Qualitative Effects

Expected qualitative effects of the Project are the following:

- Improvement of traffic safety at the occurrence of avalanche.
- Enhancement of access to neighboring countries and domestic markets during winter season.

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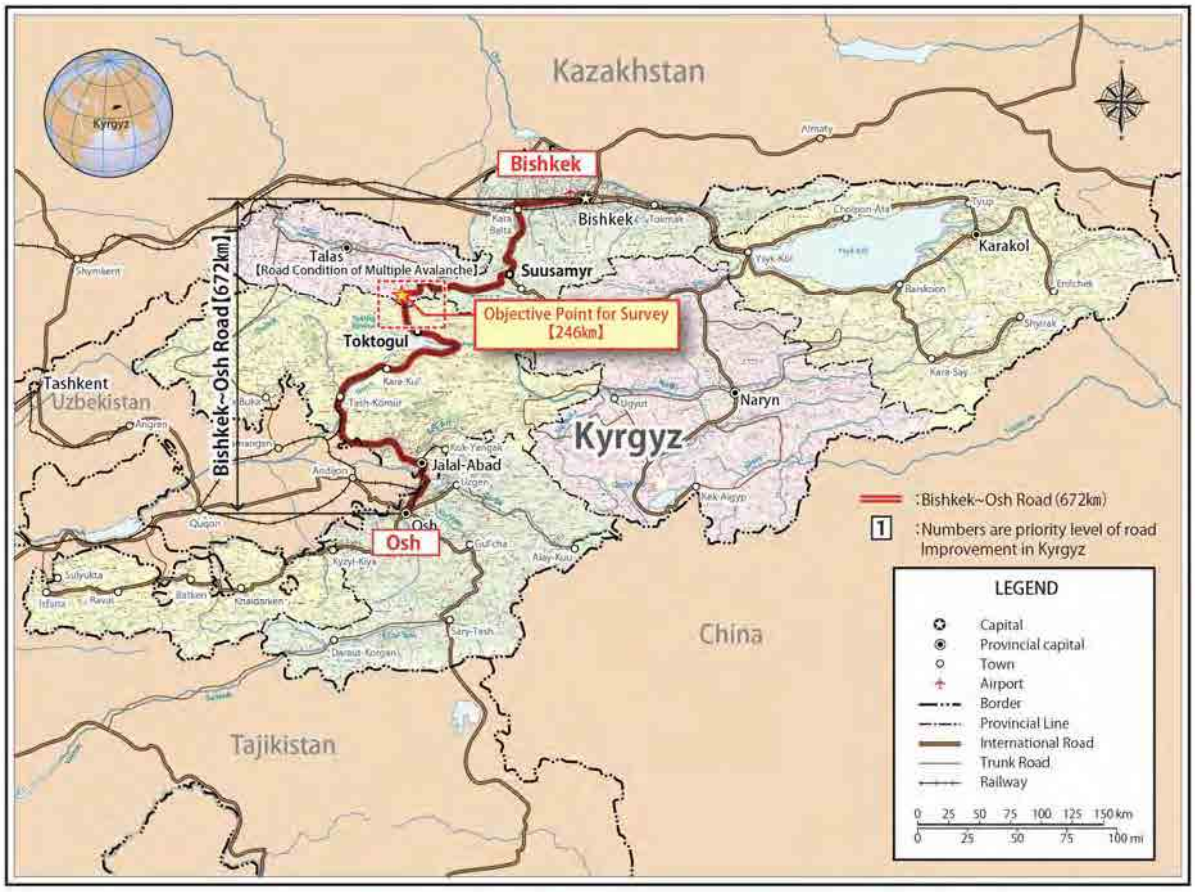
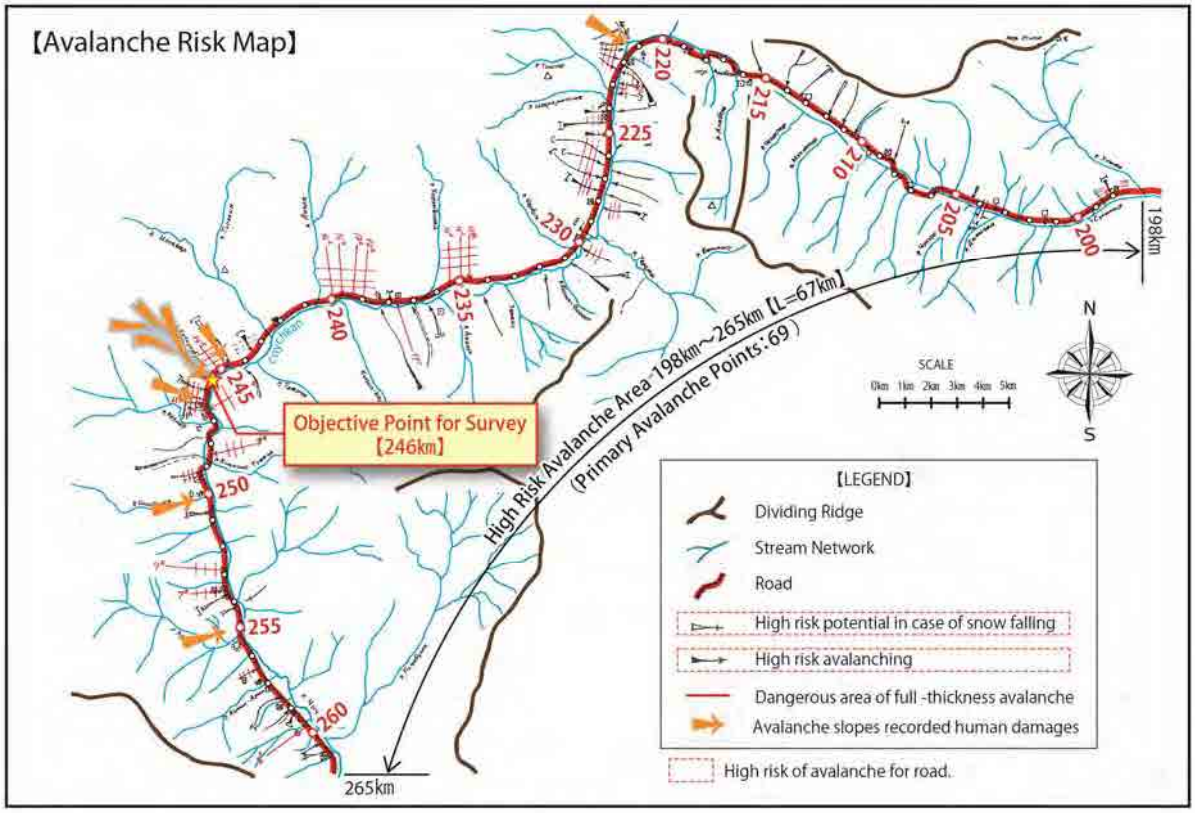
Appendices





Location Map

Perspective-1: Bird's-Eye View from Osh Side, (Summer Season)

Perspective-2: Birds-Eye View from Osh Side (Winter Season)

Perspective-3: Tunnel Portal of Bishkek Side (Winter Season)

Acronyms and Abbreviations

ADB	Asian Development Bank
BO UAD*	Bishkek-Osh Main Roads Management Unit
CAREC	Central Asian Regional Economic Cooperation
DEP*	Local Level Roads Management Unit
DI	Design Institute
EIA	Environmental Impact Assessment
E/N	Exchange of Notes
F/S	Feasibility Study
G/A	Grant Agreement
GOSSTROY*	Kyrgyz State Agency on Construction and Regional Development
IMF	International Monetary Fund
IPIG	Investment Project Implementation Group
JICA	Japan International Cooperation Agency
MES	Ministry of Emergency Situations, Kyrgyz
M/D	Minutes of Discussion
MOTC	Ministry of Transport and Communications, Kyrgyz
PLUAD*	Oblast Level Roads Management Unit
R/D	Record of Discussion
RAA	Road Administration Advisor
RAP	Resettlement Action Plan
RMD	Road Maintenance Department
RSDS	Road Sector Development Strategy
SAEPF	State Agency of Environment Protection and Forestry
SAGMR	State Agency of Geology and Mineral Resources
SAPS	Special Assistance for Project Sustainability on Bishkek-Osh Road Rehabilitation Project
SNiP*	Stroitelnye Normy i Pravila (Russian Construction Codes and Regulations)
UAD*	Main Roads Management Unit
WB	The World Bank

** Abbreviation of the Russian name*

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Chapter 1 Background of the Project

1.1 Background

The Kyrgyz Republic (hereinafter referred to as “Kyrgyz") has the road network of about 34,000 km in total length which carries about 95% of passenger traffic and more than 50% of freight traffic. The road network has been assuming the vital role for trade with neighboring countries and as community road for the people in Kyrgyz. Given that the volume of freight and passenger traffic is increasing at the rate of up to 10% per year, the role of the road network has been increasingly growing in significance.

On the other hand, the limited financial resources for maintenance, operation and development of the road network in recent years have led to significant degradation, wear and tear of the road infrastructure. In addition, excessive maintenance cost due to snow-removal during winter season and roadside disasters in the mountainous area where a large part of the road is situated has hampered development of the road network.

Bishkek-Osh Road (hereinafter referred to as the “BO Road"), which has 672 km in total length and the subject road of the Project, is the most important road in Kyrgyz. However, it passes through precipitous mountains and it is very susceptible to disaster triggered by avalanche and snow drift. It has been reported that there are about 70 hazardous locations where small scale avalanches have occurred along the BO Road, where DEP has been obliged to engage in the removal of debris to keep the smooth flow of traffic. Although most of these hazardous locations affected by small scale avalanche are opened to traffic within a few hours after avalanche, the project site at STA. 246km of the BO Road is at high risk to massive avalanche because it is located on conical slope topography.

A large scale avalanche occurred in 2012, killing 10 people and blocking the road to all traffic for one week. Traffic was allowed about one month later, but for only a limited time of the day. Other than the above, large avalanches have been affecting transportation at the project site on the BO Road every year. In consideration of this situation, measures against avalanche to ensure traffic safety and stability during winter season have been deemed as an urgent issue.

The Government of Kyrgyz (GOK) had set the road sector as one of the priority areas in its middle and long-term plans (2013-2017) and started to focus on ensuring access to the surrounding areas and domestic markets. In accordance with this policy, Kyrgyz has designated this avalanche protection project as an emergency project of highest priority.

In this regard, the GOK had requested the Government of Japan (GOJ) to extend Grant Aid for “The Project for the Avalanche Protection on Bishkek-Osh Road in Kyrgyz Republic” (hereinafter call “the Project”) in July 2012. Incidentally, Japan has defined the “correction of regional disparities and transportation infrastructure maintenance” as one of the priority areas for the Kyrgyz Country Assistance Policy, and continued support to the road sector. Therefore, the request from Kyrgyz satisfies the policy of Japan.

The GOJ had entrusted the study to examine the Project's validity to the Japan International Cooperation Agency (JICA), the official agency implementing Japan's ODA to expedite the proper execution of Japanese Grant Aid. Hence, JICA decided to conduct the Preparatory Survey and dispatched a Survey Team to Kyrgyz. The site survey in Kyrgyz was conducted twice; i.e., one in the snow season (March to April, 2014) and the other in the non-snow season (June to July, 2014), and the scale and validity of the Project was studied.

Japan's Grant Aid is assumed to be applicable for the Project. The technical and economic viability of the Project, optimal project contents and scope, outline design and project cost estimate have been studied in this Survey, and the Project contents to be undertaken by the Kyrgyz side, implementation plan and considerations for operation and maintenance have been proposed. As the result of this survey, the necessity and validity of Snow Shed construction at STA. 246km of the BO Road has been clarified.

1.2 Natural Conditions

1.2.1 Meteorology

The following figure indicates the results of the hearing survey and the analysis of observation data of the It-Agal Avalanche Observation Station located near the objective site.

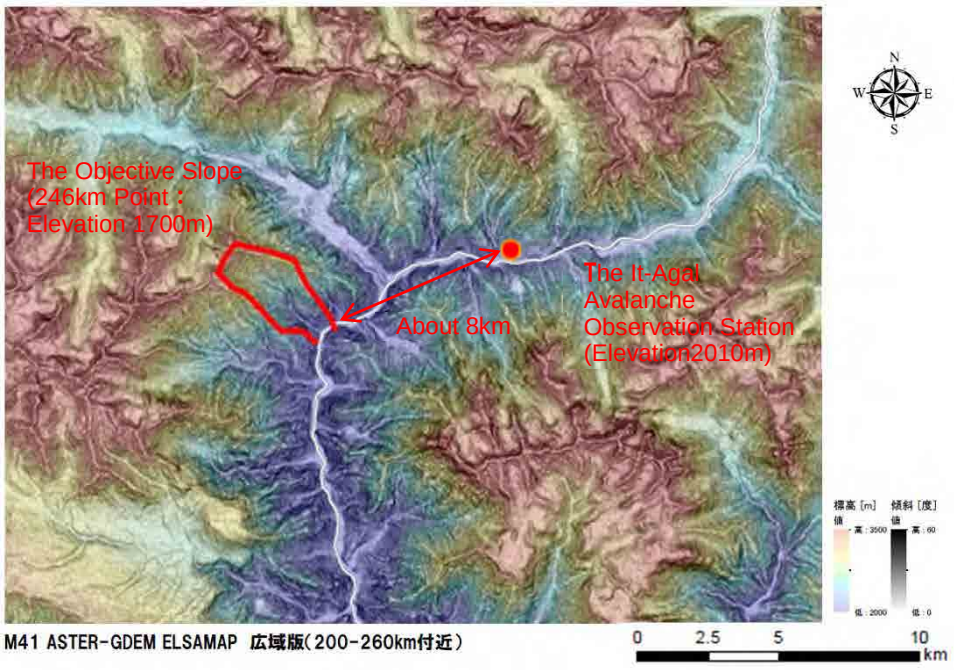


Figure 1.2.1-1 Observation Points for Meteorology

1.2.1.1 Temperature

The trend of average monthly temperature (average from 1966 to 2010) in a year is shown in Figure 1.2.1-2 and summarized as follows:

- January is the coldest month of the year. The average temperature in January is minus 10.4 degrees Celsius.

- The average temperature in December and January is minus 10 degrees, more or less, and terribly cold.
- The average temperature from November to March is minus 5.7 degrees.
- The average yearly temperature is 4.4 degrees.
- The lowest temperature ever recorded in Kyrgyz is minus 19.9 degrees in January and the highest temperature is 37.2 degrees in July.

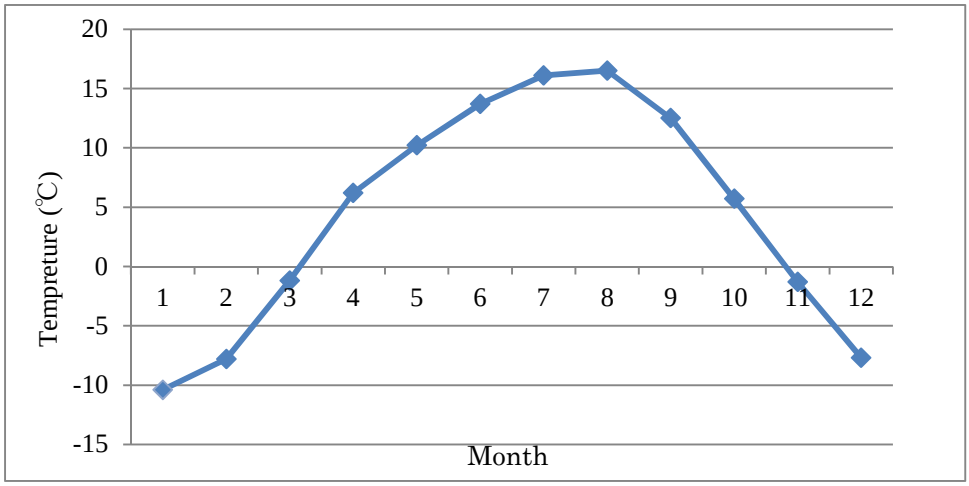


Figure 1.2.1-2 One Year Trend of Average Monthly Temperature
(It-Agal Avalanche Observation Station, 1966-2010)

1.2.1.2 Precipitation

The trend of average monthly precipitation (average from 1966 to 2010) in a year is shown in Figure 1.2.1-3 and summarized, as follows:

- Annual precipitation is 629mm.
- Highest monthly precipitation in a year is 94mm in May and the lowest is 36mm in September.
- Monthly precipitation is low in winter season, from November to April.
- Highest precipitation is 11mm in March and 32mm from May to October.
- Daily precipitation of more than 10mm is rare and only three or four days in winter have such amount of precipitation.

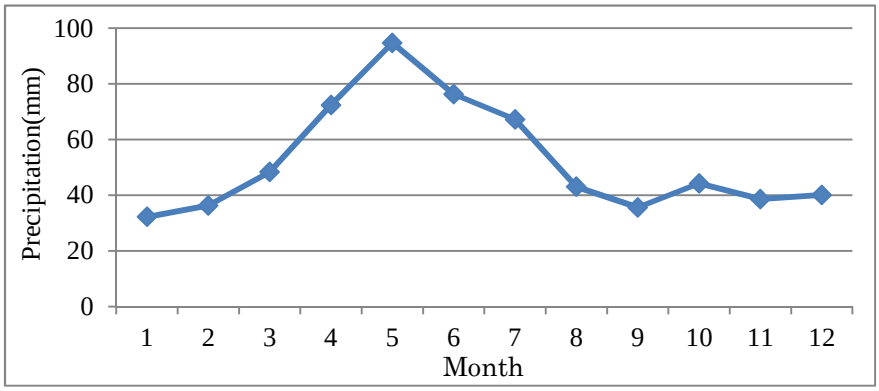


Figure 1.2.1-3 One Year Trend of Average Monthly Precipitation
(It-Agal Avalanche Observation Station, 1966-2010)

1.2.1.3 Wind Velocity

The trend of average monthly wind velocity (average from 1966 to 2010) in a year is shown in Figure 1.2.1-4 and summarized as follows:

- Average monthly wind velocity in winter season is 0.2 to 0.3m/s.
- Drift is hardly generated.
- Maximum instantaneous wind velocity is 11m/s

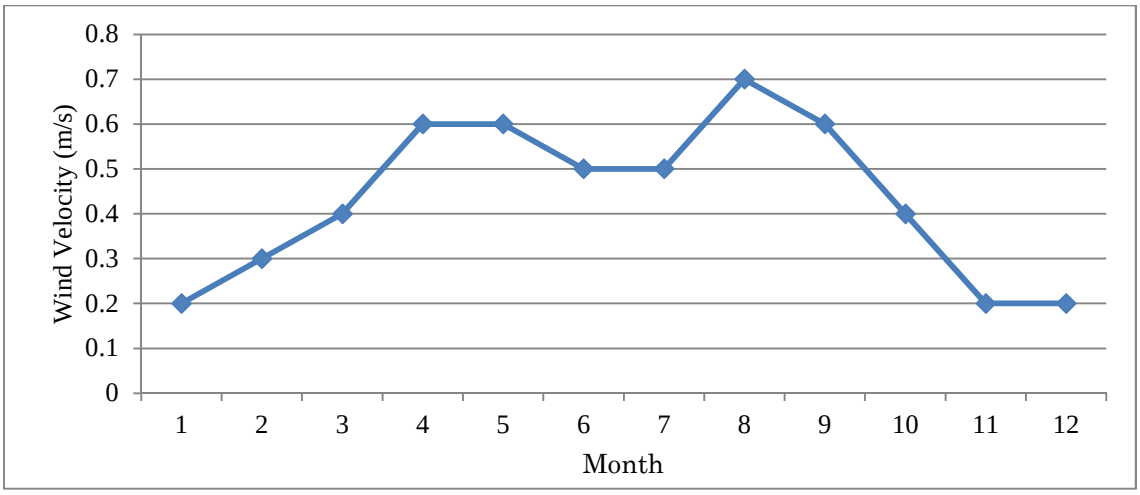


Figure 1.2.1-4 One-Year Trend of Average Monthly Wind Velocity
(It-Agal Avalanche Observation Station, 1966-2010)

1.2.1.4 Snow Depth

The objective site is located at EL. 1,700m and the area of avalanche is about 3,300m. The trend of snow depth in a year by elevation in winter season is shown in Figure 1.2.1-5 and summarized as follows:

- Snow mostly starts piling up without melting at the It-Agal Avalanche Observation Station at EL. 2,010m from November 20 every year.
- The snow on the ground files up to 53cm from November to February and after that it thaws to 41 cm.
- Snow cover period is 130 days on average (from December to March) and non-snow cover period in which temperature is over 0 degree is 23 days.
- The period of snow accumulation starts earlier and continues longer at higher elevations.
- More snow lies on the ground at higher elevations mainly in non-snow cover period.
- The snow depth is 100cm to 120cm on average and the deepest is about 200cm at high elevations.
- The longest period of snow cover is 188 days at EL. 3,000m to EL. 3,500m.

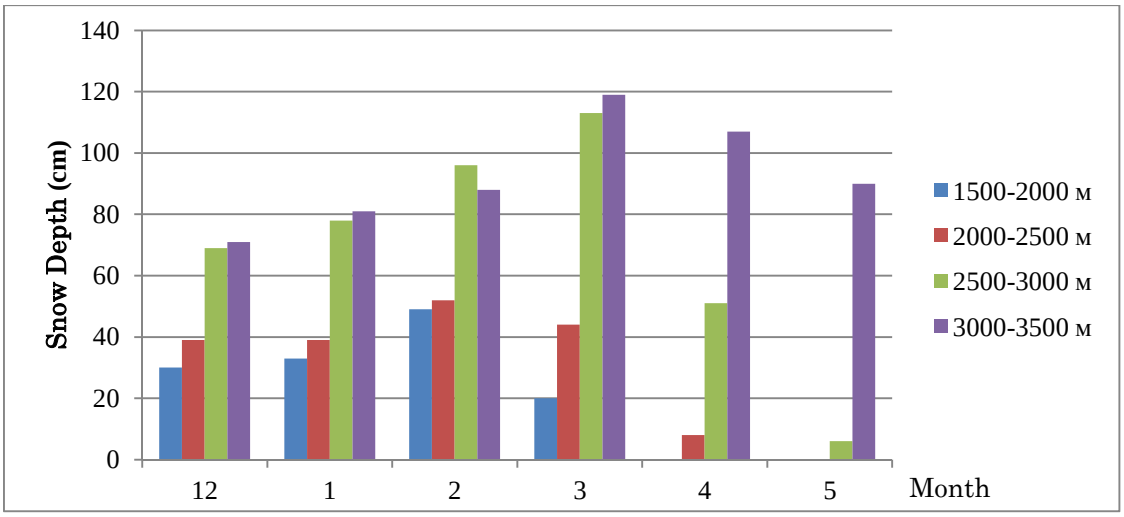


Figure 1.2.1-5 Average Snow Depth by Elevation in Chychkan River Basin (Aero Distant Snow Course, 1977-2010)

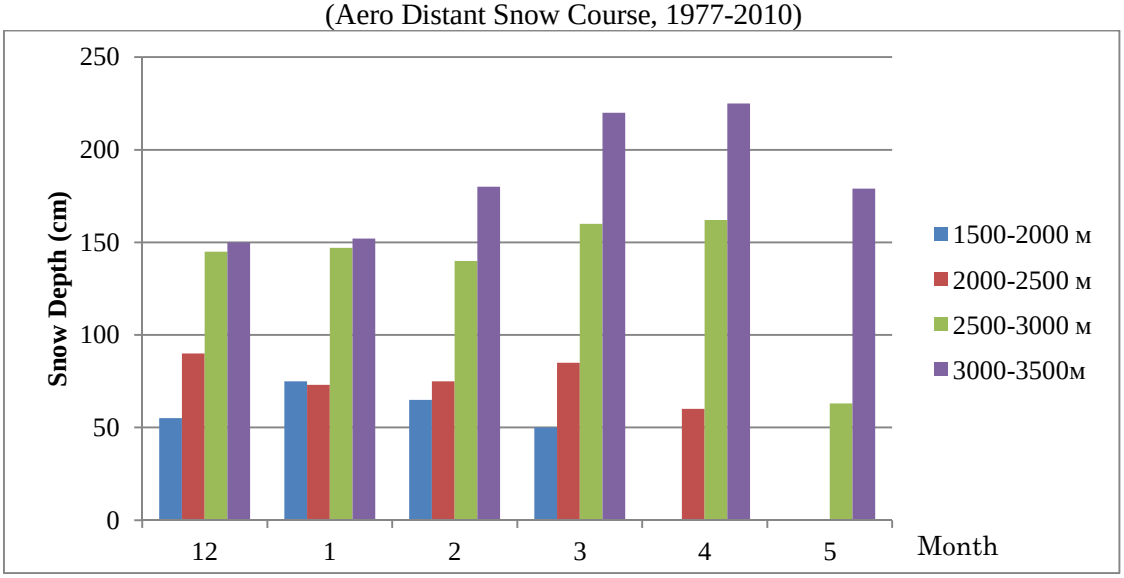


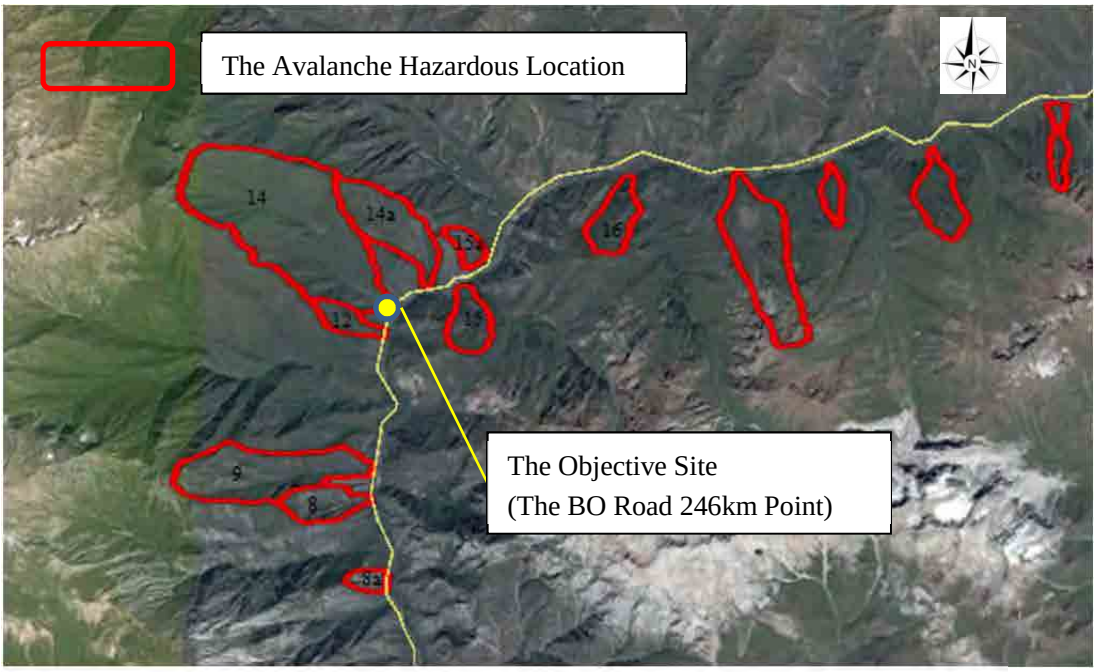
Figure 1.2.1-6 Maximum Snow Depth by Elevation in Chychkan River Basin (Aero Distant Snow Course, 1977-2010)

1.2.2 Topographic Survey

The objective site is located on the BO Road which is the most important road, with 672km in total length running from north to south in Kyrgyz and connecting with Bishkek City, the capital, and Osh City, the second largest city of Kyrgyz. The BO Road passes mainly through the mountainous area which includes the avalanche section where avalanches frequently occur from STA. 198km to STA. 265km. When avalanche occurs in this section, the road is temporarily closed to traffic or traffic is limited. This section is located in a narrow valley of about 50m to 150m in width to about 400m if large. The location of the 246km section, the objective site, is the narrow portion which is 100m from the road to the opposite side with the elevation of about 1,700m. Figure 1.2.2-1 indicates the avalanche hazardous areas around the objective site. The area of the river basin at the objective site is larger and the volume of avalanche is bigger than another area near the site.

Outcropping of rocks and the accumulation of debris and glass are mixed up on the ground surface. Coniferous forest also exists at the site, but the forest cover is not enough to prevent

avalanche. Therefore, the objective site has the topographic condition of forming avalanches more easily.



Prepared by Baihadjaev R. (Avalanche protection safety section, Engineer)

Figure 1.2.2-1 Avalanche Hazardous Locations around the Objective Site

The topographic map of the objective site is given in Figure 1.2.2-2.

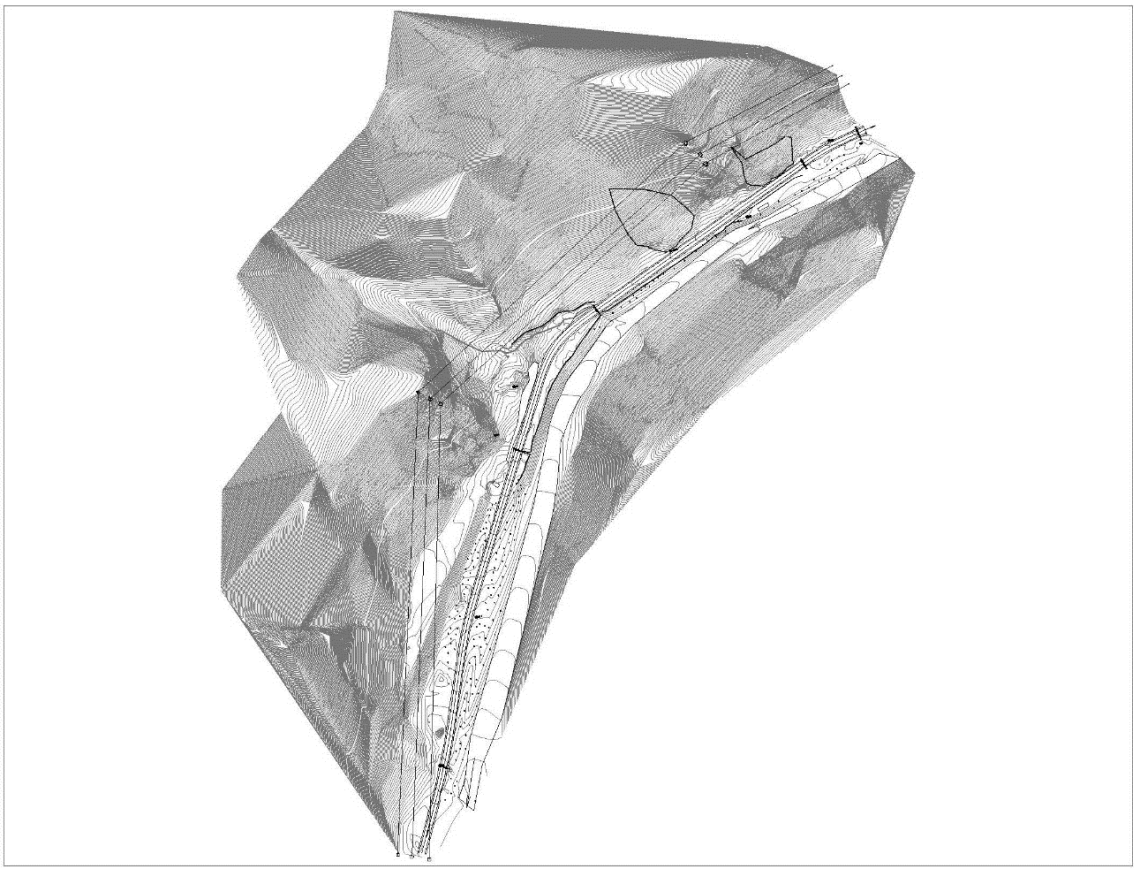


Figure 1.2.2-2 Topographic Map of the Objective Avalanche Site (STA. 246km)

1.2.3 Geotechnical Survey

The geological feature around the objective site is shown in Figure 1.2.3-1. The site is a zone with shale, schist and sandstone. The geotechnical survey includes the following items:

- Boring: 4 samples
- Seismic prospecting: 6 samples
- CBR test: 2 samples
- Laboratory test

Figure 1.2.3-1 indicates the result of the geotechnical survey conducted in the second site survey. The objective site mostly consists of shale and schist. Crystalline schist, the soil used for embankment, can be seen at the project site of the BO Road improvement project. Generally, the objective site stands on hard soil because shale has been confirmed under the crystalline schist. However, viscous soil was found by boring and relatively soft rock possibly exists.

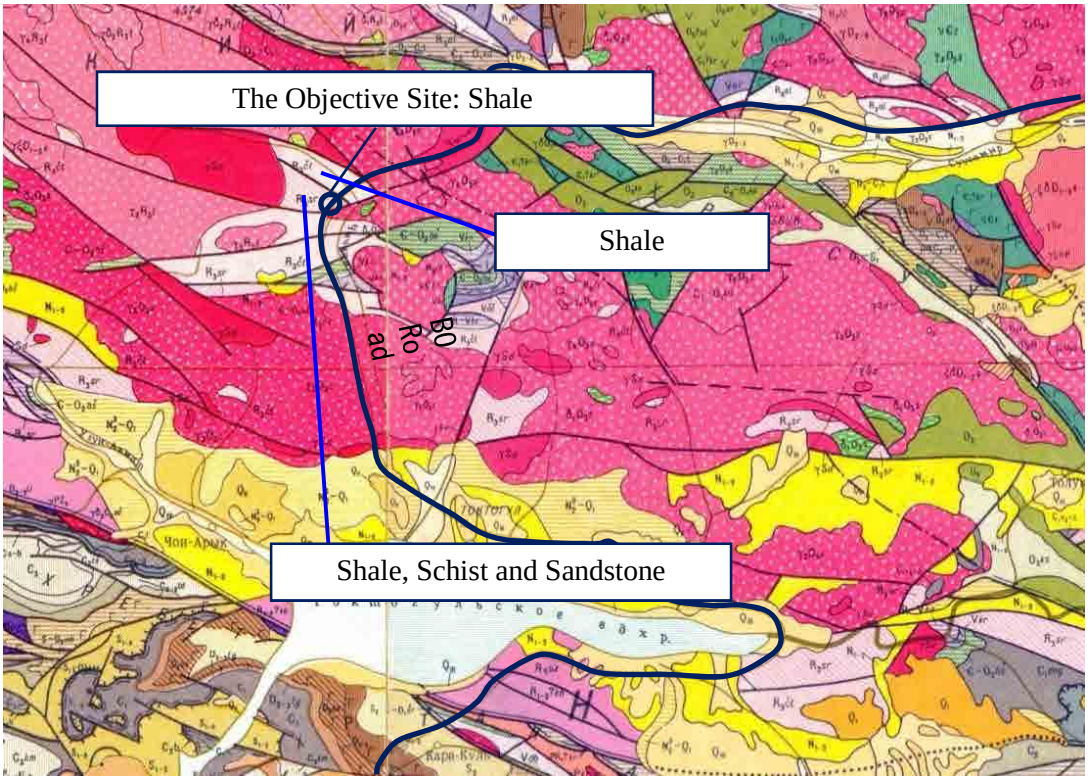


Figure 1.2.3-1 Geological Feature around the Objective Site

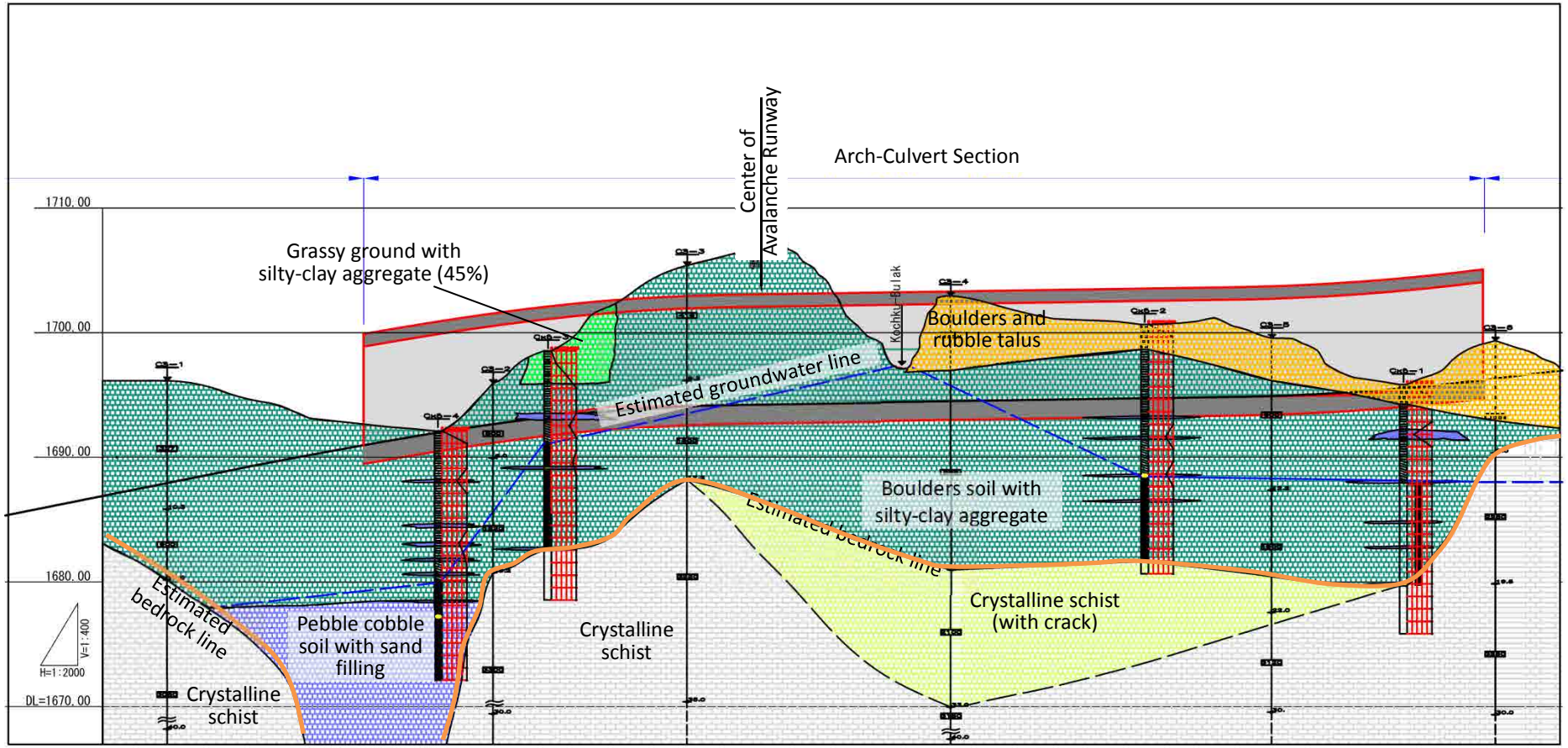


Figure 1.2.3-2 Geological Profile at the Objective Avalanche Site

1.3 Environmental Considerations

1.3.1 Organization and Legislation for Environmental and Social Considerations

1.3.1.1 Organization for Environmental Consideration

Organizations related to the Project are: the Ministry of Transport and Communications (MOTC, the implementing agency), DEP and the Investment Project Implementation Group (IPIG) which are the internal organizations of MOTC, the Ministry of Finance (MOF), the State Agency of Geology and Mineral Resources (SAGMR), and the State Agency of Environment Protection and Forestry (SAEPF). The Toktogul Forestry of the Jalal-Abad Regional Office in SAEPF and the Toktogul District in Jalal-Abad Oblast will manage the project area.

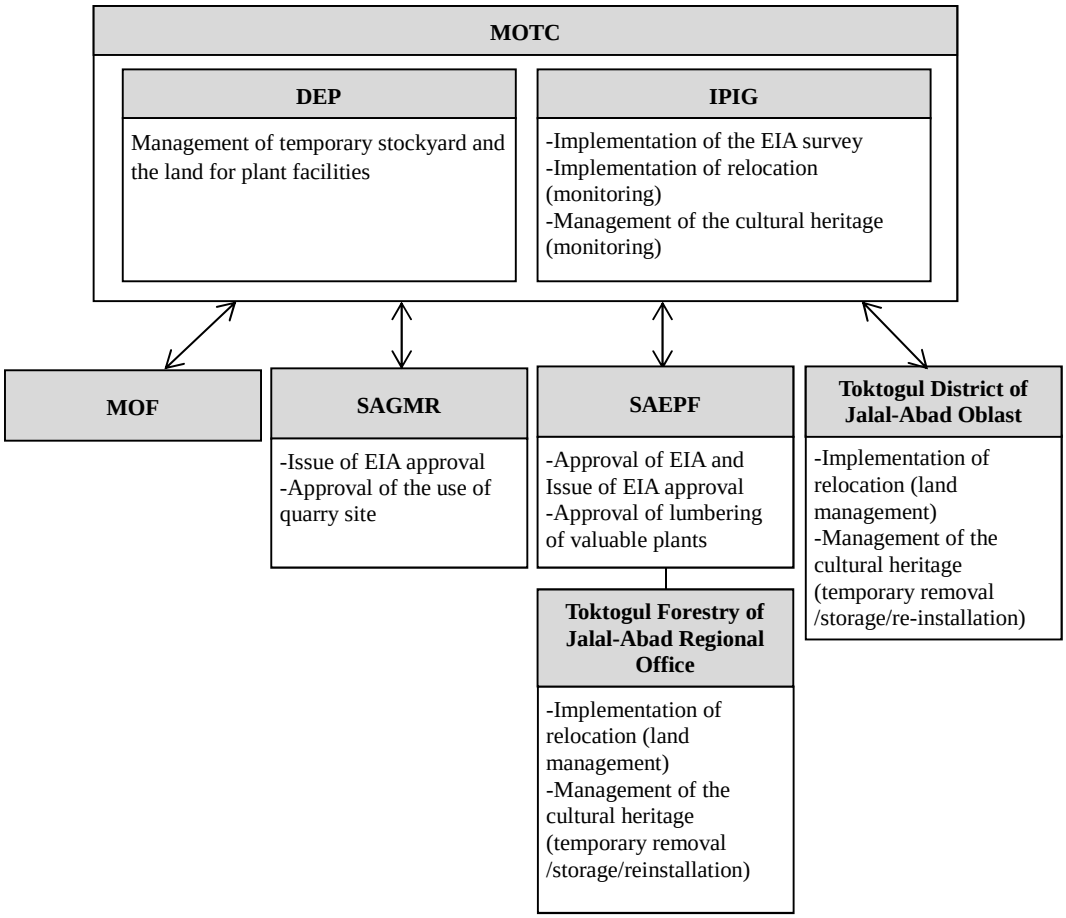


Figure 1.3.1-1 Implementing System of Environmental and Social Considerations

Environmental measures are to be implemented by the following institutions:

- Testing Chamber for Ecosystem in Chui, where most chemical analysis is performed.
- Testing Chamber of SAEPF, where some chemical analysis is performed.
- Testing Chamber of Hygiene and Infectious Disease Association.

The functions of SAEPF include:

- Provision of information on ecosystem
- Management of forest development and wild animal hunting
- Monitoring of ecosystem
- Issuance of environmental permit
- International cooperation for environmental protection

1.3.1.2 Legislations and Institutions for Environmental Consideration

Legislations and institutions related to environmental impact assessment are as given below.

Table 1.3.1-1 Environmental Legislations and Institutions of Kyrgyz

No.	Title
1	Constitution of the Kyrgyz Republic (2010.6.27)
2	Land Code of the Kyrgyz Republic No. 45 (1992.6.2)
3	Law of the Kyrgyz Republic No. 53, “Environmental Protection” (1999.6.16)
4	Law of the Kyrgyz Republic No. 54, “Environmental Review” (1999.6.16)
5	Law of the Kyrgyz Republic No. 151, “General Technical Regulations on Environmental Safety” (2009.5.8)
6	Law of the Kyrgyz Republic No. 165, “The Protection of Soil Fertility of Agricultural lands” (2012.8.10)
7	Law of the Kyrgyz Republic No. 4, “Agricultural Land Management” (2001.1.11)
8	Law on Production and Consumption Waste No. 89 (2001.11.13)
9	Law of the Kyrgyz Republic No. 160, “Mineral Resources” (2012.8.9)
10	Law of the Kyrgyz Republic No. 32, “The Rate of Payments for Environmental Pollution” (2002.3.10)
11	Resolution of the Kyrgyz Republic No. 559, “The Methodology for Calculating Payments for Environmental Pollution” (2011.9.19)
12	Law of the Kyrgyz Republic No. 200, “The Rates of Fees for the Use of Wildlife ” (2008.8.11)
13	Law of the Kyrgyz Republic No. 15, “The Prohibition of Logging, Transportation, Purchase and Sale, Harvest and Use and Exports of valuable Tree Species” (2007.2.12)
14	Law of the Kyrgyz Republic No. 89, “International Treaties” (1999.7.21)
15	Law of the Kyrgyz Republic No. 30 ,“Pastures” (2009.1.26)
16	Resolution of the Kyrgyz Republic No. 515, “The Procedure for Granting Use Rights to Pasture Resources for Purposes Unrelated to Grazing” (2013.9.13)
17	Decree of the Government of the Kyrgyz Republic No. 458, “The Approval of the Procedure of Determination of the Cost Estimate (Standard Price) (2013.8.13)
18	Resolution of the Kyrgyz Republic No. 224, “Approval of Rates for Calculation of Compensation for Damage caused to Objects of Flora and Fauna (2013.5.3)
19	Law of the Kyrgyz Republic No. 151, “The Mountainous Areas” (2002.11.1)

1.3.1.3 International Treaties on Environment

International treaties on the environment that have been ratified by Kyrgyz are listed in the following table.

Table 1.3.1-2 International Treaties on Environment

No.	Title
1	The Convention on Environmental Impact Assessment in a Trans-boundary Context (2001)
2	Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (2001)
3	Convention on Biological Diversity (1996)
4	United Nations Convention to Combat Desertification (1999)
5	Convention on Long-range Trans-boundary Air Pollution (2000)
6	United Nations Framework Convention on Climate Change (2000)

1.3.1.4 Environmental Standards

Kyrgyz has no original environmental standard and the ones of Russia recommended by the national organization, "Kyrgyz Standard", are generally referred to in Kyrgyz . The environmental standards used as reference in Kyrgyz are summarized below.

(1) Air Quality

Russian Standards for ambient air quality referred to in Kyrgyz are given below.

Table 1.3.1-3 Ambient Air Quality Standards

Unit: mg/m^3

No.	Pollutant	Maximum Permissible	Average Daily Concentration
1	Suspended Particulate Matter (SPM)	0.5	0.15
2	Sulfur Dioxide (SO2)	0.5	0.05
3	Nitrogen Dioxide (NO2)	0.085	0.04
4	Carbon Monoxide (CO)	5	0.06
5	Sulfates (S)	-	0.0003

Source: Guidelines for the Control of Air Pollution, RD 52.04.186-89, 1991

(2) Water Quality

Russian Standards for ambient water quality used as reference in Kyrgyz are given below.

Table 1.3.1-4 Ambient Water Quality Standards

Unit: mg/l

Item	Standards
Arsenic	0.01
Mercury	0.0005
Lead	0.01
Cadmium	0.001

Source: Maximum permissible concentration (MPC) of chemicals in water for drinking water, cultural and community use, Hygiene Regulations GN2.1.5.1315-03, 2003

(3) Noise and Vibration

Russian standards for noise and vibration used as reference in Kyrgyz are given in the following table.

Table 1.3.1-5 Noise Standards

Unit: dB

Category	L_{eq}	L_{max}
Areas immediately adjacent to hospitals and sanitariums	Day=45 Night=35	Day=60 Night=50
Areas immediately adjacent to dwellings, polyclinics, dispensaries, rest homes, holiday hotels, libraries, schools, etc.	Day=55 Night=45	Day=70 Night=60
Recreational areas in hospitals and sanatoriums	Day=60 Night=50	Day=75 Night=65
Recreational areas in hospitals and sanitariums	35	50

Source: State General Standards 23337-78, CH 2.1.8.562-96

Table 1.3.1-6 Vibration Standards (Category 2)

Geometric Mean Frequency Bands, Hz	Maximum Allowable Vibration Level at Workplaces Category 2: Transportation - Technological Type							
	Maximum Limit Values: Xo, Yo, Zo							
	Vibro Acceleration				Vibro Speed			
	m/s^2		dB		m/s^2		dB	
	1/3 octave	1/1 octave	1/3 octave	1/1 octave	1/3 octave	1/1 octave	1/3 octave	1/1 octave
1.6	0.25		108		2.50		114	
2.0	0.22	0.40	107	112	1.80	3.50	111	117
2.5	0.20		106		1.30		108	
3.15	0.18		105		0.98		105	
4.0	0.16	0.28	104	109	0.63	1.30	102	108
5.0	0.16		104		0.50		100	
6.3	0.16		104		0.40		98	
8.0	0.16	0.28	104	109	0.32	0.63	96	102
10.0	0.20		106		0.32		96	
12.5	0.25		108		0.32		96	
16.0	0.32	0.56	110	115	0.32	0.56	96	101
20.0	0.40		112		0.32		96	
25.0	0.50		114		0.32		96	
31.5	0.63	1.10	116	121	0.32	0.56	96	101
40.0	0.79		118		0.32		96	
50.0	1.00		120		0.32		96	
63.0	1.30	2.20	122	127	0.32	0.56	96	101
80.0	1.60		124		0.32		96	
Corrected and equivalent corrected levels and their values		0.28		109		0.56		101

Source: Sanitary Norms: “Industrial vibration, vibration in residential and public buildings”, CH 2.2.4/2.1.8.556-96

Table 1.3.1-7 Vibration Standards (Category 3)

Geometric Mean Frequency Bands, Hz	Maximum Allowable Vibration Level at Workplaces Category 3 - Technological Type "B"							
	Maximum limit values, Xo, Yo, Zo							
	Vibro Acceleration				Vibro Speed			
	m/s^2		dB		m/s^2		dB	
	1/3 octave	1/1 octave	1/3 octave	1/1 octave	1/3 octave	1/1 octave	1/3 octave	1/1 octave
1.6	0.0130		82		0.130		88	
2.0	0.0110	0.020	81	86	0.089	0.180	85	91
2.5	0.0100		80		0.063		82	
3.15	0.0089		79		0.045		79	
4.0	0.0079	0.014	78	83	0.032	0.063	76	82
5.0	0.0079		78		0.025		74	
6.3	0.0079		78		0.020		72	
8.0	0.0079	0.014	78	83	0.016	0.032	70	76
10.0	0.0100		80		0.016		70	
12.5	0.0130		82		0.016		70	
16.0	0.0160	0.028	84	89	0.016	0.028	70	75
20.0	0.0200		86		0.016		70	
25.0	0.0250		88		0.016		70	
31.5	0.0320	0.056	90	95	0.016	0.028	70	75
40.0	0.0400		92		0.016		70	
50.0	0.0500		94		0.016		70	
63.0	0.0630	0.110	96	101	0.016	0.028	70	75
80.0	0.0790		98		0.016		70	
Corrected and equivalent corrected levels and their values		0.014		83		0.028		75

Source: Sanitary Norms: “Industrial vibration, vibration in residential and public buildings”, CH 2.2.4/2.1.8.556-96

1.3.1.5 Acquisition of Environmental Permission

(1) Environmental Permission

Under Law No. 54 of the Kyrgyz Republic (“Environmental Review, 1999”) and the Instructions establishing the modalities for assessment of proposed activities on the environment (EIA) in Law No. 386 of the Kyrgyz Republic (1997), a road development project is classified as a project which will possibly affect the environment. The Project will thus require Environmental Impact Assessment (EIA) by MOTC and EIA approval by SAEPF. The procedure of EIA Approval is as shown in Figure 1.3.1-2.

The Initial Environmental Examination (IEE) was carried out and public consultations on the Project were held according to the Law of Kyrgyz and the JICA Guidelines for Environmental and Social Considerations. The results of the IEE were summarized in the report named “The EIA Report” with precedent in Kyrgyz. The EIA report was submitted to SAEPF by MOTC in October 2014, and after one month of examination, it was approved by SAEPF in November 2014.

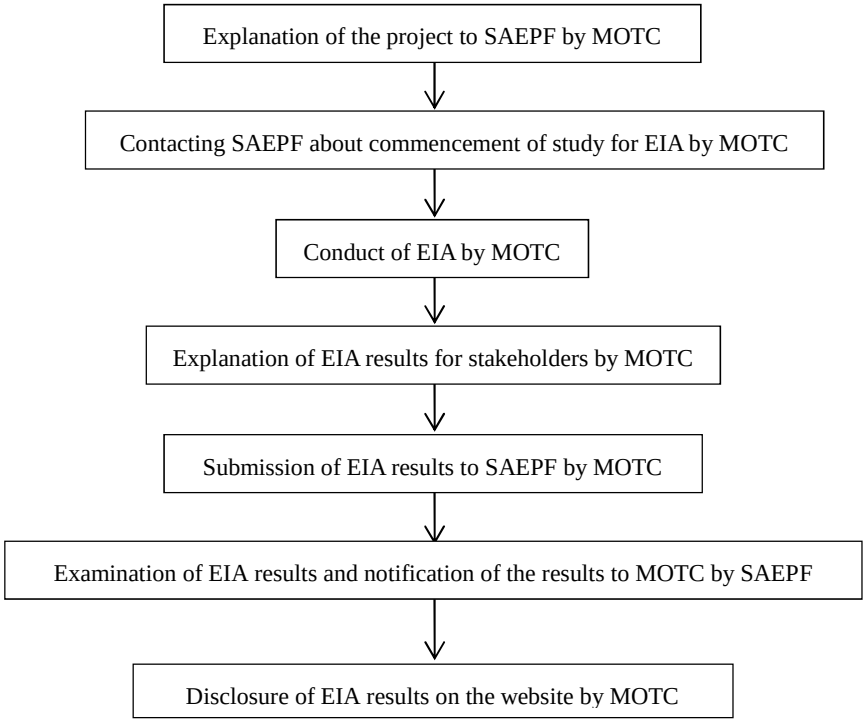


Figure 1.3.1-2 Acquisition Procedure for Environmental Permission

(2) Felling Permission for Valuable Plants

Valuable plants are protected by the law regarding "the prohibition of cutting, transportation, utilization, purchasing and selling of particular valuable wood species (walnut and archa trees) in Kyrgyz Republic" and it is necessary to obtain a felling permission of those plants in the implementation of projects such as public undertakings. The implementing entities of the Project (MOTC) need to compensate for the affected plants by either one of the compensation methods, i.e., pecuniary compensation or non-pecuniary compensation of planting seedlings selected in a conference between SAEPF and the implementing entities (MOTC).

The procedure for obtaining the felling permission of valuable plants mentioned in Decree No. 58 of the GOK is as shown below.

Procedure for Felling Permission of Valuable Plants

(1) Implementing entities file an application for felling permission of valuable plants to SAEPF.
(2) The SAEPF central office instructs the SAEPF regional office which manages the object plants to consider compensation contents.
(3) The SAEPF regional office investigates the habitat status of the object plants and the environmental impact by the Project with the implementing entity.
(4) SAEPF assesses the environmental impact to valuable plants and considers compensation contents.

1.3.2 Comparative Review of Alternatives

1.3.2.1 Selection Policy for Avalanche Measures

Avalanche scale at the project site is quite large. Therefore, it is difficult to apply “preventive measures” in case cost-effectiveness of preventive measures, workability of construction and maintenance are taken into account. As a consequence, the selection policy for avalanche measures should be studied from the concept of “protective measures” against avalanche debris on the BO Road.

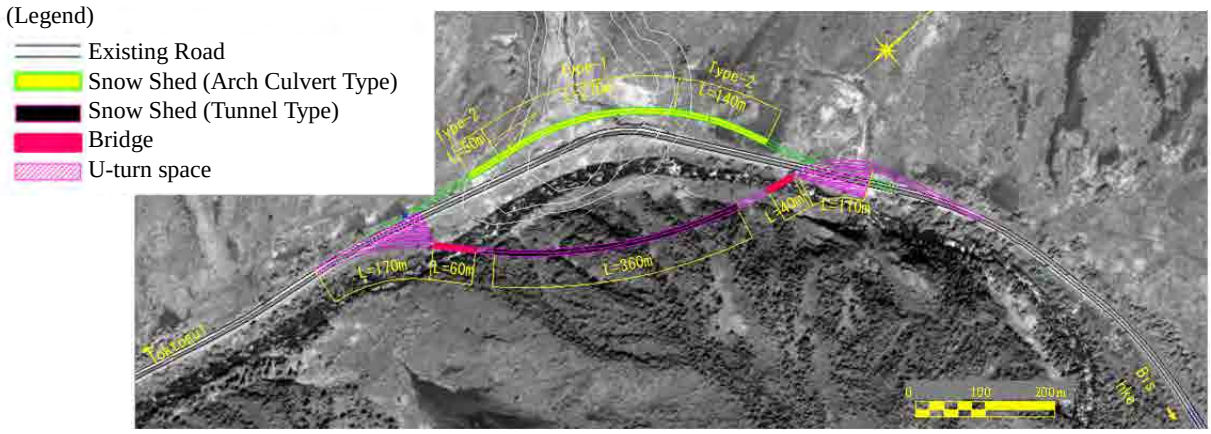
The selection policy of avalanche measures has been described in detail in Chapter 2.

1.3.2.2 Comparative Review of Alternatives

A comparative review of the Project and the alternatives is shown in Table 1.3.2-1, including the “without-project” (zero option) situation. Zero Option, Option 1 of Arch-Culvert Type of Snow Shed, and Option 2 of Tunnel Type of Snow Shed have been compared and examined from the viewpoints of engineering, socio-economy, and environmental and social considerations.

Option 1, the Arch-Culvert Type, is superior to the other options in engineering aspects because the structure with an arched form can withstand even the thickest layer of avalanche debris, and road alignment and traffic performance are good. Both Option 1 and Option 2 can contribute to economic development by ensuring traffic in winter from the social and economic aspects. In environmental and social aspects, Option 1 is recommended because of the smaller impact on natural environment than Option 2, although human damage by avalanche is prevented in both options. Therefore, Option 1 is the optimum option for the Project.

Table 1.3.2-1 Comparative Review of Alternative Types of Snow Shed



Items	Zero Option	Option 1 (Arch-Culvert Type)	Option 2 (Tunnel Type)
Outline	No project is planned.	Avalanche protection by arched gallery construction near existing road: - Arch type gallery: 460m - Approach road	Avalanche avoidance by tunnel construction on the opposite bank: - Tunnel: 360m - Bridges: 2 bridges - Approach road
Engineering Aspects	—	- Adoption of the arch form of structure which can withstand even the thickest layer of avalanche debris. (+) - It is necessary to maintain lighting systems and other equipment. (-) - The minimum radius is R=330m, which provides sufficient visibility even inside the Snow Shed. (+)	- It is necessary to maintain bridges and lighting systems and other equipment in tunnel. (-) - Road surface on the bridge is easy to freeze; it is difficult to provide traffic safety in winter season. (-)
Social and Economic Aspects	Road blockage due to occurrence of avalanche may have a considerably negative impact on logistics and local economies. (-)	- Movement of people and goods is activated and economy is developed by securing traffic in winter. (+) - Construction will cost 3.2 billion JPY. (-)	- Movement of people and goods is activated and economy is developed by securing traffic in winter. (+) - Construction will cost 3.2 billion to 3.7 billion JPY. (-)
Environmental and Social Aspects	- Social disruption may be induced because road blockage and traffic regulation caused by the occurrence of avalanche have a negative impact on local economy. (-) - Human damage may be caused by the avalanche. (-)	- Excavation work is needed to install an arch-culvert under the ground. (-) - Resettlement of residents is needed. (-) - Human damage by avalanche is prevented. (+)	-For bridge construction at the site, deforestation is required. - It is essential to have a place for waste processing because of tunnel construction. (-) - Resettlement of residents is needed. (-) - Human damage by avalanche is prevented. (+)
Evaluation	**Not recommended**	**Recommended**	**Not recommended**
	Human damage may be caused and no contribution to measures against avalanche is expected.	Economic efficiency is nearly the same as Option 2; however, traffic safety and performance are superior to Option 2.	Economic efficiency is nearly the same as Option 1; however, traffic safety is not superior to the others because the road alignment becomes worse.

1.3.3 Scoping and TOR for the Survey on Environmental and Social Considerations

1.3.3.1 Scoping

EIA for the Project is carried out based on the Environmental Legislations and Institutions of the Kyrgyz Republic mentioned in "1.3.1.2, Legislations and Institutions for Environmental Consideration," and the JICA Guidelines for Environmental and Social Considerations (the JICA GL) since the Project is implemented as a Japan's Grant Aid Project. Therefore, scoping is also essential according to the legislations and institutions of the Kyrgyz Republic and the JICA GL.

Table 1.3.3-1 Scoping Results of the Project

Category	Impacts		Evaluation		Reasons (Expected Negative Impact)	
			Pre-/At-work	In-use	Pre-/At-work	In-use
Social Environment	1	Involuntary Resettlement	B	B	About 2 households are affected at the Project site. Involuntary resettlement is required according to the JICA Guidelines with compensation for mainly providing alternative lands. The objective area is a part of state land.	Confirmation of the recovery conditions of living is needed when involuntary resettlement is required.
	2	Local Economy such as Employment and livelihood, etc.	D	D	There are no local economies affected by the Project.	
	3	Land Use and Utilization of Local Resources	B	D	Land use for construction office and lodging for workers, plant facilities and quarries is expected and it may impact on land development and local resources like natural resources.	No land use is expected in-use.
	4	Water Usage or Water Rights and Common Rights	B	D	Water use from Chychkan River or Kochku-Bulak Stream for sprinkling during construction is expected and it may impact on local people who use water from Chychkan River or Kochku-Bulak Stream as living water.	Negative impact on local people is not expected, because water use is not planned during construction
	5	Social Institutions Such as Social Infrastructures and Local Decision-making Institutions	D	D	There are no social institutions affected by the Project.	
	6	Existing Social Infrastructures and Services	B	D	A part of existing road may be used as a bypass road when a temporary bypass road is constructed along the river.	Negative impacts on existing social infrastructures and services are not expected.

Category	Impacts		Evaluation		Reasons (Expected Negative Impact)	
			Pre-/At-work	In-use	Pre-/At-work	In-use
	7	Poverty Group	D	D	There are no poverty groups among the affected people.	
	8	Indigenous and Ethnic People	D	D	There are no indigenous and ethnic people affected by the Project.	
	9	Misdistribution of Benefit and Damage	D	D	Nothing brings misdistribution of benefit and damage to the project site.	
	10	Local Conflict of Interests	D	D	No local conflict of interest is expected around the project site.	
	11	Cultural Heritage	B	D	Discussion of relocation of memorial monuments for avalanche victims is needed.	No impact on cultural heritage is expected.
	12	Landscape	D	D	Existence of construction equipment in the work site may impact on surrounding scenery, but there is no particular impact because the site is not a scenic area.	Snow Shed may change the landscape, but there is no particular impact because the site is not a scenic area.
	13	Accident	B	D	Consideration for accidents during construction and avalanche is required.	Reduction of accident is expected by improving traffic potential.
	14	Infectious Diseases such as HIV/AIDS	B	D	An infected worker may enter the construction camp.	There is no risk of HIV/AIDS infection.
	15	Work Environment (incl. Work Safety)	B	D	Considering work environment is needed to prevent occupational injury or accidents.	No negative impact on workers is expected.
	16	Gender	B	D	Gender discrimination in wages may occur among workers.	Work to cause gender disparities is not planned.
	17	Children's Right	D	D	No impact on children's right is expected because workers must be 16 years of age or over and passports are required for the employment contract in the Kyrgyz Republic.	
Natural Environment	18	Sanctuary	D	D	There is no national park or sanctuary around the project site.	
	19	Ecosystem	B	D	Forestland may be lumbered for road construction and impacts on rare species of plants and archa are expected.	No impact on ecosystem is expected
	20	Hydrological Situation	B	B	- Outflow and inflow of sediment is expected. - Kochku-Bulak Stream may be affected.	Kochku-Bulak Stream may be affected by the Project.
	21	Topography and Geographical Features	D	D	Generally, topography and geographical features may not be affected because large cuttings and embankment are not planned.	

Category	Impacts		Evaluation		Reasons (Expected Negative Impact)	
			Pre-/At-work	In-use	Pre-/At-work	In-use
Pollution	22	Trans boundary Impact and Global Warming	C	D	Global warming gas emission from construction vehicles is anticipated.	Increase of traffic is expected; however, decrease of global warming gases is expected because of reduction in the use of snow blowers and of traffic congestion caused by traffic regulations at the time of avalanche.
	23	Air Pollution	B	D	Work of construction equipment and vehicles may cause air pollution such as exhaust gas or dust.	Increase of traffic is expected; however, decrease of air pollution is expected because of reduction in the use of snow blowers and improvement of traffic ability.
	24	Water Pollution	B	D	Drainage from the construction site is concerned to be a potential source of water pollution.	Work that affects water quality is not expected.
	25	Soil Contamination	B	D	Leakage of asphalt or gasoline from construction equipment is concerned.	Work to affect soil is not expected.
	26	Waste	B	D	Wastes from the construction work or workers are expected.	Wastes are not expected.
	27	Noise and Vibration	B	D	Noise and vibration from construction equipment are expected.	Noise and vibration to affect local people are expected.
	28	Ground Subsidence	D	D	Ground subsidence is not expected because the project site is on gravel ground	
	29	Offensive Odor	C	D	Offensive odor may be generated from wastes, or exhaust gas from construction equipment.	Offensive odor is not expected.
	30	Bottom Sediment	D	D	Work to affect bottom sediment is not expected.	

Legend:
A: Serious negative impact is expected.
B: Some negative impacts are expected.
C: Extent of negative impact is not known
(Further study and examination is needed to clarify the impact as the study progresses).
D: No negative impact is expected

1.3.3.2 TOR for Survey on Environmental and Social Considerations

Based on the scoping in the previous section, a TOR for the required survey on environmental and social considerations is designed as shown in the following table after selecting the items that are ranked B or C.

Table 1.3.3-2 TOR for Survey on Environmental and Social Considerations

Items	Survey Items	Survey Methods
Involuntary Resettlement	- Understanding of involuntary resettlement scale - Planning of Resettlement Schedule	- Hearing survey with the related organizations - Site survey
Land Use and Utilization of Local Resources	- Confirmation of land acquisition for the construction (material storage, etc.)	- Hearing survey with the related organizations - Site survey
Water Usage	- Confirmation of water usage situation of local residents (river, etc.)	- Hearing survey with the related organizations - Site survey
Existing Social Infrastructure and Services	- Confirmation of existing social infrastructures around the project site - Understanding of actual status of infrastructures	- Research of data & resources - Site survey
Cultural Heritage	- Confirmation of installation state of Avalanche Victim Monuments	- Research of data and resources - Hearing survey with the related organizations - Site survey
Accident	- Analysis of accidents during construction work and traffic accident - Consideration of road safety practice	- Research of data & resources
Infectious Diseases such as HIV/AIDS	- Understanding of actual status - Consideration of efforts against infectious disease	- Research of data & resources
Work Environment (incl. Work Safety)	- Consideration of work safety practice	- Research of data and resources - Hearing survey from the related organizations - Collection and confirmation of the information on project work description, method, period, location/ area and equipment used
Gender	- Understanding of actual status	- Research of data and resources
Ecosystem	- Confirmation of habitat status of plants around the project site	- Research of data and resources - Hearing survey from the related organizations - Collection and confirmation of the information on the project work description, method, period, location /area and equipment used
Hydrological Situation	- Understanding of actual status - Checking the affected area during construction	- Hearing survey from the related organizations - Site survey
Trans-boundary Impact and Global Warming	- Prediction of CO2 emission amount - Checking the affected area during construction - Consideration of emission reduction measures	- Research of data and resources - Site survey - Collection and confirmation of the information on the project work description, method, period, location /area and equipment used
Air Pollution	- Understanding of actual status - Prediction of future concentration of atmospheric pollutant - Checking the affected area during construction - Consideration of emission reduction measures	- Research of data and resources - Site survey - Collection and confirmation of the information on the project work description, method, period, location /area and equipment used
Water Pollution	- Understanding of actual status - Checking the affected area during construction	- Research of data and resources - Site survey - Collection and confirmation of the information on the project work

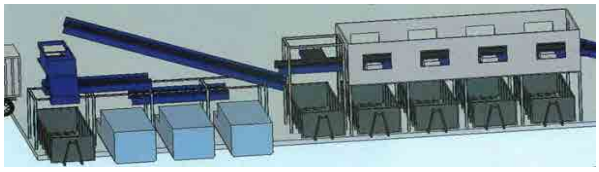
Items	Survey Items	Survey Methods
		description, method, period, location /area and equipment used
Soil Contamination	- Understanding of actual status - Checking the affected area during construction - Consideration of pollutant outflow prevention measures	- Research of data and resources - Site survey - Collection and confirmation of the information on the project work description, method, period, location /area and equipment used
Waste	- Confirmation of waste disposal method - Consideration of reuse method of trees	- Research of data and resources - Hearing survey from the relating organizations
Noise and Vibration	- Understanding of actual status - Checking the affected area during construction	- Research of data and resources - Hearing survey from the relating organizations - Collection and confirmation of information on the project work description, method, period, location /area and equipment used
Offensive Odor	- Checking the affected area during construction	- Research of data and resources - Site survey - Collection and confirmation of the information on the project work description, method, period, location /area and equipment used
Alternatives	- Reviewing the alignment - Reviewing work methods	- Reviewing alignment alternatives to optimize technical, economic, social and environmental aspects of the Project. - Reviewing work methods to minimize impacts on the environment and traffic congestion during the construction.
Stakeholder Consultation	- Holding of stakeholder consultations for affected persons and region - Analysis of opinions and reflections gained from public consultation for the Project	- Holding of stakeholder consultations - Comparison with other cases, checking of the opinions gained, and reflection on the Project

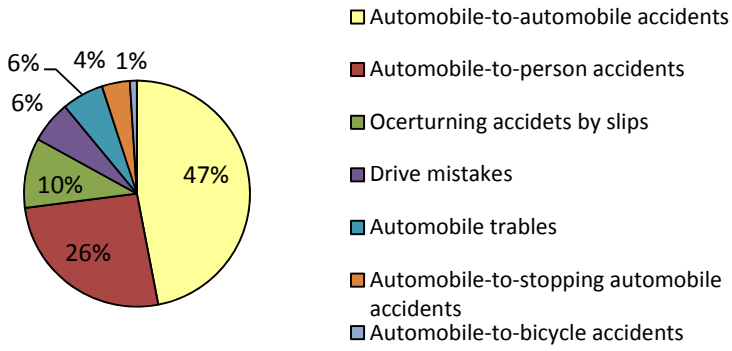
1.3.4 Survey Results on Environmental and Social Considerations

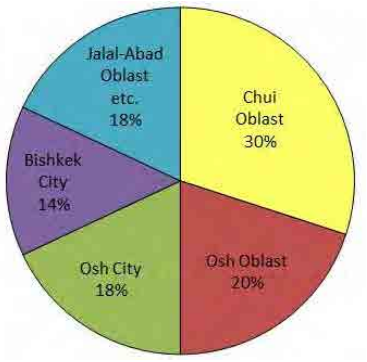
Table 1.3.4-1 indicates the survey results in accordance with the TOR in Subsection 1.3.3.

Table 1.3.4-1 Survey Results on Environmental and Social Considerations

Impact	Results
Involuntary Resettlement	[Refer to "1.3.8.2, Legal Framework of Involuntary Resettlement" for related legislations and regulations.] Site and hearing surveys on involuntary resettlement were implemented by MOTC and the Survey Team and it was found that one household and six people taking care of an apiary will be affected by the Project. The affected people have been settling on government land leased from the Toktogul Forestry Office of SAEPF for several years. MOTC discussed the compensation contents with the affected people after consultation with Toktogul District on November 21, 2014. It was determined that alternative lands are to be provided to the affected people without monetary compensation in accordance with their wishes, and the agreement of relocation and compensation was signed by the affected people and the relevant organizations on the same day. Furthermore, vehicles and manpower will be provided by MOTC (DEP-23) for demolishing and transporting houses according to the requests of the affected people. Notice to the households and consultation on compensation contents are to be implemented by MOTC and Toktogul District in the middle of November 2014. MOTC is planning to establish the persons responsible for relocation and to start monitoring of the activities. Relocation is scheduled to be completed by October in 2015.

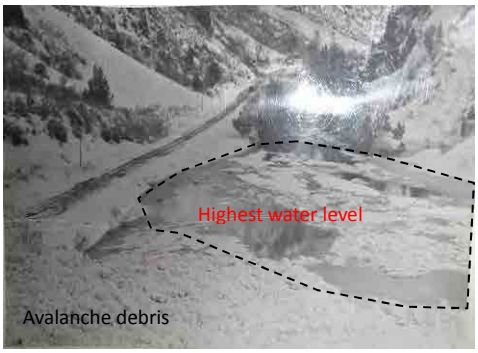
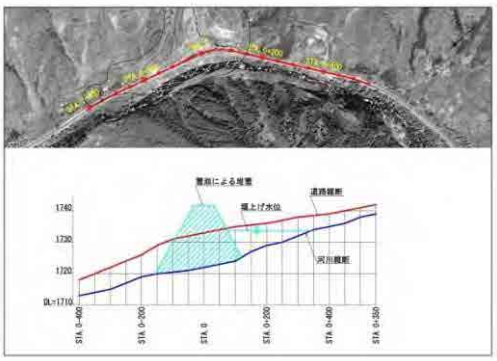
Impact	Results
Land Use and Utilization of Local Resources	Quarry Site There are two (2) possible quarry sites. One is located in the compound of the existing asphalt plant in Toktogul City which is planned to be provided with a crushing machine. No license is required for using the place because it is managed by MOTC. The other is the Kayrak Quarry in Toktogul City with an area of more than 10ha. It was proposed by the State Agency of Geology and Mineral Resources (SAGMR) during the survey; therefore, the Contractor and the Consultant have a responsibility to prepare the required documents from the regional office of SAEPF and the local authority before starting the construction works. MOTC has a responsibility to obtain the license for quarry operation from SAGMR. Due to its close location to the residential area, the quarry is to be equipped only with a sifting machine. These two quarry sites can provide enough materials required by the Project.  Photo1.3.4-1 The Kayrak Quarry  Figure 1.3.4-1 The Image of Shifting Machine Temporary Stockyard The temporary stockyard for excavated materials such as earth and stones has been secured by MOTC at the area of about 0.5 ha beside the Equipment Yard of DEP No. 23 located at the 242km point where SAEPF manages. It is judged to be the best area in consideration of the distance from the project site and the width.  Photo1.3.4-2 Temporary Stockyard Plant Facility Concrete plant is planned to be installed near the project site. The existing asphalt plant in Toktogul City that is managed by DEP 23 is planned to be used as the asphalt plant for the project.
Water Usage	It was confirmed that local people use water from Chychkan River or Kochku-Bulak Stream as living water for washing clothes, etc. Water from Chychkan River or Kochku-Bulak Stream may be used for the construction work before and during construction; however, work that could affect water quality or volume is not planned. Therefore, particular impacts on local people are not expected. As mentioned in "water quality," mitigation measures and monitoring of Chychkan River or Kochku-Bulak Stream are constantly carried out paying attention to the deterioration of water quality.
Existing Social Infrastructures and Services	Traffic volume at the project site was surveyed in winter and summer. The summary of the traffic volume is as follows: - Traffic volume in winter: 2000 to 2200 per day, 400 to 500 of which is truck volume - Traffic volume in summer: 3300 to 3500 per day, 650 to 750 of which is truck volume - Traffic volume in winter: December to March is about 60% to 70% against one in summer. -Traffic in weekend is heavy by 10% compared with the weekday volume in winter and summer. The BO Road is the most important road in the Kyrgyz Republic; however, traffic in winter is light, which is 60% of the one in summer because of the high risk of avalanche, and traffic congestion does not usually occur. However, the existing road may be partly included when bypass route along the river is constructed; therefore, accident prevention is needed on the occasion.

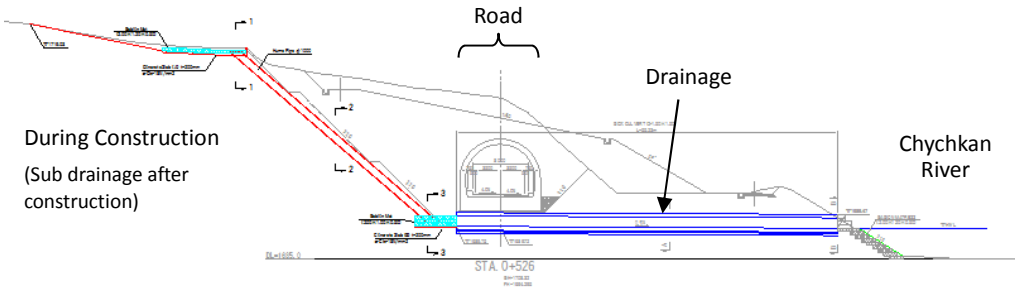
<table>
<tr><th>Impact</th><th>Results</th></tr>
<tr><td>Cultural Heritage</td><td>There are two memorial monuments for the avalanche victims in the project site. Relocation of the monuments is required under the responsibility of MOTC when they are in the right-of-way, within 14m from road center, or they are obstructive in construction.</td></tr>
<tr><td>Accident</td><td>There were 7000 traffic accidents and 1000 deaths in the Kyrgyz Republic in 2007, while the number of deaths per year in Japan is 5000. Population of the Kyrgyz Republic is about 5 million; therefore, it is shown that the number of deaths in the Kyrgyz Republic is abnormally high comparing the Kyrgyz Republic and Japan from the perspective of percentage of deaths to population. The primary causes are possibly the slip on the frozen road and the low visibility due to snowstorm or dust blown up from an unpaved road in addition to speeding and reckless driving.
There were 159 traffic accidents, 47 deaths and 261 wounded on the BO Road in 2011. The details of the number of traffic accidents are as follows:
 

Source: JOC, Road safety advice, CAREC Transport Corridor 1, 2009
Figure 1.3.4-2 Details of the Number of Traffic Accidents
No information on accidents during construction is found in the Kyrgyz Republic; however, it is 12% of all accidents and 10% of it is serious accidents such as construction was suspended for four days according to statistics in Japan. When the construction scale is larger, the occurrence rate of accidents is higher. Causes of accidents include contact with construction equipment, contact with vehicles, handling of tools, and collapse in descending order of the number of accidents. Accident avoidance measures are needed such as showing construction region on electronic bulletin boards or signage, installation of colored cones to serve as detour guides, or providing traffic personnel.</td></tr>
<tr><td>Infectious Diseases such as HIV/AIDS</td><td>5,600 people infected with HIV were confirmed in the Kyrgyz Republic in 2013, which is 0.09% of the population. The number of people infected with HIV is increasing by 50 to 70 people every month and the regional breakdown shows a high percentage in Chui Oblast (30%), followed by Osh Oblast (20%) and Osh City (18%). There were 9 persons affected in Toktogul District after 2010, which is about 0.01% of the total population of Toktogul District.[1]
Table1.3.4-2 Ratio of the Number of People infected with HIV (by Region)
<table>
<tr><th>Region</th><th>The Number of People infected with HIV</th><th>Ratio</th></tr>
<tr><td>Chui Oblast</td><td>1,518</td><td>30%</td></tr>
<tr><td>Osh Oblast</td><td>1,012</td><td>20%</td></tr>
<tr><td>Osh City</td><td>911</td><td>18%</td></tr>
<tr><td>Bishkek City</td><td>708</td><td>14%</td></tr>
<tr><td>Jalal-Abad Oblast
Naryn Oblast
Issyk-kul Oblast
Batken Oblast</td><td>911</td><td>18%</td></tr>
<tr><td>Total</td><td>5,060</td><td>100%</td></tr>
</table>
Source: Public Broadcasting Company of Kyrgyz Republic
 

Source: Public Broadcasting Company of Kyrgyz Republic
Figure 1.3.4-3 Ratio of the Number of People infected with HIV (by Region)</td></tr>
</table>

[1] Public Broadcasting Company of Kyrgyz Republic (November 28, 2013)

Impact	Results
Work Environment (incl. Work Safety)	The Law "On Labor Protection," 2009 provides labor standards for the protection of workers. Labor safety and sanitation management for the construction industry is regulated under the Standards, Norms and Rules (SNiP) by the State Construction Committee (Gosstroi), one of the government agencies. The Construction contractor needs to follow these legislations and develop a working environment.
Gender	It is said that there are no records of trials and no gender issues such as gaps in education level between men and women. However, actually, it is pointed out that wage disparities are large; the wage of women is only 70% of the men because bride kidnapping is still practiced in the oblast of Kyrgyz Republic due particularly to labor shortage in rural areas. The opportunities for employment promotion are created in construction, while wage disparity is possibly brought about for women who seek employment in the employment conditions.
Ecosystem	(1) Animal Species It was confirmed that there are no rare animals in the project site. The following animals were mainly identified in the survey by MOTC. - Mammals: wood mouse, forest dormouse, rabbit, etc. -Birds: rock bunting, rock pigeon, tawny pipit, etc. -Reptiles: Pevtsova toad, Kyrgyz lizard, snake, etc. -Fishes: carp, freshwater minnow, char, etc. (2) Plant Species 5 archa trees which are among the valuable plants in Kyrgyz Republic were identified. When archa is needed to be cut, MOTC needs to obtain approval for the felling of archa according to the procedures to obtain felling permission of valuable plants mentioned above. The compensation method was considered by MOTC in the survey for the permission. MOTC is planning to newly plant 5 seedlings for cutting 1 tree. MOTC will plan the planting schedule and place to plant near the project site and then obtain the permission. Planting is scheduled in April or in the period of October to November which is the preferable time, and the budget for planting will be prepared by MOTC in 2015.
Hydrological Situation	The survey team acquired the materials when the highest water level was observed. During the First Field Survey, information regarding the largest scale of river closure by avalanche was obtained (Photo 1.3.4-3). Therefore, it may be assumed that, in order to keep the current road height, there should be no impact on river water level that could result in flooding. Photo 1.3.4-4 shows the range of floods, which can be assumed based on Photo 1.3.4-3.  Photo 1.3.4-3 River Condition during Water Level Rising in the Past (Depth)  Photo 1.3.4-4 Range of Flooding during Water Level Rising The construction is planned not to affect the water quality and water flow of Kochku-Bulak Stream. During the construction, the use of drainage installed on the existing road is planned. After the construction, the use of drainage installed on top of the arch culvert and joining the Chychkan River are planned. The drainage used during construction is to be used as sub-drainage after the construction work.

<table>
<tr><th>Impact</th><th>Results</th></tr>
<tr><td></td><td>


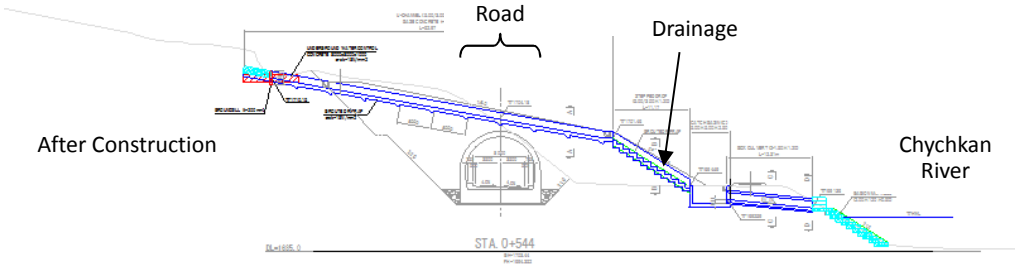


Figure 1.3.4-4 Drainage Structure
</td></tr>
<tr><td>Trans-boundary Impact and Global Warming</td><td>
Global warming gas emissions were estimated with emission basic unit based on “the Environmental Impact Assessment Guideline on Global Warming Gas Emissions in Road Project” by the Ministry of Environment.
This estimation is the emission in working of construction equipment without the emission due to carrying equipment and materials or wastes. The accurate emission of global warming gases including the emission due to carrying equipment and materials or wastes can be estimated when the detail plan is decided. The global warming gases capable of reducing the emission shall be identified based on the estimation and measures to reduce them are needed.
Table 1.3.4-3 Global Warming by Gas Emission
<table>
<tr><th>Type of Construction</th><th>Main Work</th><th>Base Unit of CO2 (t-CO2/km)</th><th>Length (km)</th><th>Emission (t-CO2)</th></tr>
<tr><td>Road Construction</td><td>Cut and embankment, Slope, Lower part of overpass, Box culvert, Ancillary, Drainage, Traffic control device, Pavement</td><td>2,267.8</td><td>0.9</td><td>2,041.0</td></tr>
</table>
*Note: It is assumed that arch culvert is constructed with earthworks.
</td></tr>
<tr><td>Air Pollution</td><td>
As the result of the survey on air quality at 3 points in the objective area by MOTC and the survey team, it was found that SO2 and SPM were falling below the environmental standard value. CO at the point A-T2 and A-T3 excessed the reference values; however, the measured values were greatly affected by not only traffic volume but also vehicles without exhaust emission control device.
In the quarry site, CO excessed the reference value. It is presumed that the measured values were affected by the puddle at the entrance of the quarry and the dump site. That means that oxygen was possibly generated by the relation between soil microorganism and humidity around the area.
The summary of the survey in the project site is shown below.
Table 1.3.4-4 Summary of the Results of Air Quality Survey (Project Site)
<table>
<tr><th>Point</th><th>Date</th><th>SO2 (mg/m^3)</th><th>CO (mg/m^3)</th><th>SPM (mg/m^3)</th></tr>
<tr><td rowspan="2">A-T1</td><td>2014.06.23</td><td>0.0-0.1</td><td>2.3-3.9</td><td>0.1-0.2</td></tr>
<tr><td>2014.06.24</td><td>0.0-0.1</td><td>3.1-4.2</td><td>0.1-0.2</td></tr>
<tr><td rowspan="2">A-T2</td><td>2014.06.23</td><td>0.0-0.0</td><td>1.1-6.8</td><td>0.1</td></tr>
<tr><td>2014.06.24</td><td>0.0-0.1</td><td>2.4-3.6</td><td>0.1-0.4</td></tr>
<tr><td rowspan="2">A-T3</td><td>2014.06.23</td><td>0.0-0.1</td><td>1.4-8.8</td><td>0.1-0.4</td></tr>
<tr><td>2014.06.24</td><td>0.1</td><td>2.6-5.3</td><td>0.1-0.2</td></tr>
<tr><td colspan="2">The Environmental Reference Value</td><td>Max 0.5</td><td>Max 5.0</td><td>Max 0.5</td></tr>
</table>
*Values: The lowest value – The highest value
Survey Result: SO2 and SPM were falling below the reference values and CO exceeded the values at Points A-T2 and A-T3.
</td></tr>
</table>

<table>
<tr><th>Impact</th><th>Results</th></tr>
<tr><td>Water Pollution</td><td>As the result of the survey of water quality in the objective area, it was found that pH, DO and SS were falling below the environmental standard value.
Soil, dust and mineralogical dust, etc., due to working of construction equipment are expected as main factors; however, there is no possibility that raw sewage is directly discharged. Sprinkled water for preventing scattering of dust and rainwater may be naturally evaporated. Monitoring is continued and to prevent water deterioration, continuous monitoring is required and drainage from the construction site need to be discharged after clarifying turbid water through a turbid water treatment apparatus.
Excess of the referred values was not found in the survey at the quarry site.
Table 1.3.4-5 Summary of the Water Quality Survey Results (Project Site)
<table>
<tr><th>Points</th><th>Date</th><th>pH</th><th>Dissolved Oxygen (mg/l)</th><th>Suspended Solids (mg/l)</th></tr>
<tr><td rowspan="2">W-T1</td><td>AM</td><td>7.5</td><td>9.25</td><td>3</td></tr>
<tr><td>PM</td><td>7.6</td><td>9.05</td><td>5.2</td></tr>
<tr><td rowspan="2">W-T2</td><td>AM</td><td>7.61</td><td>8.98</td><td>2.6</td></tr>
<tr><td>PM</td><td>8.78</td><td>9.13</td><td>6.2</td></tr>
<tr><td rowspan="2">W-T3</td><td>AM</td><td>7.6</td><td>8.81</td><td>5.2</td></tr>
<tr><td>PM</td><td>7.61</td><td>9.00</td><td>5.6</td></tr>
<tr><td colspan="2">Environmental Reference Value</td><td>6.5-8.5</td><td>＞4.0</td><td>＜0.75</td></tr>
</table>
Survey Result: pH, SS and DO at the project site are falling below the environmental standard value.</td></tr>
<tr><td>Soil Contamination</td><td>Soil contamination is possibly caused by gasoline leaking from construction equipment or vehicles and seeping into the ground.
This contamination is caused by insufficient management of equipment; therefore, daily maintenance and inspection of all equipment related to the construction are required to avoid soil contamination.</td></tr>
<tr><td>Waste</td><td>Wastes from construction work are expected to be construction generated soil by cutting work, the felling of trees, other wastes, etc.</td></tr>
<tr><td>Noise and Vibration</td><td>As the result of the survey of noise and vibration in the project site and the quarry site, almost all of the measured values did not exceed the environmental standard value. Noise and vibration from construction equipment need to be monitored during construction, because there are many apiaries along the BO Road although there are no public facilities such as schools and hospitals. Noise tends to become bigger in proportion to the traffic volume; however, noise and vibration are not expected to impact on local residents after the construction work.
Table 1.3.4-6 Summary of the Noise and Vibration Survey Results (Project Site)
<table>
<tr><th>Point</th><th>Date</th><th>Sound Level (dBA)</th><th>Vibration Level (dBA)</th></tr>
<tr><td rowspan="2">A-T1</td><td>2014.06.23</td><td>65-77.4</td><td>79.5-81.2</td></tr>
<tr><td>2014.06.24</td><td>61.2-74</td><td>78-80.3</td></tr>
<tr><td rowspan="2">A-T2</td><td>2014.06.23</td><td>66.9-76</td><td>78.9-95.4</td></tr>
<tr><td>2014.06.24</td><td>66.2-72.6</td><td>77-91.2</td></tr>
<tr><td rowspan="2">A-T3</td><td>2014.06.23</td><td>59.3-74</td><td>79.1-80.9</td></tr>
<tr><td>2014.06.24</td><td>63-80.2</td><td>79.8-83.7</td></tr>
<tr><td colspan="2">Environmental Reference Value</td><td>75</td><td>83</td></tr>
</table>
*values: The lowest value – The highest value
Survey Result: Noise and vibration are mostly falling below the environmental standard value.</td></tr>
<tr><td>Offensive Odor</td><td>Household wastes generated in the construction camp can produce offensive odor if appropriate treatment for the wastes is not carried out.
The contractor needs to make agreement on the treatment of household wastes with the Department of Housing and Public Buildings in Jany-Djor Village adjacent to the Contractor’s camp for project implementation.</td></tr>
<tr><td>Alternatives</td><td>Refer to “1.3.2, Comparative Review of Alternatives.”</td></tr>
<tr><td>Stakeholder Consultation</td><td>Stakeholder consultation meeting was held with people living in Toktogul District on July 2, 2014. There were negative opinions and many requests for early implementation of the Project.</td></tr>
</table>

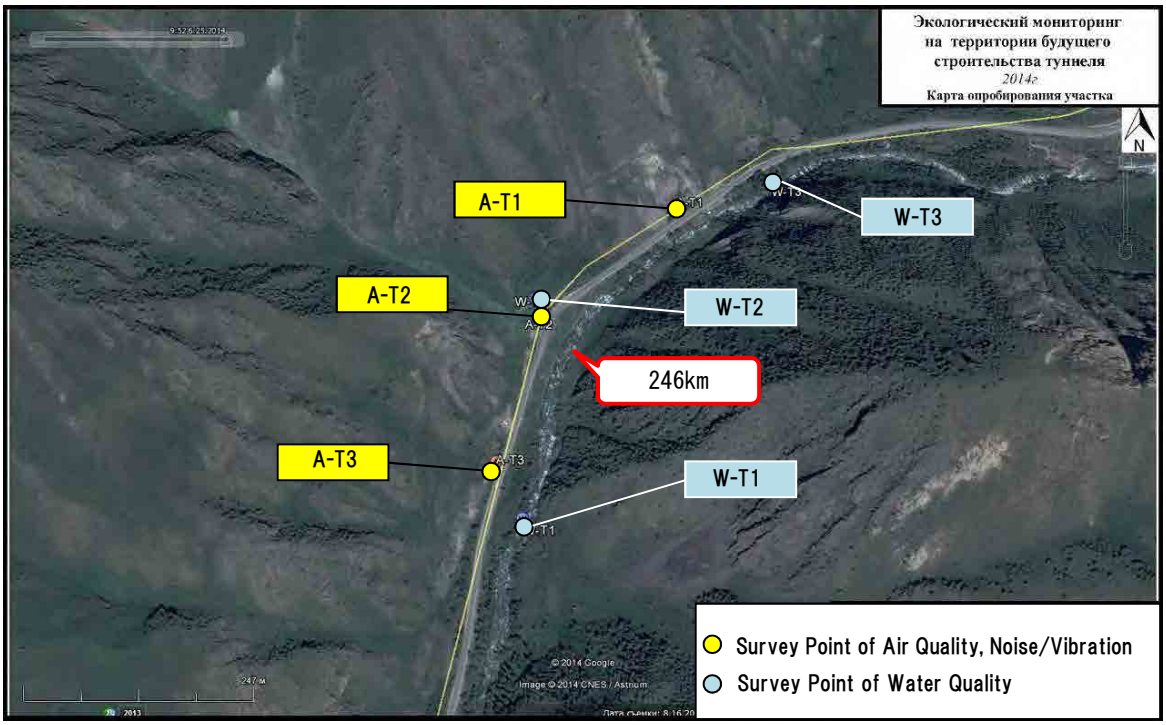


Figure 1.3.4-5 Map of the Survey Point (the Project Site)

1.3.5 Impact Evaluation and Mitigation Plan

The following table shows the re-evaluation of the scoping, based on the survey results on environmental and social considerations in the previous section, and mitigation plan for the items possibly affected.

Table1.3.5-1 Impact Evaluation and Mitigation Plan

A: Serious negative impact, B: Some negative impact, C: Uncertain negative impact、D: Little negative impact

Category	Impacts		Evaluation		Evaluation Based on the Survey		Reason		Mitigation Measures
			Pre-/At-work	In-use	Pre-/At-work	In-use	Pre-/At-work	In-use	
Social Environment	1	Involuntary Resettlement	B	B	B	B	Two households including apiaries with seven people are affected by the Project. MOTC considered relocation of those households and compensation contents and decided that alternative lands are provided for the affected people without monetary compensation.	Confirmation of the recovery conditions of living is needed when involuntary resettlement is required.	MOTC shall compensate losses for affected people according to the JICA Guidelines. The provision of alternative relocation site by MOTC and Toktogul District was determined as compensation. Reconstruction support shall also be given to those who opted for relocation.
	2	Local Economy such as Employment and Livelihood, etc.	D	D	D	D	There are no local economies affected by the Project.		-

Category	Impacts		Evaluation		Evaluation Based on the Survey		Reason		Mitigation Measures
			Pre-/At-work	In-use	Pre-/At-work	In-use	Pre-/At-work	In-use	
	3	Land Use and Utilization of Local Resources	B	D	B	D	There is some impact on land use because unutilized land is developed for a quarry site. On the other hand, existing facilities are used for temporary stockyards and plant facilities with no new land use.	No land use is expected	Consultants and contractors shall prepare the appropriate construction plan and execute the appropriate construction management so as to minimize land development.
	4	Water Usage or Water Rights and Common Rights	B	D	D	D	Use of Water from Chychkan River or Kochku-Bulak Stream for sprinkling during construction is expected; however; there is no particular impact on local people.	No water use is planned during construction	
	5	Social Institutions such as Social Infrastructures and Local Decision-making Institutions	D	D	D	D	There are no social institutions affected by the Project.		-
	6	Existing Social Infrastructures and Services	B	D	B	D	Accidents may occur because the existing road is partly included when bypass route along the river is constructed	Negative impacts on existing social infrastructures and services are not expected	- In order to mitigate traffic congestion, the contractor shall take measures through advance consultation with MOTC and the local police. - Limit speed for construction vehicles and place signs and protective facilities to avoid accidents.
	7	Poverty Group	D	D	D	D	There are no poverty groups in affected people.		-
	8	Indigenous and Ethnic People	D	D	D	D	There are no indigenous and ethnic people affected by the Project.		-

Category	Impacts		Evaluation		Evaluation Based on the Survey		Reason		Mitigation Measures
			Pre-/At-work	In-use	Pre-/At-work	In-use	Pre-/At-work	In-use	
	9	Misdistribution of Benefit and Damage	D	D	D	D	Nothing brings misdistribution of benefit and damage to the project site.		-
	10	Local Conflict of Interests	D	D	D	D	No local conflict of interests is expected around the project site.		-
	11	Cultural Heritage	B	D	B	D	Memorial monuments for the avalanche victims need to be relocated.	No impact on cultural heritage is expected.	When relocation is needed, the consultant and contractor shall prepare the plans for relocation, storage, and reinstallation to minimize impacts on the monuments.
	12	Landscape	B	B	D	D	Existence of construction equipment in the work site may impact on surrounding scenery, but there is no particular impact because the site is not a scenic area.	Snow Shed may change the sight, but there is no particular impact because the site is not the scenic area.	-
	13	Accident	B	D	B	D	Consideration for accident during construction and avalanche is required.	Reduction of accident is expected by improving traffic potential.	The contractor shall conduct the following mitigation measures for the prevention of accidents during construction: administration of medical supplies and safety equipment for working at height; provision of enough traffic guides, emergency response measures, safety education, meeting every morning and activity for danger prediction such as the installation of road signs. Also, an environment, health and safety manager shall be appointed for sanitary and environmental issues and to record and report accidents during the construction.

Category	Impacts		Evaluation		Evaluation Based on the Survey		Reason		Mitigation Measures
			Pre-/At-work	In-use	Pre-/At-work	In-use	Pre-/At-work	In-use	
	14	Infectious Diseases such as HIV/AIDS	B	D	B	D	An infected worker may flow into construction camp.	No negative impact on workers is expected.	The spread of HIV infection is possibly caused by unprotected sexual activities with workers who are possibly HIV positive and needle sharing among drug users. Therefore, the contractor shall strictly control the use of drugs. Also, the contractor shall invite experts and the police to teach and educate newly admitted persons and implement the campaign to prevent unprotected sexual activities and give workers contraceptives in advance.
	15	Work Environment (incl. Work Safety)	B	D	B	D	Consideration on work environment is needed to prevent occupational injury or accidents.	No negative impact on workers is expected.	The contractor shall require workers to wear working clothes and helmets for the prevention of injuries or accidents and implement enlightening activities of occupational health through morning meetings or lectures. Emergency response system to accidents shall be established.
	16	Gender	B	D	B	D	Gender discrimination in wages may occur among workers.	Work to cause gender disparities is not planned.	The contractor shall regularly monitor the wage ledgers of the original, sub- and sub-subcontractor so as to prevent wage disparities between men and women workers of particularly sub and sub-subcontractor, which is difficult to manage.
	17	Children’s Right	D	D	D	D	No impact on children's right is expected.		-
	18	Sanctuary	D	D	D	D	There are no national parks or sanctuaries around the project site.		-

Category	Impacts		Evaluation		Evaluation Based on the Survey		Reason		Mitigation Measures
			Pre-/At-work	In-use	Pre-/At-work	In-use	Pre-/At-work	In-use	
Natural Environment	19	Ecosystem	B	D	B	D	Lumbering of 5 archa, rare species is expected. When archa is needed to be cut down, MOTC needs to obtain the approval for cutting down archa. MOTC is planning to newly plant a total of 25 seedlings.	No impact on ecosystem is expected.	The consultant and the contractor shall prepare the appropriate construction plan and execute the appropriate construction management so as to prevent unneeded lumbering of trees.
	20	Hydrological Situation	B	D	B	B	There is less impact on hydrological situation by the outflow and inflow of sediment. Kochku-Bulak Stream may be affected by the Project.	Kochku-Bulak Stream may be affected by the Project.	A drainage plan shall be prepared by the contractor so as to minimize the impact on Kochku-Bulak Stream and construction management shall be executed taking water flow into consideration.
	21	Topography and Geographical Features	D	D	D	D	Topography and geographical features may not be affected because large cutting and embankment are not planned.		-
Pollution	22	Trans boundary Impact and Global Warming	C	D	B	D	The global warming gas emission from construction vehicles is anticipated.	Increase of traffic is expected; however, decrease of global warming gases is expected because of reduction in the use of snow blowers and of traffic congestion caused by traffic regulations at the time of avalanche.	The consultant and the contractor shall predict the emission of global warming gas by the construction work, specify the measures capable of reducing the emission and endeavor to reduce it.
	23	Air Pollution	B	D	B	D	Current air quality is currently falling below the reference values; however, the spread of the global warming gas	Increase of traffic is expected; however, decrease of air pollution is also expected because of reduction in the use	The consultant and the contractor shall strictly maintain and manage construction equipment and avoid unnecessary work for them. Water shall be sprinkled and construction equipment

Category	Impacts		Evaluation		Evaluation Based on the Survey		Reason		Mitigation Measures
			Pre-/At-work	In-use	Pre-/At-work	In-use	Pre-/At-work	In-use	
							from construction equipment is expected. Increase of CO2 emission from construction vehicles is anticipated.	of snow blowers and improvement of traffic ability.	shall be covered with fling-up dust prevention facility. Furthermore, early greening shall be effectively carried out in addition to the avoidance of unnecessary traffic and the limitation of speed of construction vehicles.
	24	Water Pollution	B	D	B	D	Drainage from the construction site is anticipated to be a potential source of water pollution.	Work that will affect water quality is not expected.	The consultant and the contractor shall discharge drainage from the construction site after clarifying turbid water through a turbid water treatment apparatus for the mitigation of impact on water quality. Also they shall prohibit leaving containers of fuel or lubricant, parking and washing vehicles and leaving construction wastes.
	25	Soil Contamination	B	D	B	D	Leakage of asphalt or gasoline from construction equipment is anticipated.	Work that will affect soil is not expected.	The consultant and the contractor shall strictly conduct daily maintenance and inspection of e construction equipment to avoid the leakage of gasoline from them. Also, they shall store fuel and chemicals in a fenced storage with waterproof equipment.
	26	Waste	B	D	B	D	Wastes from the construction work or workers are expected.	Wastes are not expected.	The consultant and the contractor shall bring construction wastes to the specified disposal site and appropriately treat them. Also, by-products such as trees shall be reused as much as possible.
	27	Noise and Vibration	B	D	B	D	Noise and vibration from construction equipment are expected.	Noise and vibration that will affect local people are expected.	The consultant and the contractor shall measure noise of construction equipment during construction and prevent noise with the use sound proof cover as necessary in addition to noise reducing devices and construction work with low noise.

Category	Impacts		Evaluation		Evaluation Based on the Survey		Reason		Mitigation Measures
			Pre-/At-work	In-use	Pre-/At-work	In-use	Pre-/At-work	In-use	
	28	Ground Subsidence	D	D	D	D	Ground subsidence is not expected because the project site is on gravelly ground.		-
	29	Offensive Odor	C	D	B	D	Offensive odor may be generated from wastes or exhaust gas from construction equipment.	Offensive odor is not expected.	The consultant and the contractor shall strictly maintain and manage construction equipment and prevent unnecessary work for them. Also, they shall appropriately treat living wastes for offensive odor prevention.
	30	Bottom Sediment	D	D	D	D	Work to affect bottom sediment is not expected.		-

1.3.6 Environmental Management Plan and Monitoring Plan

Draft Environmental Management Plan on the impacts to environmental Items, expected impacts, mitigation measures, monitoring parameters and the implementation organization based on the survey result are proposed below. The plan shall be made and implemented by MOTC, the Consultant or the Contractor, and the contents of the plan needs to be reported to the Toktogul District.

The consultant and the contractor shall prepare a Draft Environmental Management Plan and get approval from MOTC, supervise the status of the implemented monitoring and take correction measures when the monitoring is not conducted as planned. They shall also prepare an environmental report every ten (10) days, monthly and annually, and MOTC shall confirm the reports and give instructions to taking of measures of correction, if necessary.

These environmental countermeasures are generally included in the construction plan, and the cost is included in the construction cost.

Table1.3.6-1 Environmental Management Plan / Environmental Monitoring Plan

Environmental Items		Expected Impacts	Mitigation Measures	Implementing Organization	Monitoring Contents - Frequency
1	Involuntary Resettlement	Affected household: 2 Affected person :7	Implementation of involuntary resettlement according to the JICA GL; alternative lands where affected people can live with the living standards equal to or more than that of present life shall be prepared for affected people by MOTC together with the Toktogul District. Compensation for reestablishment of lives is included.	MOTC	<u>At- work</u> - Confirmation of living conditions and their income - every month - Confirmation of grievances - every month <u>In-use</u> *When recovery of livelihood is not confirmed at work - Confirmation of living conditions and their income - every month for two years - Confirmation of grievances - every month for two years - Consideration of the necessity for additional countermeasures for the recovery of livelihood.
2	Land Use and Utilization of Local Resources	Use of undeveloped lands as the quarry site.	Preparation of the construction plan and execution of the construction management so as to minimize land development.	Consultant and Contractor	- Confirmation of land use as the quarry – every month

Environmental Items		Expected Impacts	Mitigation Measures	Implementing Organization	Monitoring Contents - Frequency
3	Existing Social Infrastructures and Services	Use existing road as the temporary bypass.	- Advance consultation with MOTC and the local police. - Limitation of speed of construction vehicles, installation of signs and protective facilities.	Contractor	- Confirmation of the number of grievances against traffic congestion on the temporary road / every time when an grievance is accepted
4	Cultural Heritage	Relocation, storage and reinstallation of the monuments of avalanche victims.	Appropriate plan and implementation of relocation, storage and reinstallation.	MOTC	- Confirmation of plan and implementation of the monuments of the avalanche victims - when the plan is formulated and after construction
5	Accident	Accidents and avalanche during construction.	- Administration of medical supplies and safety equipment for working at height, provision of enough traffic guides emergency response measures, safety education, meeting every morning and activity for danger prediction such as the installation of road signs. - Record and report of accidents by the environment, health and safety manager.	Contractor	- Confirmation the safety and health plan – every month - Report of accidents - when accidents occur
6	Infectious Diseases such as HIV/AIDS	Influx of workers who are HIV positive.	- Strict control of the use of drugs. - Implementation of the campaign to prevent unprotected sexual activities by the experts and police	Contractor	- Confirmation of implementation status of control of the drug use and the campaign – every month
7	Work Environment (incl. Work Safety)	Injuries and accidents of workers.	- Requirements of wearing working clothes and helmets for workers - Implementation of enlightening activities of occupational health - Establishment of an emergency response system when accidents occur.	Contractor	- Confirmation of wearing state of working clothes and helmets/ everyday - Confirmation of implementation status of enlightening activities – every month - Report of accidents - when accidents occur
8	Gender	Wage disparities between men and women workers.	Regular monitoring of the wage ledgers of the original, sub and sub-subcontractor.	Consultant	- Confirmation of the wage ledgers - every month
9	Ecosystem	Felling of trees.	- Preparation of a construction plan taking the schedule of lumbering of and planting of archa into consideration. - Systematic lumbering of archa and planting of seedlings and appropriate construction management after planting.	Consultant and contractor	- Confirmation of the planting plan of archa and the implementation status of planting - when the plan is formulated and after planting
10	Hydrological Situation	Change of water flow of Kochku-Bulak Stream	Preparation and appropriate execution of the drainage plan.	Consultant and contractor	- Confirmation of water flow by visual observation - everyday

Environmental Items		Expected Impacts	Mitigation Measures	Implementing Organization	Monitoring Contents - Frequency
11	Air Pollution	Spread of global warming gas by construction equipment	- Strict maintenance and management of the construction equipment and prevention of unnecessary work for them. - Water sprinkling and the use of covering material -Air quality monitoring quarterly	Consultant and contractor	- Confirmation of air by visual observation - everyday - Water sprinkling for dust generation point - when needed - Air quality monitoring (SO2,CO,SPM) (three points) - quarterly
12	Water Pollution	Water pollution by drainage	- The use of a turbid water treatment apparatus, etc. - Water quality monitoring monthly	Consultant and contractor	- Water quality monitoring (pH, SS, DO) (three points) - monthly
13	Soil Contamination	Soil contamination by leaking asphalt or gasoline from the construction equipment into the soil.	- Strict conduct of the daily maintenance and inspection of the construction equipment.	Consultant and contractor	Monitoring of leaking status - everyday
14	Waste	Construction wastes and living wastes.	- Appropriate treatment of wastes at the specified disposal - Reuse of lumbered trees etc.	Contractor	- Confirmation of the record of waste transportation - every month
15	Noise and Vibration	Noise and vibration by the construction equipment.	- The use of sound proof covers, etc. - Adoption of noise reducing device and construction work with low noise. - Noise and vibration monitoring quarterly	Consultant and contractor	Noise and vibration monitoring (three points) - quarterly
16	Offensive Odor	Offensive odor from emitted gas or waste.	- Strict maintenance and management of construction equipment and prevention of unnecessary work for them. - Appropriate treatment of living wastes. - Waste management and monitoring monthly	Contractor	- Confirmation of the record of waste management - every monthly

The above draft environmental management plan is the preliminary plan. The detail plan shall be determined in consideration of the requirement of environmental protection by MOTC before the start of construction work.

1.3.7 Stakeholder Consultation

The first stakeholders' consultation meeting was implemented for local people of the objective area, Toktogul District, by MOTC after the Project was explained to Toktogul City on July 2, 2014. After approval of the EIA, the second stakeholders' consultation meeting was held on November 21, 2014 and the method of compensation was explained to the attendees.

Three (3) consultation meetings were planned and the third will be held before the start of construction work. The implementation schedule is shown in Table 1.3.7-1.

Table 1.3.7-2 and Table 1.3.7-3 give a summary of the first and second stakeholder consultation meetings, respectively.

Table 1.3.7-1 Implementation Schedule of Stakeholder Consultation Meeting

	Date / Time	Place	Contents
1st	July 2, 2014 / 14:00 -	Toktogul City	- Explanation of the project summary - Explanation of the contents of the EIA survey
2nd	November 21, 2014 / 13:00 -	Toktogul City	- Explanation of the EIA survey results - Explanation of compensation policy
3rd	Undecided (before start of construction)	Undecided	- Explanation of the detail of the Project, etc.

Table 1.3.7-2 Summary of the First Stakeholder Consultation Meeting

Date/Time	July 2, 2014 / 14:00-	
Place	Toktogul Regional Office, Toktogul City	
Attendees	Deputy Governor of Toktogul District, Local people in Toktogul District, Personnel of relevant administrative organizations	
Contents	-Explanation of the project summary -Explanation of the contents of the EIA survey	
Language	Russian	
Opinions	Question 1:	When will the construction start? Immediate implementation is desired.
	Answer:	Construction will start in 2016.
	Question 2:	Will Japanese contractors implement the construction work? The use of local contractors is desired for the employment of countermeasures.
	Answer:	The prime contractor will be Japanese because the Project will be implemented as a grant aid project of Japan. However, Kyrgyz companies will be included as cooperative companies.
	Question 3:	Are there any countermeasures to maintain the water quality of Chychkan River? The maintenance of water quality of the river and Kochku-Bulak Stream is desired.
	Answer:	The drainage from the construction site is planned to be discharged into Chychkan River after clarifying turbid water through a turbid water treatment apparatus, etc.
	Question 4:	What scale of avalanche can the Snow Shed withstand?
	Answer:	The Snow Shed is designed to withstand the magnitude of one of the greatest avalanches in the past, which is 42m of debris height based on the hearing survey.
	Question 5:	Occurrence of avalanche of earth and rocks is anticipated in the objective area. Can the Snow Shed withstand sediment deposition?
	Answer:	The Snow Shed can withstand sediment deposition because 42m of debris height is equivalent to about 15m of earth covering.

Table 1.3.7-3 Summary of the Second Stakeholder Consultation Meeting

Date/Time	November 21, 2014 / 13:00-	
Place	Toktogul Regional Office, Toktogul City	
Attendees	Head of Jany-Djor Village in Toktogul District, local people in Toktogul District, personnel of relevant administrative organizations	
Contents	-Explanation of the survey result for EIA -Explanation of compensation	
Language	Russian	
Opinions	Question 1:	Who will prepare the compensation cost?
	Answer:	MOTC will prepare compensation cost because the Kyrgyz republic is in charge of land acquisition for the Project.
	Question 2:	Which land will be provided to affected people?
	Answer:	SAEPF and Toktogul District will considerate and select land where negative impact to the affected people is not expected.
	Question 3:	The affected people have fences. Are they given any assistance?
	Answer:	DEP23 will assist the affected people to remove and relocate fences.
	Question 4:	Will the Project start in 2015?
	Answer:	It is planned to carry out the relocation of cables and the temporary removal of monuments from 2015 in preparation for the construction.

1.3.8 Land Expropriation and Resettlement

In this section, the land expropriation and resettlement of the project are described. Their description is required in the JICA GL although not required in the legislation of the Kyrgyz Republic.

1.3.8.1 Necessity of Land Expropriation and Resettlement

The project site is state land. Therefore, land expropriation is not required. However, involuntary resettlement is required because there are people who rent and live in the land. MOTC shall securely implement relocation and provide compensation according to the agreement signed in November, 2014.

The contractor and the consultant have the responsibility to prepare the required documents from the regional office of SAEPF and the local authority before the start of construction work. MOTC has the responsibility to obtain the license for quarry operation from SAGMR.

1.3.8.2 Legal Framework on Involuntary Resettlement

Involuntary resettlement in the Kyrgyz Republic is conducted based on the Constitution of the Kyrgyz Republic (2010.6.27), the Civil Code of the Kyrgyz Republic No. 16 (1992.6.2), and the Land Code of the Kyrgyz Republic No. 45 (1992.6.2). Recently, it has been conducted based on the regulation of MOTC or the guidelines of the donor of each project in addition to the legislations; therefore, the Project is also based on these regulations and the guidelines.

The differences between the laws and guidelines of the Kyrgyz Republic and the JICA GL are shown in Table1.3.8-1.

Table1.3.8-1 Comparison between Laws and Guidelines of the Kyrgyz Republic and the JICA Guidelines

No.	JICA Guidelines	Laws and Guidelines of the Kyrgyz Republic	Difference with the JICA GL	Project Policy
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	The Constitution of Kyrgyz Republic (KR), Land Code, Civil Code	None	Same as JICA GL
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	The Constitution of KR, Land Code, Civil Code	None	Same as JICA GL
3.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	The Constitution of KR, Land Code, Civil Code	None	Same as JICA GL
4.	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	The Valuation of properties is carried out according to market value and market price based on the decrees, Government Resolution No. 537 as of 21 August 2003 and No. 217 as of 03 April 2006.	None	Same as JICA GL
5.	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	The Constitution of KR, Land Code, Civil Code	None	Same as JICA GL
6.	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	Not specified	Necessity of preparing resettlement action plan is not clear.	Same as JICA GL
7.	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	Not specified	Necessity of consultations is not clear.	Same as JICA GL
8.	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	Not specified	Necessity of consultations is not clear.	Same as JICA GL
9.	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	Not specified	Necessity of consultations is not clear.	Same as JICA GL

No.	JICA Guidelines	Laws and Guidelines of the Kyrgyz Republic	Difference with the JICA GL	Project Policy
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	Grievance Redress mechanism will be established by MOTC based on the Order of the MOTC No. 95 (04 October 2012) and the Act of KR No. 67 (05 April 2007).	Treatment of these vulnerable groups is not clear.	Same as JICA GL
11.	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advantage of such benefits. (WB OP4.12 Para.6)	"Cut-off date" is not specified in the Kyrgyz Republic. However, "cut-off date" has been set by MOTC based on the donor policy in many projects, and affected people have been identified and recorded through an initial baseline survey from the date.	Identification of affected people is not clear, but there is no difference in actual conditions.	Same as JICA GL
12.	Eligibility of benefits include the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under the law), the PAPs who do not have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Only the PAPs who have formal right to property are eligible for compensation. (Land Code)	PAPs who do not have formal legal rights to land at the time of census are not eligible for compensation.	All PAPs will be eligible for compensation and rehabilitation assistance, regardless of tenure status under the JICA Guidelines.
13.	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	Not specified.	Land-based resettlement is not clear.	Same as JICA GL
14.	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	Not specified. PAPs have only the right to receive compensation of losses.	Support for the transition period is not provided.	Same as JICA GL
15.	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities, etc. (WB OP4.12 Para.8)	Not specified. However particular attention has been paid to the needs of the vulnerable groups as necessary.	Attention to the vulnerable groups is not clear, but there is no difference in actual conditions.	Same as JICA GL

1.3.8.3 Range of Impacts

Cut-off date of the Project is set on the day of the second stakeholder consultation meeting in the middle of November, 2014. Since the inflow of new population is not expected, the household interview survey and the assets inventory survey were conducted after the first stakeholder consultation meeting. The results of the surveys are as shown below.

(1) Household Interview Survey

Two (2) affected households and seven (7) affected persons were found in the household interview survey. The information on households and the number of affected people by age are shown below.

Table1.3.8-2 Information of Households

	Place	Sex	Age	Marital Status	Family Structure
1	Bishkek City Side (End Point Side)	Female	30	Married	Household Spose Daughters (2) Sons(2)
2	Toktogul City Side (Starting Point Side)	Male	48	Married	Household *Others are in Bishkek

Table1.3.8-3 Number of Affected People by Age

Age	Number
0-4	2
5-9	1
10-14	1
15-19	0
20-24	0
25-29	0
30-34	1
35-39	1
40-44	0
45-49	1
50 or over	0
Total	7

(2) Assets Inventory Survey

The state of assets of affected people is shown below.

Table 1.3.8-4 State of Assets of Affected People

	Bishkek City Side (End Point Side)	Toktogul City Side (Starting Point Side)
Sex of Household	Female	Male
Number of Residents	6 including 4 children	1 (Disabled) *Others are in the other house. Wife is disabled.
Stay Period	From May to October every year	From June to September (2014)
Land	- Area: 800m^2 - Ownership pattern: lease from the Toktogul Forestry until 2016 and plan to lease after 2016	- Area: 800m^2 - Ownership pattern: temporary lease from a third person who leased the land from Toktogul Forestry for three months.
Building	- House: 3, Doghouse: 1 - Display base of honey: 1 - Beehive: 40	- House: 1 *movable by a tractor - Display base of honey: 1 - Beehive: 120
Crop	- Onion: 2m^2 - Garlic: 0.5 m^2 - Radish: 0.5 m^2	None
Tree	- Cassis: 13 trees, 15 m^2 - White birch: 5 trees, 2 m^2 - Flower: 1 m^2 *All of the above are for greening with guidance from the Forestry.	None
Income	Honey selling: 30,000KGS/month (in stay period)	- Honey selling: 200,000-300,000KGS/three months (in stay period) - Disability benefits
Appearance		

(3) Other Affected Items

1) Monuments

There are two monuments of avalanche victims in the objective area. MOTC and Toktogul District investigated the monuments. However, no record of installation was found and the installation personnel were not identified. It was judged that they were installed without any permission. Therefore, their temporary removal and reinstallation were permitted by Toktogul District even if permission from the installation personnel is not provided.

Photo 1.3.8-1 Monuments

2) Archa

Archa is protected by the prohibition of cutting, transportation, utilization, purchasing and selling of particular valuable wood species (walnut and archa trees) in Kyrgyz Republic and there are some in the project site. Five (5) of them are required to be cut down during the Project. MOTC need to apply to SAEPF for the felling of archa and consider compensation contents before implementing the Project.

1.3.8.4 Contents of Compensation and Assistance

Compensation contents are shown below. The land that the affected people use is managed by the Forestry Office. Therefore, the people will lose the right of land use when the lease contract with the forestry is terminated. The provision of alternative lands is adopted as the compensation for everything including compensation for the buildings, relocation cost, mobilization cost and so on.

Table 1.3.8-5 Compensation Contents

Affected Items	Compensation Contents	Responsible Institutions
Affected People	-Basically, alternative lands where affected people can live with the living standards equal to or more than that of present life shall be provided near the current place to stay, in Jany-Djor village. The alternative lands shall be used from 2015. -MOTC (DEP23) shall prepare vehicles and manpower to help affected people transfer houses. - No compensation for crops is required because they are annual plants and lands for them are small. No compensation for trees is required because they are for greening. (Affected people in Bishkek side)	- MOTC - Jany-Djor Village in Toktogul District
Monuments	-No compensation because the monuments were installed without any permission. - They are temporarily removed and stored during construction and reinstalled after construction.	- MOTC - Toktogul District
Archa	- Planting of 5 trees per one archa which are about 15 year-old trees and 1m height, total 25 trees. - 35,000KGS is expected as the cost of planting 25 trees including the planting fee 10,000KGS.	MOTC

1.3.8.5 Grievance Redress Mechanism

A grievance redress group (GRG) will be established for the duration of project implementation. Firstly, the complaint, etc., will be received in the community that the affected people belong to and will be submitted to the Local GRG if the complaint is not resolved in three (3) days. The Local GRG discusses the complaint with the person who submitted it and seeks a resolution listening to opinions from the local Roads Maintenance Unit and the representative of affected persons (Stage 1, Local Level). If the complaint is not resolved in fifteen (15) days, the complaint will be submitted to the Central GRG, MOTC headquarters and the solution will be determined after the approval of MOTC-IPIG (Stage 1, Central Level).

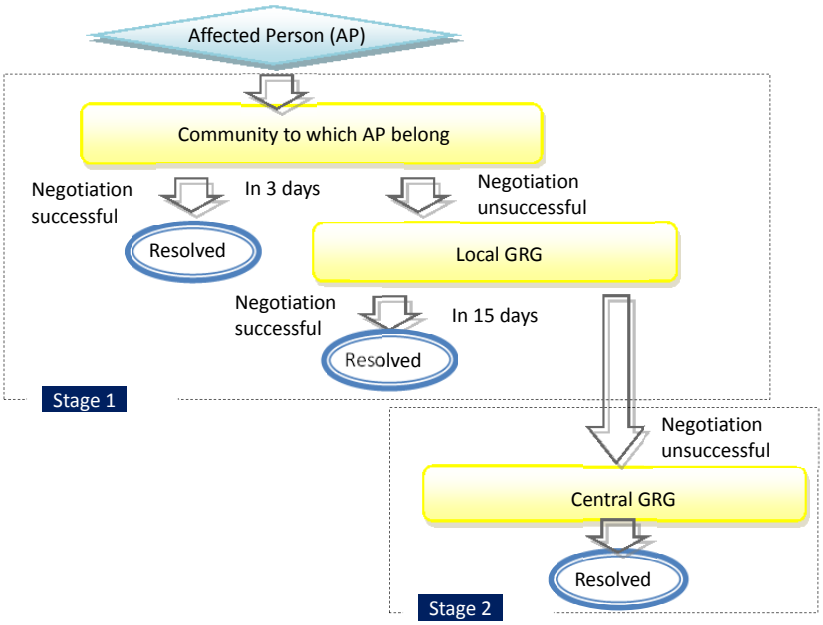


Figure 1.3.8-1 Grievance Redress Process

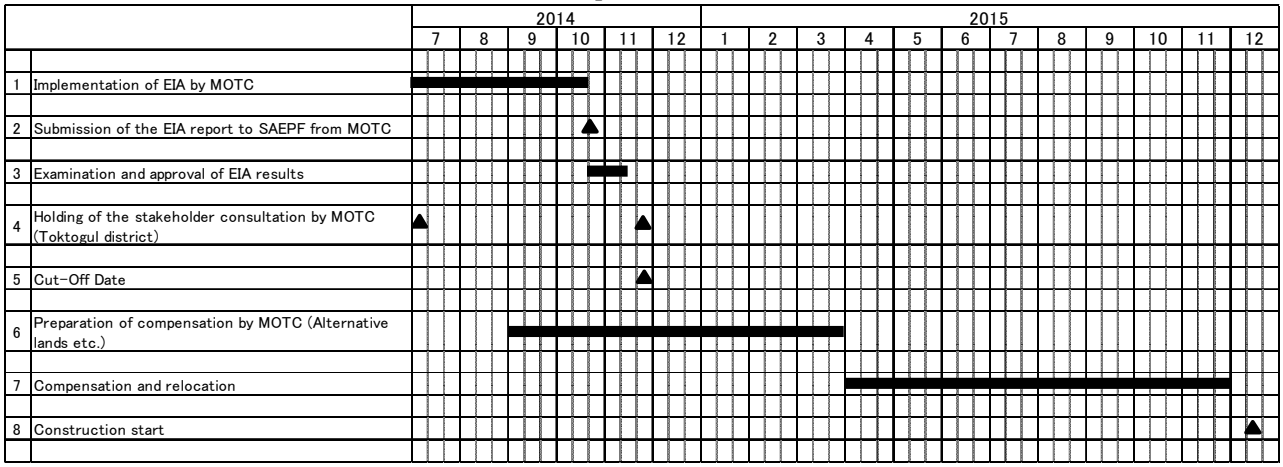
1.3.8.6 Implementing System

Involuntary resettlement shall be conducted by MOTC-IPIG until the Exchange of Notes (E/N) between the GOK and the GOJ is concluded and it shall be conducted by MOTC-IPIG or another group of MOTC after the E/N.

1.3.8.7 Implementing Schedule

Various applications and compensation conducted by MOTC were confirmed. The agreed implementation schedule is shown in the following table, and includes compensation and relocation from spring, the 3rd stakeholder consultation meetings before construction and the start of construction in December 2015.

Table1.3.8-6 Implementation Schedule



1.3.8.8 Costs and Funds

The survey team explained that MOTC should prepare the relocation cost of apiaries and other costs for compensation based on the JICA GL and agreement was obtained.

1.3.8.9 Monitoring System of Implementing Organization

Confirmation of living conditions after relocation and grievances shall be monitored by MOTC during construction. When recovery of livelihood is not confirmed at work, the quarterly monitoring shall be continued for two years.

1.3.8.10 Others

(1) Draft Monitoring Form

1) Pollution

i) Air Quality (Emission Gas/Ambient Air Quality)

Item	Measured Value (Mean)	Measured Value (Max.)	Country's Standards*1	Referred International Standards (Japan)	Remarks (Measurement Point, Frequency, Method, etc.)
SO_2	A-T1 :	A-T1 :	0.5 mg/m^3	0.04 ppm	-Point: the same point as the baseline survey (3 points) -Frequency: See *1 -Method: the same method as the baseline survey (3 times 2 days)
	A-T2 :	A-T2 :			
	A-T3 :	A-T3 :			
CO	A-T1 :	A-T1 :	5 mg/m^3	10 ppm	
	A-T2 :	A-T2 :			
	A-T3 :	A-T3 :			
SPM	A-T1 :	A-T1 :	0.5 mg/m^3	0.10 mg/m^3	
	A-T2 :	A-T2 :			
	A-T3 :	A-T3 :			

*1: Quarterly or adjusted based on air pollutant-generating activities. Semi-annually in 2 years (in-use).

ii) Water Quality (Effluent/Wastewater/Ambient Water Quality)

Item	Measured Value (Mean)	Measured Value (Max.)	Country's Standards*1	Referred International Standards (Japan)	Remarks (Measurement Point, Frequency, Method, etc.)
pH	W-T1：	W-T1：	6.5-8.5	6.5-8.5 (6.5-8.5)	-Point: the same point as the baseline survey (3 points) -Frequency: monthly -Method: the same method as the baseline survey
	W-T2：	W-T2：			
	W-T3：	W-T3：			
SS	W-T1：	W-T1：	＜0.75	<25 mg/l (<50 mg/l)	
	W-T2：	W-T2：			
	W-T3：	W-T3：			
DO	W-T1：	W-T1：	＞4.0	>5 mg/l (>5 mg/l)	
	W-T2：	W-T2：			
	W-T3：	W-T3：			

*1: Country's Standards: Maximum permissible concentration (MPC) of chemicals in Water of drinking and cultural and community uses. Hygiene regulations GN 2.1.5.1315-03
Referred International Standards (Japan): Class B (Class C). Class4 (Class C applied for management standards)

iii) Soil

Monitoring Item / Frequency	Monitoring Results during Report Period
Monitoring of the leaking status / everyday	

iv) Waste

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of the record of waste transportation / every month	

v) Noise and Vibration

Item	Measured Value (Mean)	Measured Value (Max.)	Country's Standards*1	Referred International Standards (Japan)	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level	A-T1：	A-T1：	75dB	45-55 dB	-Point: the same point as the baseline survey (3 points) -Frequency: quarterly -Method: the same method as the baseline survey
	A-T2：	A-T2：			
	A-T3：	A-T3：			
Vibration level	A-T1：	A-T1：	83 dB	60-65 dB	
	A-T2：	A-T2：			
	A-T3：	A-T3：			

*1: Country's Standards: Maximum allowable vibration levels of work places Category 3 - technological type "B"
Referred International Standards (Japan): Region A (residential area)

vi) Odor

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of the record of waste management / every month	

2) Natural Environment

i) Ecosystem

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of the planting plan of archa and the implementation status of planting / when the plan is formulated and after planting	

ii) Hydrological Situation

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of water flow by visual observation / everyday	

3) Social Environment

i) Living / Livelihood

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of living conditions and their income / every month	
Confirmation of grievances / every month for two years	

ii) Land Use and Utilization of Local Resources

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of land use as the quarry / every month	

iii) Existing Social Infrastructures and Services

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of the number of grievance against the traffic congestion on the temporary road / every time when a grievance is accepted	

iv) Cultural Heritage

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of plan and implementation of the monuments of the avalanche victims / when the plan is formulated and after construction	

v) Accidents

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation the safety and health plan / every month	
Report of accidents / when accidents occur	

vi) Infectious Diseases such as HIV/AIDS

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of implementation status of control of drug use and the education campaign / every month	

vii) Work Environment

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of wearing state of working clothes and helmets / everyday	
Confirmation of implementation status of enlightening activities / every month	
Report of accidents / when accidents occur	

viii) Gender

Monitoring Item / Frequency	Monitoring Results during Report Period
Confirmation of the wage ledgers / every month	

(2) Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) The EIA Survey was carried out and the report of the survey was prepared with the instruction of the contents of EIA from SAEPF based on the law of the Kyrgyz Republic No. 54 “Environmental Review”, 1999 and Instructions establishing modalities for assessment of proposed activities on the environment (EIA) in the Kyrgyz Republic, 1997 No. 386. (b) The EIA report was submitted to SAEPF in October 2014 and will be approved by the end of November in 2014. (c) It is unclear whether the EIA report will be unconditionally approved or not at this time, but if conditions are imposed on the approval of the report, MOTC will work to satisfy the condition. (d) The permits for cutting of vulnerable plants, archa trees, will be applied after the approval of the EIA report, in January 2014 and will be approved until March of 2015.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the Project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) The consultations with the city and stakeholders were held and understanding was obtained from the local stakeholders. (b) The comments from stakeholders were recorded as the minutes and have been reflected in the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the Project been examined with social and environmental considerations?	(a) Y	(a) Alternative plans have been examined including 'zero option'; Option 1 was selected from among the Zero Option, Option 1: arch culvert type snow shed, and Option 2: tunnel type snow shed in consideration of the traveling performance
2. Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken? (b) Where industrial areas already exist near the route, is there a possibility that the Project will make air pollution worse?	(a) Y (b) Y	(a) Some types of vehicles emit many air pollutants and may impact on air, but monitoring will be implemented to mitigate the impacts. (b) Current air quality in the project site is falling below the reference values. Increase of traffic is expected; however, decrease of air pollution is expected because of reduction in the use of snow blowers and improvement of traffic ability.
	(2) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?	(a) N (b) N (c) N/A	(a) Cut slope will be protected with slope protection work; therefore, soil runoff is controlled and impacts on water quality will be little. (b) Measures will be taken to prevent contaminated water running into water sources by equipping drainage.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(b) Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater? (c) Do effluents from various facilities, such as parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas not to comply with the country's ambient water quality standards?		(c) There are no parking and service areas around the project site.
	(3) Wastes	(a) Are wastes generated from the project facilities, such as parking areas/service areas, properly treated and disposed of in accordance with the country's regulations?	(a) N/A	(a) There are no parking areas and service areas around the project site.
	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) Y	(a) Noise and vibration from passing vehicles are not expected so as to impact on local people.
3. Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the Project will affect the protected areas?	(a) N	(a) The project site is not located in protected areas.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? (e) 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? (f) In case the project site is located at undeveloped areas, is there a	(a) N (b) Y (c) N (d) N (e) N (f) N (g) N (h) N	(a) The project site does not include ecologically valuable habitats. (b) The project site includes a habitat of one of vulnerable plants, archa, which needs to be protected in the Kyrgyz Republic. (c) There are vulnerable plants (archa) but the big impacts are not concerned because only five of them are affected. The road alignment was considered so as to minimize impacts. Also planting 5 trees per one tree cutting is scheduled. (d) There are no particular impacts such as disruption of migration routes, etc. (e) Major deforestation is not expected and the impacts on ecosystem are little although cutting work is partially needed in the construction. (f) The project site is not located at undeveloped areas. (g) The Impacts on the surrounding vegetation are little because cutting trees are required partially in cutting work section. (h) Same as the above.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		possibility that the new development will result in extensive loss of natural environments? (g) Is there a possibility that changes in localized micro-meteorological conditions, such as solar radiation, temperature, and humidity due to a large-scale timber harvesting will affect the surrounding vegetation? (Quoted from "17. Foresty") (h) Is there a possibility that a large-scale timber harvesting will result in loss of breeding and feeding grounds for wildlife? (Quoted from "17. Foresty")		
	(3) Hydrology	(a) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	(a) N	(a) Other drainage for Kochku-Bulak Stream will be secured during construction so as not to impact on the water flow. After the construction the use of drainage installed on top of the arch culvert and joining the Chychkan River are planned. There is less possibility to block flow of percolation water. However, it is likely that percolation water level suddenly becomes high. Therefore, permeable material such as gravel will be installed on both sides of snow shed to enable drainage of water underground.
	(4) Topography and Geology	(a) Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) Y (b) N (c) N	(a) Ground strength around the project site is secured. The method to prevent debris from falling will be used considering the impacts on the debris. (b) Appropriate measures such as drainage system on slope surface or slope protection will be adopted. (c) Appropriate measures such as drainage system on slope surface or slope protection will be adopted and the contractor should take measures for preventing soil runoff at disposal sites and sand pits.
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on	(a) Y (b) Y (c) Y (d) N (e) Y (f) Y (g) Y (h) Y	(a) 2 households (7 people) will be affected and need to be relocated. The road alignment was considered so as to minimize impacts. (b) The 1st stakeholder consultation meeting and hearing survey with affected people are held by MOTC. The 2nd and 3rd stakeholder consultation meetings are scheduled after submitting the EIA report to SAEPF. (c) The land that the affected people use is managed by the Forestry Office; therefore, the people lose the right of land use when the

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, elderly as well as those below the poverty line, ethnic minorities, and indigenous people? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(i) Y (j) Y	lease contract with the forestry office is terminated. The provision of alternative lands is adopted as the compensation for everything: the compensation for the buildings, relocation cost, moving cost and so on. Relocation will start from April 2015 and the recovery state of their living condition will be monitored. Detail resettlement plan such as alternative lands will be prepared by MOTC and Toktogul District. (d) Monetary compensation is not planned in the resettlement. (e) MOTC and Toktogul District will make an agreement with affected people and prepare documents after compensation contents are agreed. (f) Affected people include females and children; therefore, MOTC shall appropriately consider the plan in consideration with them. (g) There are negative comments to relocation at this time and the agreement shall be obtained. (h) MOTC will establish the organization framework and secure budget for the relocation. (i) The monitoring plan has been formulated. (j) The grievance redress committee will be established. There were no comments to the construction project; however, the committee would take actions immediately if complaints are made.
	(2) Living and Livelihood	(a) Where roads are newly installed, is there a possibility that the Project will affect the existing means of transportation and the associated workers? Is there a possibility that the Project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts? (b) Is there any possibility that the Project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary? (c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the Project? Are adequate	(a) N (b) Y (c) Y (d) Y (e) N (f) N	(a) Affected people at the project site run apiaries and sell honey at the same time. The relocation is necessary because of the Project. However, the people can live under living standards equal to or more than that of present life and hence large impacts are not expected. (b) Affected apiaries may compete with other apiaries in the new location; however, that can be avoided if the alternative lands are fully considered in advance. (c) There is no possibility that diseases will be brought. (d) A part of existing road may be used as a bypass road when a temporary bypass road is constructed along the river. In order to mitigate the traffic congestion, the contractor shall take measures through advance consultation with MOTC and the local police authorities.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		considerations given to public health, if necessary? (d) Is there any possibility that the Project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)? (e) Is there any possibility that roads will impede the movement of inhabitants? (f) Is there any possibility that structures associated with roads (such as bridges) will cause sun-shading and radio interference?		(e) No possibility. (f) No possibility.
	(3) Heritage	(a) Is there a possibility that the Project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) Y	(a) There are two monuments of avalanche victims; however, temporary removal and their reinstallation after project construction are considered with the cooperation of Toktogul City.
	(4) Landscape	(a) Is there a possibility that the Project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) There are no landscapes to be considered in the project site.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous people? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	(a) N (b) N	(a) No special measures are required because ethnic minorities do not settle in the project areas. (b) Rights do not exist to be respected because of no settlements of ethnic minorities and indigenous people.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the Project? (b) Are tangible safety considerations in place for individuals involved in the Project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the Project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers, etc.? (d) Are appropriate measures being taken to ensure that security guards involved in the Project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) Observation of laws and ordinances are the most important matters; therefore, it shall be considered in the construction management. (b) The contractor shall ensure that workers put on work wears and helmets, and to introduce devices for safety and hazard protection. (c) The contractor shall plan and practice work safety training and traffic safety in accordance with the Kyrgyz related laws and regulations in order of danger aversion for residents and workers. (d) The contractor shall conduct education and training and shall exercise control over security guards to avoid harm. In addition, in preparation for accidents involving security guards, the operator and contractor shall prepare the measures and penal rules.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) The following are expected as countermeasures against pollution during construction: - Air pollution: The consultant and the contractor shall strictly maintain and manage construction equipment and avoid unnecessary work for them. They shall sprinkle water and cover the construction equipment with a fling up dust prevention cover. Furthermore, the early greening shall be effectively carried out in addition to the prevention of unnecessary traffic and the limitation of speed of construction vehicles. -Water pollution: The consultant and the contractor shall discharge drainage from the construction site after clarifying turbid water through a turbid water treatment apparatus for the mitigation of impact to water quality. Also they shall prohibit leaving containers of fuel or lubricant, parking and washing vehicles and leaving construction wastes. - Soil Contamination: The consultant and the contractor shall strictly conduct daily maintenance and inspection of the construction equipment to prevent leakage of fuel from them. Also, they shall store fuel and chemicals in a fenced storage protected with waterproof equipment. - Waste: The consultant and the contractor shall carry the construction wastes to the specified disposal site and appropriately treat them. Also by-products such as trees shall be reused as much as possible. - Noise and Vibration: The consultant and the contractor shall measure noise produced by the construction equipment during construction and prevent noise using sound-proof cover as necessary, as well as noise reducing device and construction work with low noise. - Offensive Odor: The consultant and the contractor shall strictly maintain and manage construction equipment and avoid unnecessary work for them. Also they shall appropriately treat living wastes for offensive odor prevention. (b) Visitation zone including vulnerable plants are cut in cutting work; however, planting of seedlings shall be planned in accordance with

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				the regulations of the Kyrgyz Republic. (c) Traffic congestion and traffic accidents are expected; however, there will be no large impact because they will be brought in only the project site.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) Y	(a) The operator and contractor shall develop a monitoring plan and manage to secure the environment to avoid claims from the residents. (b) With reference to other cases, the contents of monitoring will be determined in accordance with characteristics of the project site and domestic laws. (c) Monitoring and analyzing outputs are conducted by a person with specific ability in the field. Outsourcing of personnel is available. Cost for monitoring is included in the whole construction costs because the activity is a part of the Project. (d) The contractor shall report the results of monitoring to MOTC and MOTC will manage them. Also the results of the monitoring shall be reported to the JICA team immediately after measurement.
6. Notes	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation). (b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	(a) Y (b) N	(a) Items related to forestry have been added. (b) Indicated works related to power infrastructure do not occur in the Project.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to trans-boundary or global issues should be confirmed, if necessary (e.g., the Project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) Y	(a) CO_2 emissions with the construction should be taken into account (construction work, equipment operation). Estimation of emission is to be conducted based on an engineering method.

Chapter 2 Contents of the Project

2.1 Basic Concept of the Project

2.1.1 Objective of the Project

The GOK has mentioned road development as one of the priority fields in the Mid-Term Development Plan (2013-2017), and attached importance to ensure transportation at the surrounding area and the domestic market. Ensuring the stability of winter traffic and securing the safety in the BO Road have become urgent issues. In order to improve this situation, the overall goal and objective of the Project are set forth as indicated below.

Overall Goal	The Project contributes to enhance transportation capacity to surrounding area and domestic market.
Objective of the Project	Winter transportation and safety at the 246-km point of the BO Road are improved.
Output of the Project	Avalanche protection works is constructed at STA. 245km of the BO Road

2.1.2 Scope of Japanese Assistance

The Snow Shed at the 246-km point of the BO Road which is the main arterial road connecting the capital city, Bishkek and the second largest city, Osh, is to be developed in the Project to achieve the above objective. Thus the reduction of impassable days by avalanche disasters, the increase of traffic volume in winter season and the reduction of maintenance cost to remove snow are expected. The summary of the facilities to be developed is given in the following table.

Table 2.1.2-1 Scope of the Project under Japanese Grant Aid

Item		Specifications
Location		Sta. 246km of Bishkek-Osh Road
Road Width	Inside of the Snow Shed	Roadway: 7.0m (3.5m*2) Roadside: 1.0m (0.5m*2) Sidewalk: 1.5m (0.75m*2) Total: 9.5m
	Approach Road	Roadway: 7.0m (3.5m*2) Roadside: 1.0m (0.5m*2) Sidewalk: 4.0m (2.0m*2) Total: 12.0m
Structure Type		Arch-Culvert Type
Project Length		Snow Shed: 460m Connecting Road (Bishkek side): 190m Connecting Road (Toktogul side): 360m Total: About 1,010m
Pavement		The Snow Shed Inside: Concrete Pavement (t=18cm) Approach Road: Asphalt Pavement (Surface Course: t=6cm, Base Course: t=8cm, Upper Sub-base: t=20cm, Lower Sub-base: t=25cm)
Lighting		Inside the Snow Shed and at both portals
Others		Gravity Retaining Wall (L=208m); Leaning Type Revetment Works (L=73m); Prevention Fence for Falling Stones (L=155m); Drainage (about 3,500m); Maintenance Road (L=1,146m); U-Turn Space (2,632m^2)
Applicable Criteria		Design Standard of the Kyrgyz Republic

2.2 Outline Design of Japanese Assistance

The following policies were developed for the Outline Design of the Project taking into account the special characteristics of large-scale disaster prevention along the main arterial road in Kyrgyz.

2.2.1 Design Policy on Avalanche Protection

2.2.1.1 Definition of Scope of the Project

(1) Mechanism of Avalanching Flowage and Reaching

Large scale avalanches wash away with the surrounding snow, air, trees and sediment and, in some cases, might transfer big rocks weighing a few tons denudated from slope surface up to the roadside. The magnitude of avalanche at STA. 246km has been demonstrated by big rocks deposited on the slope by the road.

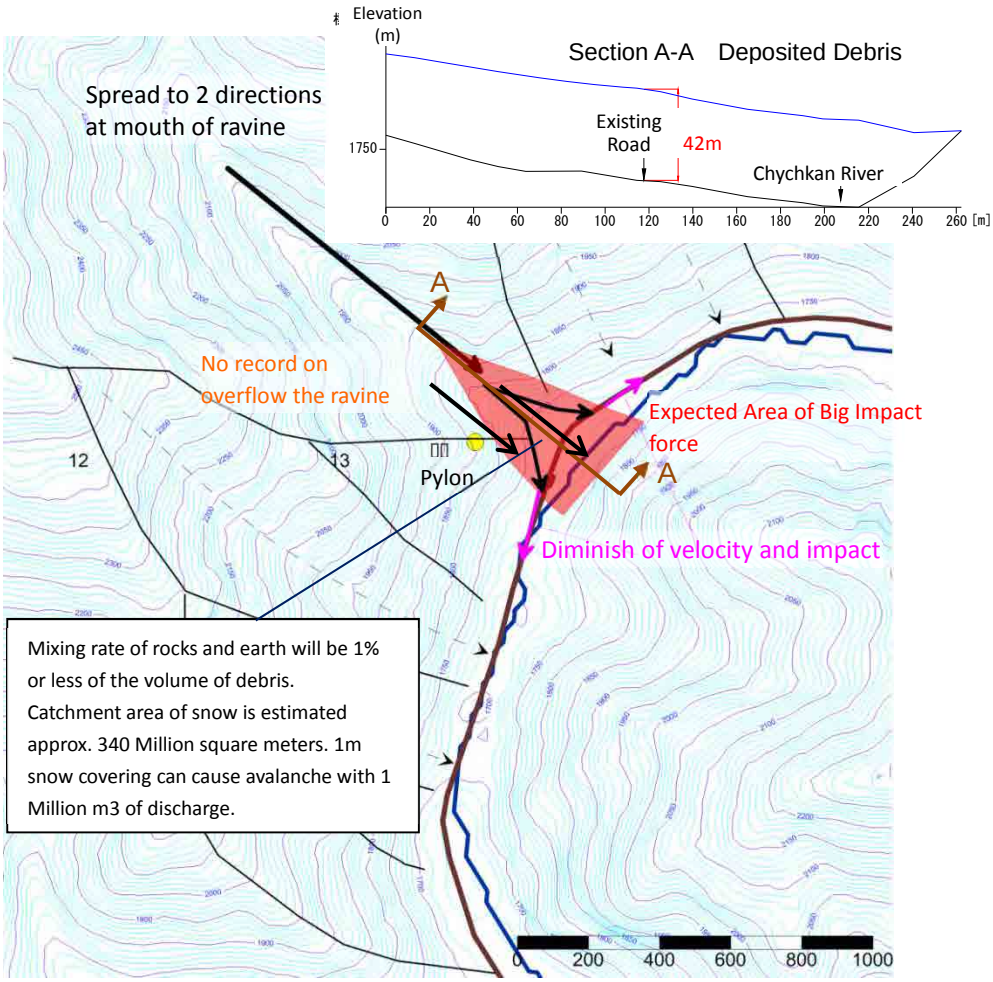


Figure 2.2.1-1 Expected Run-out Area of Avalanche

According to the interview survey with the staff of It-Agal Avalanche Mentoring Station, the following phenomenon regarding avalanche behavior had been observed at STA. 246km of the BO Road.

- Avalanching flow spreads to two directions toward Chychkan River at the mouth of a ravine.
- Discharge of avalanche towards the downstream side of Chychkan River is much larger than the discharge towards the upstream side.

- The avalanche has never overflowed the mountain ridge before.

Based on the above observations, the following can be expected regarding flow velocity and impact force of avalanche.

- Faster flow velocity and stronger impact force at the mouth of ravine are expected.
- The flow velocity and impact force of avalanche gradually diminish from the mouth of ravine to the edge of deposit area.

In general, it is difficult to quantitatively forecast with high degree of accuracy the impact force and intermixture of big rocks for extremely large scale avalanches. In this regard, the avalanche protection facility shall be designed as free from impact force of avalanche and rocks by covering it with sufficient earth embankment.

(2) Design Scale of Avalanches for the Project

In accordance with the record of avalanches at STA. 246km of the BO Road collected from Kyrgyz Meteorological Office, 22 avalanches have been recorded during 46 years from 1968 to 2013. Maximum volume of avalanche was 290 million m^3 with 540m of deposit width and 42m height of debris at the roadway, which was the highest on record based on the result of interview survey.

Table 2.2.1-1 Record of Avalanche at STA. 246km

Date	Volume [1000 m^3]	Deposit Width on Roadway [m]	Ave. Debris Height at Run-out Area [m]	Debris Height at Roadway [m]
1968/3/15	1,560	150	10.2	10
1969/3/8	976	200	7	
1969/3/11	1,246	300	6.7	
1970/3/26	1,459	320	13.22	
1972/3/28	2,250	250	15	
1973/4/8	800	30	9	5
1973/4/20	750	200	10	7.6
1975/3/3	1,482	360	10	
1976/2/13	726	100	11.3	
1976/3/25	468	100	11.7	7
1984/3/29	1,830	540	20	10
1988/4/15	296	100	7.7	
1993/2/5	200	200		
1996/3/18	2,903	400	19.6	40*
2002/4/10	70	115	5	10
2007/2/26	1,000	250	16	10
2009/3/8	1,200	250	15	
2009/4/27	1,300	325	10	
2010/3/12	1,500	250	20	
2011/11/23	900	200	15	
2012/3/21	1,980	200	33	
2013/3/6	750	250	10.0	

*According to interview survey, actual maximum deposit height was 42m.

Deposit area of avalanche is recorded among the above data. The deposit area has been projected on the map prepared, based on the Distal Elevation Model (ASTER GDEM) procured from satellite image as shown in the following figure.

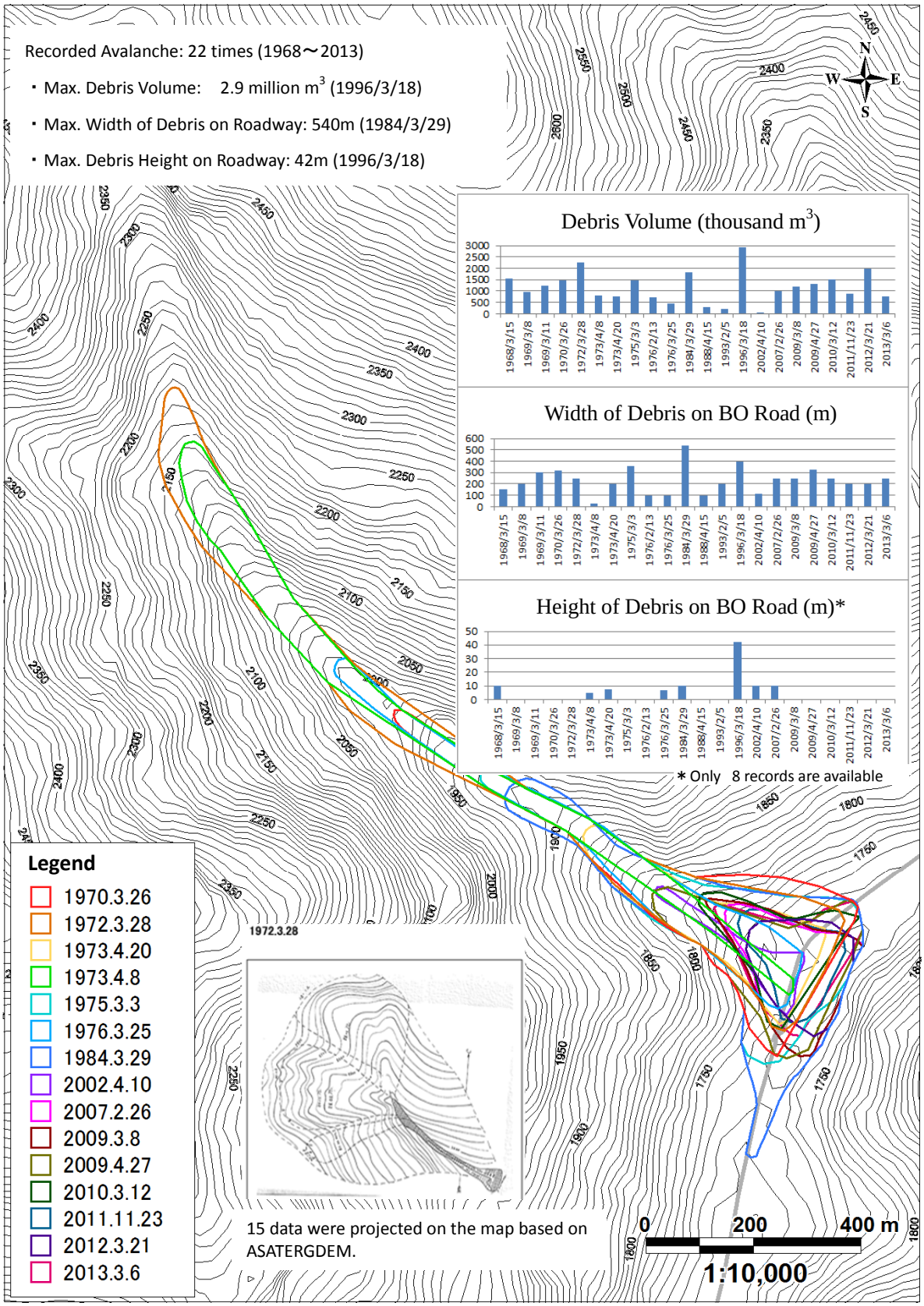


Figure 2.2.1-2 Recorded Debris Deposit Area

It has been recorded several times during the past 46 years that human suffering and closed traffic were due to the large scale slope avalanches over the roadway. Since the slope over the roadway at STA. 246 of the BO Road is at high risk, permanent avalanche protection measures shall be designed

based on the largest scale of avalanche in the past to ensure the traffic flow on the BO Road during winter season.

(3) Return Period of Avalanches and its Adequacy

Twenty-two (22) large scale avalanches crossing the roadway have been recorded during 46 years and 43 times of the record were collected by the Study Team. Return period of past largest avalanche to be considered for the Project shall be defined as 50-years since return period processed by statistical analysis based on fewer universes such as 43 data would cause significant deviation. Based on this concept, the Avalanche Protection Measure shall be designed against the 50-year return period under the Project.

Avalanche protection measures have been designed with the design return period of 30 to 100 years in foreign countries as shown in Table 2.2.1-2. In comparison with international standards as below, 50 years design return period for the Project is deemed to be within the appropriate range in terms of design condition.

Table 2.2.1-2 International Design Standards on Avalanching Return Period for Avalanche Protection Facility

Country	Return Period	Application	Resources
Japan	30 years	Road Facility	Guideline for Snow and Ice Protection Measure
Switzerland	100 years	Road Facility	Snow Research Center, Japan
USA	30 years	Structures with permissible and unoccupied buildings	Avalanche Handbook, The Mountaineers Book

(4) Verification of Avalanche Affected Area

Based on the results of interview survey, the past largest avalanche was verified by computer simulation. Maximum debris height has reached 42m and 61.6 m/s (222 km/h) of flow velocity in maximum was demonstrated by the simulation. The results of simulation and other small scale avalanches confirmed by interview survey have been plotted on a map in the following page.

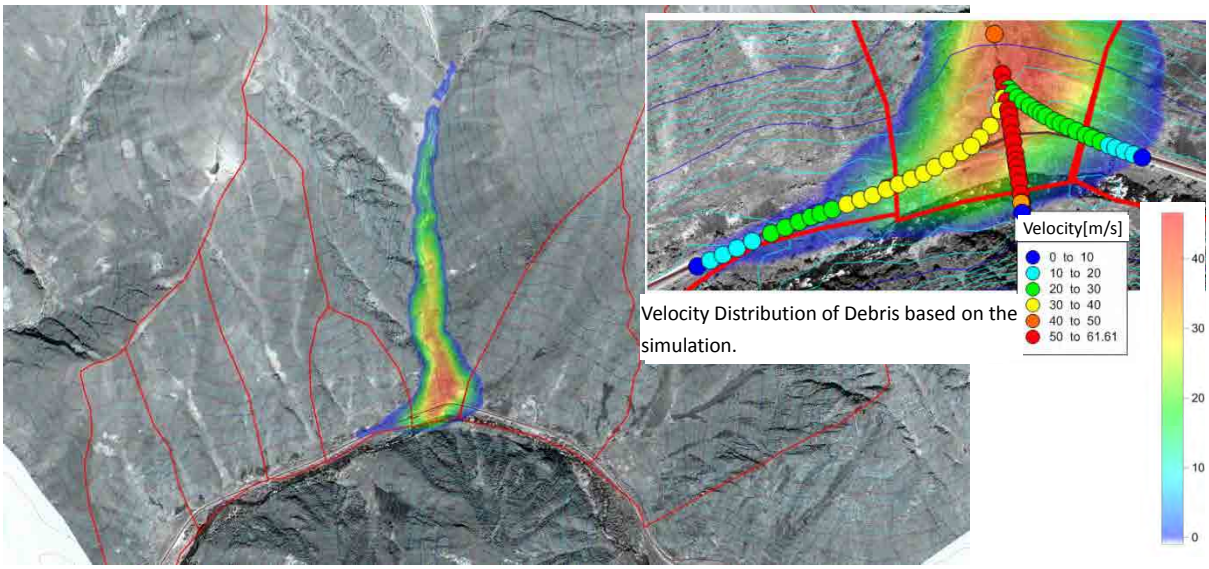


Figure 2.2.1-3 Expected Area and Depth of Largest Magnitude of Avalanche

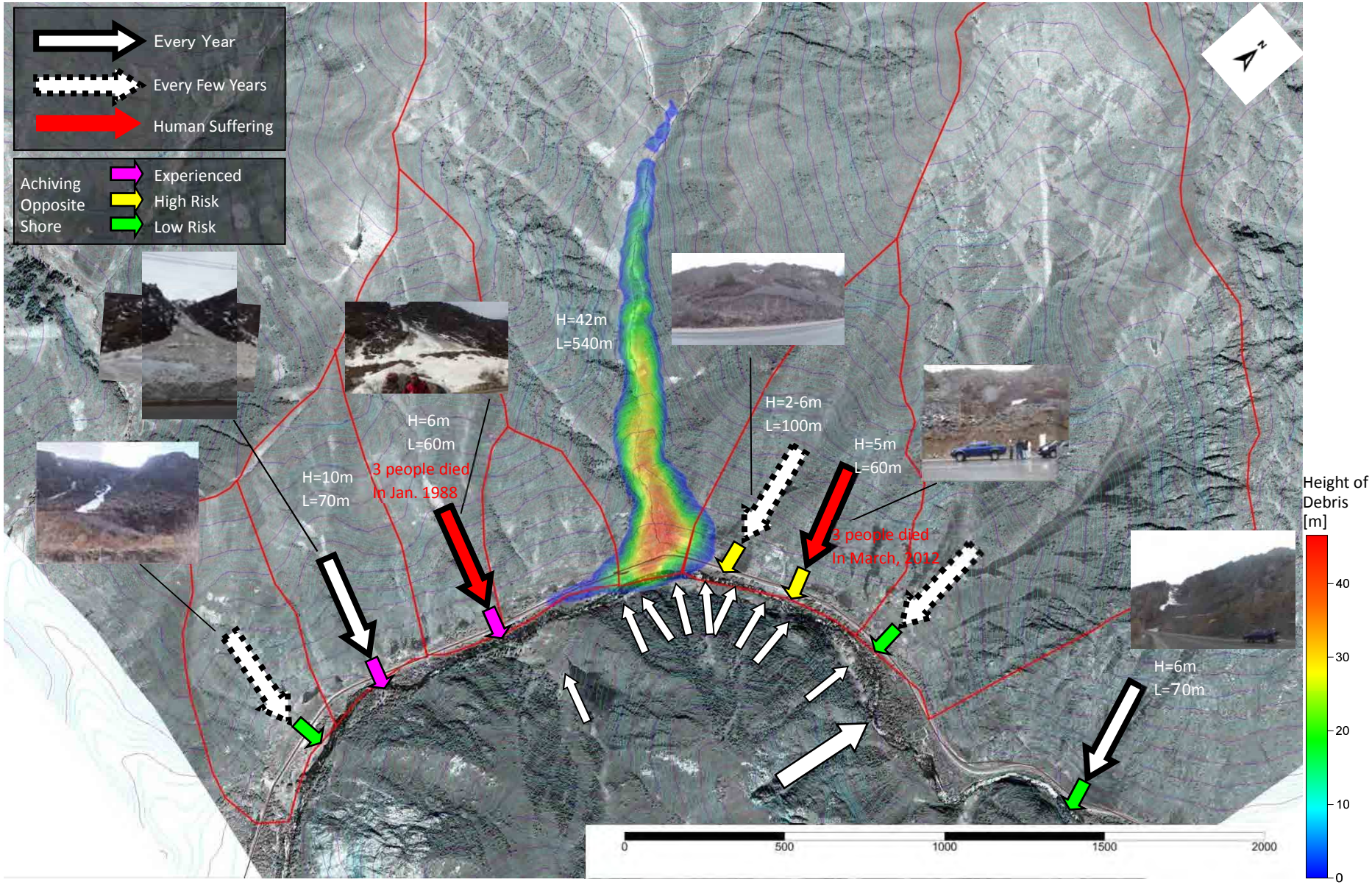


Figure 2.2.1-4 Situation of Avalanche in the Project Area

(5) Policy on Project Coverage

Based on aforementioned situation of avalanche in the project area, starting and ending point of measures on avalanches shall be planned in accordance with following policies:

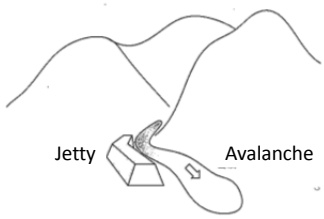
- Snow Shed planned at STA. 246km shall be able to accommodate 42m debris height at main flow point. The Snow Shed shall be designed against the past largest avalanche; however, small avalanches near the entrance of Snow Shed shall be considered in the determination of length of the Snow Shed.
- U-Turn space shall be planned near entrances of the Snow Shed in order to ensure the U-Turn of vehicles including large trailers in case small-scale avalanches interrupt the traffic at STA. 246km.

2.2.1.2 Policy on Measure against Avalanche and Route Selection

(1) Measures against Avalanche Disaster

Measures against avalanche disaster fall roughly into two categories; namely, “Control Measures” which will prevent or absorb the avalanche; and “Protective Measures” which will block the debris at run-out area. Typical Control Measures and Protective Measures are shown in Table 2.2.1-3.

Table 2.2.1-3 Typical Avalanche Measures

Type	Control Measure	Control Measure	Control Measure
Typical Measure	Prevention Pile/ Barrier	Absorbing Fence	Guiding Jetty
Image			
Profile	Starting zone (Origin/Source) of avalanche will be prevented.	Absorbing fence on avalanche track will absorb the motional energy of the encountered avalanche.	The flow direction of avalanche will be changed and be guided to the safer side direction.
Applicability to the Project	The catchment area is too large to prevent the origin and thus disadvantageous for the Project due to high initial cost and O&M cost. This measure may also have an adverse impact to the landscape.	Avalanche scale is too large so that the fences will be damaged or destroyed by the impact force of avalanche. It is not applicable to the Project.	There is no safer outlet due to geographic condition like gorge at STA. 246km. Application of this measure will be impossible for the Project.
Type	Protective Measure	Protective Measure	Protective Measure
Typical Measure	Protective Retaining Wall	Snow Shed (Open Type)	Snow Shed (Closed Type)
Image			
Profile	Concrete Retailing Wall can protect the road from avalanche	The roadway will be covered with a sloped roof supported by columns. Avalanche will pass over the roof to the roadside.	Debris will not encroach into the roadway which is fully covered by a concrete structure.
Applicable Location	Avalanche scale is so large that the fences will be damaged or be destroyed by impact force of avalanche. It is not applicable to the Project.	Since very huge amount of debris by avalanche is expected at STA. 246km, this type of Snow Shed could not prevent the incoming snow from the outside after a large scale avalanche. It is not applicable to the Project.	Since very huge amount of debris by avalanche is expected at STA. 246km, only this type of Snow Shed can prevent the encroaching snow from outside after the avalanche. It is the most applicable to the Project.

It would be infeasible to apply the avalanche control measures to the Project in terms of cost, constructability and maintenance, since the starting area and track area of the avalanche is very large, 5,000m in horizontal distance and 1,600m in vertical interval. From this point of view, the Protective Measure at the run-out area shall be applied to the Project.

The Flowchart for Selection of the Protective Measure is given in Figure 2.2.1-5. Since very huge impact energy by avalanche is expected at the end of slope, protection fence and concrete retaining wall might be destroyed by avalanche. Very high debris also makes it difficult to apply the open type and the box culvert type of Snow Shed due to heavy loading by debris. In this regard, the Arch-Culvert Type or Tunnel Type is expected to meet the condition at the Project Site.

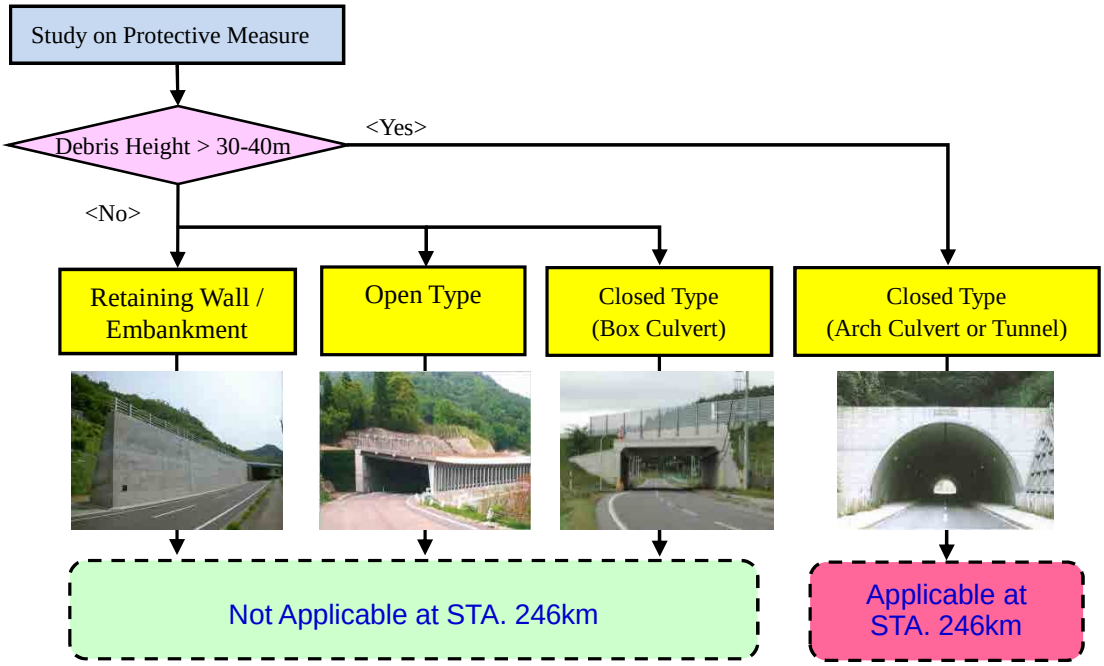


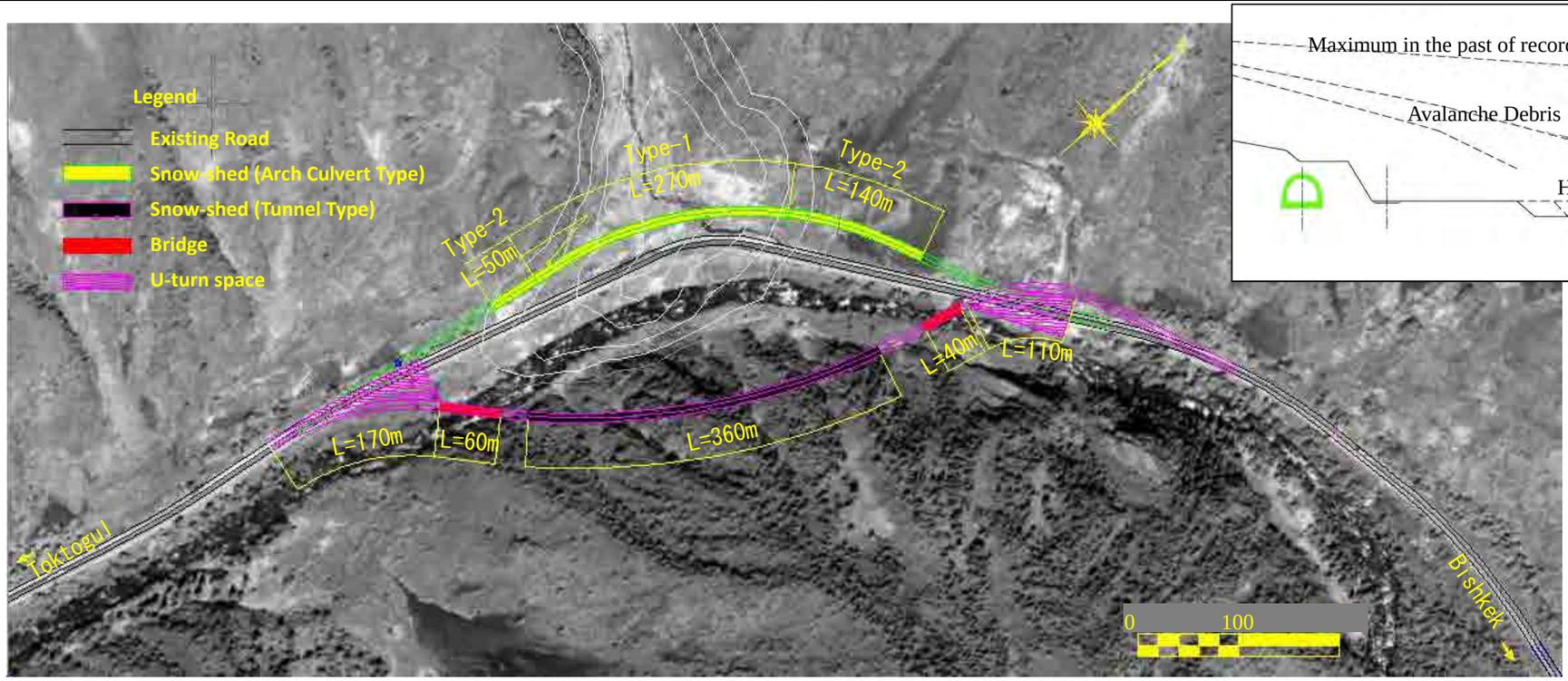
Figure 2.2.1-5 Flowchart for the Selection of Protective Measures

(2) Route Selection

Alternative route to bypass the avalanche hazardous zone is quite limited since the project site is located at gorge area. Alternative routes to mitigate the damage by avalanche are Alternative-1: Chychkan River's Right Bank Route by diverting existing road to hillside; and Alternative-2: Chychkan River's Left Bank Route by diverting existing road to the opposite shore.

Protective Measure for Alternative-1 shall be the Arch Culvert Type of Snow Shed, and Alternative-2 shall be the Tunnel Type. The comparative study on the two alternatives is summarized in Table 2.2.1-4 with the conclusion that Alternative-1, Arch-Culvert, would be at advantage in traffic safety and certainty of construction cost.

Table 2.2.1-4 Comparison of Alternative Routes

PLAN	

	Alternative-1: Chychkan River's Right Bank Route	Alternative-2: Chychkan River's Left Bank Route
Concept	Divert existing road to hillside	Divert existing road to the opposite shore
Construction Overview	・Length of Arch Culvert: 460m Type-1; Center of Run-out Area (270m), Type-2; Edge of Run-out Area (190m) ・Approach Road: Earth Works and Drainage Works	・Length of Tunnel: 360m ・Bridges: 2 bridges (L1=40m, L2=60m) ・Approach Road: Earth Works and Drainage Works
Structural Feature	Arch Culvert can bear high debris (Maximum Height: 42m)	Mountainous Tunnel can minimize the risk of avalanche. Multi-span arrangement is required for the river crossing bridges.
Construction Characteristic	Cast-in place concrete with travelling center or Pre-cast Block will be used for the arch culvert. Construction Period will be 3 years.	Rock excavation work is done by a combination of explosives and giant breaker. Construction period is 3 years.
Operation and Maintenance	Operation cost for road lighting is required. Ventilation is not required since the length of the culvert is less than 500m with less traffic volume.	Operation cost for road lighting is required. In comparison with Alternative-1, O&M cost is much more expensive due to two bridges.
Traffic Safety	Design Driving Speed: 60km/h Minimum Curve Radius: 330m or more to secure sight distance.	Design Driving Speed: 60km/h S-shaped Curve is applied to horizontal alignment with inflection point on the bridge, which might hamper traffic safety. Bridge has high risk of accident by slippage due to road surface freezing. The gap between anti-freezing condition in tunnel and freezing condition on the bridge might cause the slippage accident.
Natural Environment	Earth cut at the slope will be required during construction of the arch culvert. Land formation will be restored after completion of construction.	Less environmental impact except trimming trees and waste of excavation.
Construction Cost	Almost same as Alternative-2	Rather expensive than Alternative-1. In case additional joints and/or crushed zone are discovered, supplemental work for excavation might be required which will likewise require additional cost of construction. It is deemed that this alternative is difficult to be accommodated under the Grant Aid Scheme of Japan.
Evaluation	**Recommended**	**Not Recommended**
	Assured construction cost and advantage in traffic safety due to road alignment with large horizontal curve.	Uncertainty of Construction Cost and disadvantage in traffic safety.

(3) Required Length of Snow Shed

Length to be covered by the Snow Shed is determined as below based on past experience, geographic condition and result of computer simulation. Extent of the arch culvert at the Bishkek side shall be determined in consideration with the small scale of avalanche taking place at the edge of run-out area with 5m debris height in order to prevent unavoidable traffic accident by the debris.

Table 2.2.1-5 Determination of Location of Snow Shed Portal

	Starting Point (Toktogul Side)	Ending Point (Bishkek Side)
Large Scale Avalanche	Edge of Track: STA. 0+410 Debris Height of 5.0m or less: STA. 0+360	Edge of Track: STA. 0+600 Largest Run-out Area: STA. 0+700
Small Scale Avalanche	None	Center of Avalanche (6m of debris height): 0+770
Major Consideration on the Determination of Location of Portal	50m is reserved from track area of large scale avalanche.	50m is reserved from center line of small scale avalanche due to ambiguity of track width of small scale avalanche.
STA. Number of Portal	STA. 0+360	STA. 0+820

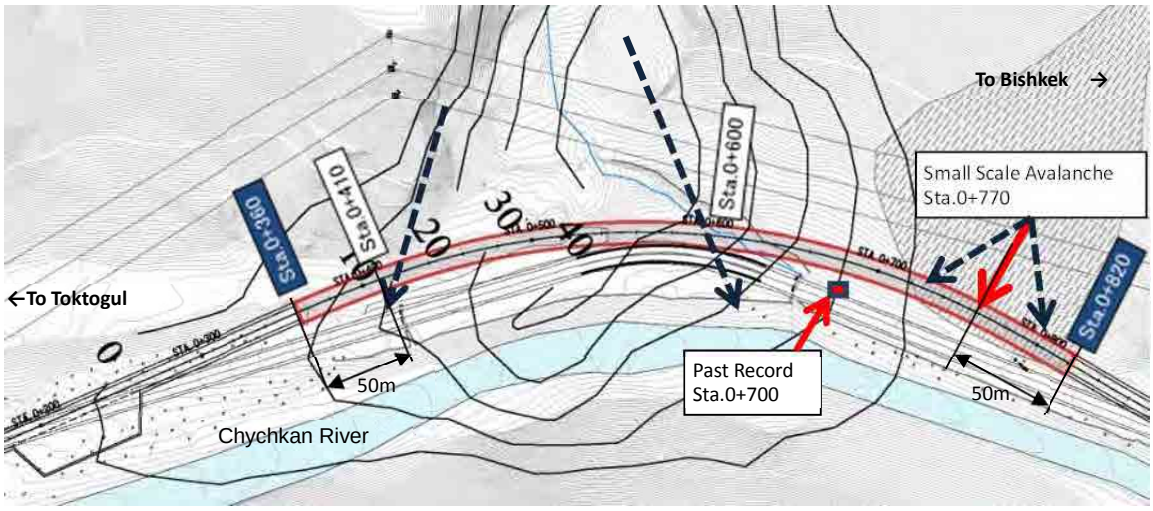


Figure 2.2.1-6 Determination of Snow Shed Length

(4) Alignment Plan

Existing BO Road at STA. 246 has a sharp horizontal curve with 160m in radius. Road alignment shall be designed to improve the current condition giving attention to traffic safety. Radius in horizontal curve for arch culvert section shall be designed to meet the requirement of non-widening of carriageway to secure the site distance since widening will drastically increase the construction cost.

While it has been reported that water level at the upstream side (Bishkek side) of the Chychkan River has been swollen by avalanche debris, it has also been confirmed that the existing road elevation has never been flooded by the swollen river water.

Based on the above situation, road profile shall be designed to pass above the existing road elevation paying attention not to impede the river flow by road embankment to minimize fluctuation in discharge of the Chychkan River.

On the other hand, the increase of debris into the Chychkan River due to new construction made by the Project is concerned; however, it is anticipated that the debris in the river will be thawed gradually at the water colliding front, and the discharge capacity will be recovered after a certain period after the deposit. It is consequently concluded that the Project would not adversely affect the current flow condition of Chychkan River in terms of high water level.

Table 2.2.1-6 Control Point of Road Alignment

Control Points		Design Policy
Horizontal Alignment	Pylon and Overhead Wire	Bypassed
	Excavation Volume	Minimize by shifting the alignment to the Chychkan River side.
	Connection with Existing Road	Connect with minimum horizontal radius in design criteria.
	Outcrop	Avoid by shifting the alignment to the Chychkan River side.
	The Chychkan River	Minimize encroaching into river cross section
	Space between existing road and the Chychkan River	Utilize as space for detour during the construction and as maintenance road after the completion.
Vertical Alignment	The run-out area	Earth covering 3m in height shall be considered to dissipate the impact force by debris.
	H.W.L. of the Chychkan River	New profile shall be above existing road elevation.
	Excavation Volume	Minimize by raising new profile

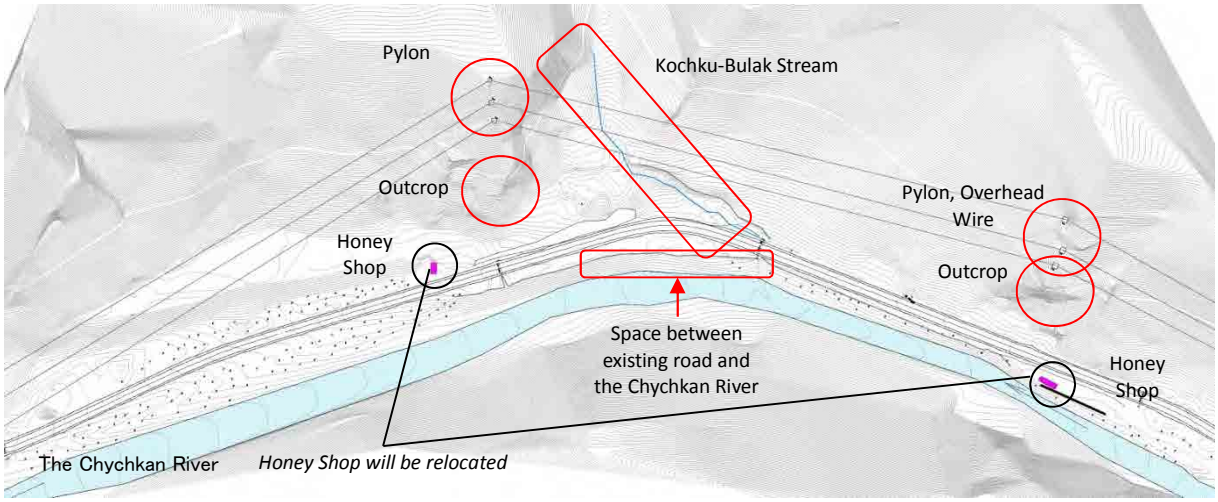


Figure 2.2.1-7 Control Points of Road Alignment in the Project Area

(5) Policy on Snow Shed Design

The structure shall bear the load of debris with a height of 42m, and be free from impact force of avalanche by earth covering along the line of slope at the track. In addition, sufficient waterproofing system shall be provided to prevent deterioration of concrete members by freezing and thawing and creation of ice cylinder inside of the arch culvert, since the Snow Shed is exposed to seepage water by runoff from the slope and thawing water.

2.2.1.3 Policy on Natural Environmental Condition

Water leakage and frost heaving shall be considered to design a sound structure since minimum ambient temperature at the project site is -40 degree Centigrade or even less. Extent of the run-out area by avalanche shall be paid attention as well to secure safety in traffic.

Seismic Design for Snow Shed shall be examined since the project site is located at a seismic-hazardous area in Kyrgyz based on the following consideration.

(1) Introduction

In general, underground structures such as culvert is hardly affected by earthquake due to its deformation performance following ground motion thus its seismic design used to be omitted in many cases.

On the other hand, seismic design of Snow Shed would be highly required for the Project according to following reasons:

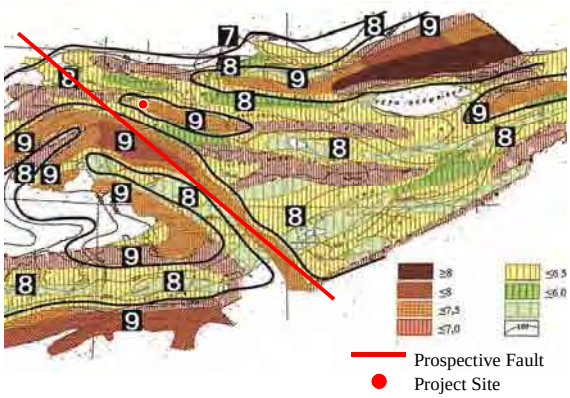


Figure 2.2.1-8 Seismic Zoning Map of Kyrgyz

(1) Large scale dimension such as 10m in height is exceeding the scope of application of normal culvert design. Large difference in height causes huge deformation in-plane due to phase difference by earthquake, which will be adverse effect of earthquake.

(2) Since the project site is located at Seismic Zone 9 of which intensity scale is defined as MSK-9, response acceleration at the ground surface corresponding to 1000gal (Ground Type-II) or more has been expected as seismic design requirement in the Kyrgyz Seismic Code.

(3) Embankment on the Snow Shed is unsymmetrical shape which will create unsymmetrical earth pressure from mountain side during earthquake.

(2) Seismic Design Policy

Since the Seismic Design Code in Kyrgyz has defined (1) Limit State Design Method with Load Factor; and (2) Design method for aboveground structure, which is not subject to underground structure, it is difficult to introduce the design code directly to the Japanese design system. Therefore, the Japanese Guideline for Seismic Design referring to a design seismic force under the Kyrgyz Seismic Design Code will be applied for the Project based on the following definitions.

Table 2.2.1-7 Seismic Level and Requisite Performance

	Requisite Performance	Remarks
Seismic Level-1	Keep its sound functions during earthquake based on the Japanese Guideline	Allowable stress design method will be applied.
Seismic Level-2	Sustain limited damage during an earthquake based on the Kyrgyz Design Code and capable of recovery within a short period.	Non-linear characteristic of structural member is considered. Yield strength of reinforcing bar shall be examined as a limit state.

1) Seismic Level-1: High Probability of Occurrence during Service Period

Since no assumption on this type of seismic level is given in the Kyrgyz Seismic Design Code, the “Design Horizontal Seismic Coefficient (Kh)” specified in the Japanese standard shall be applied based on the allowable stress design method. Seismic force consists of inertia force and seismic active earth pressure in accordance with the “Mononobe-Okabe Method”. Value of “Design Horizontal Seismic Coefficient (Kh)” shall be “2.0” based on facts that small natural period of “0.25-second” for embankment will be expected, and that minimum response acceleration is approximately 100gal in the area of MSK-7.

2) Seismic Level-2: Less probability of occurrence during service period but strong enough to cause critical damage

Based on the Respond Acceleration Spectrum defined in the Kyrgyz Seismic Design Code, horizontal forces under the ground are estimated and they are loaded to the structure in accordance with the “seismic deformation method” which is commonly used in Japanese underground structure. In order to examine the state limit defined by yield strength of reinforcing bar, non-linear characteristic of reinforced concrete member is considered in design analysis.

2.2.1.4 Policy on Participation of Local Contractor

As the result of site survey, it was confirmed that major construction materials and labor services can be procured in Kyrgyz. Japanese contractor will be able to manage the construction work by local procurement except special equipment and steel material. However, due to less experience in the construction of a large scale of concrete arch culvert in Kyrgyz, local contractors will be compelled to participate in the Project by mainly providing labor and equipment. Therefore, the form of contractor in the Project is deemed as “Direct Management” by a Japanese Contractor. On the other hand, materials and equipment which are not available in the Kyrgyz market will be procured in Japan (refer to Subsection 2.2.4.6).

2.2.1.5 Policy on Operation and Maintenance

After the completion of the Project, the Road Maintenance Department (RMD) will be responsible for its operation and maintenance and DEP-23 under the BO UAD will be in charge of implementation of maintenance work. BO UAD has experience in the maintenance management for roads and tunnels with minor repair and/or rehabilitation work while the capacity development of RMD for the maintenance work has been ongoing under “the Project for Capacity Development for Maintenance Management of Bridges and Tunnels (JICA; 2013~2015)” by preparing the tunnel maintenance manual and so on. Under such a situation, particular consideration shall be made on the selection of a simple maintenance structure to be applied to the Project in order to mitigate the maintenance load of RMD in the future.

2.2.1.6 Policy on Construction Schedule

Schedule for concrete work and asphalt pavement work which are easy to be affected by change in temperature shall be carefully planned based on meteorological data. In addition, sufficient safety

measures shall be taken into account during the avalanche disaster season starting from November up to April in the following year.

2.2.2 Basic Plan

2.2.2.1 Applied Design Standard

The design standards to be applied in this project have been agreed after discussing them with the Kyrgyz side. They are the general design standards used in Kyrgyz Republic, namely:

- Highway Design (SNiP KR 32-01:2004)
- Bridge and Culvert (SNiP 2.05.03-84: 2011)
- Construction in Seismic Area (SNiP KR, 20-02: 2009)

In case of out of coverage field in designing, the following design standards are additionally applied:

- AASHTO Policy on Geometric Design Highway and Streets, 2011
- AASHTO Guide for Design of Pavement Structure, 1993
- Government Order on Road Design Standards, Japan, 2004
- Specifications for Highway Bridges, Japan Road Association, 2012
- Design Guideline for Culvert, Japan Road Association, 2010

2.2.2.2 Road Plan

(1) Design Speed

According to the design standard of Kyrgyz (SNiP KR 32-01:2004), design speed within Category III and in the mountainous area can be reduced up to 50km/h (Table 2.2.2-1**)**. Since the design speed of the existing roads in the project site is 60km/h, the design speed of the road planned in this project is similarly 60km/h.

Table 2.2.2-1 Design Speed

Road Category	Design Speed (km/h)		
	Basic Design Speed	Admissible Design Speed in Difficult Sections of Terrain and in Confined Spaces	
		Stiff Terrain	Mountainous Terrain
1A	140	110	70
1B	120	100	60
II	120	100	60
III	100	80	50
IV	80	60	40
V	60	40	30

Source: Highway Design (SNiP KR 32-01:2004)

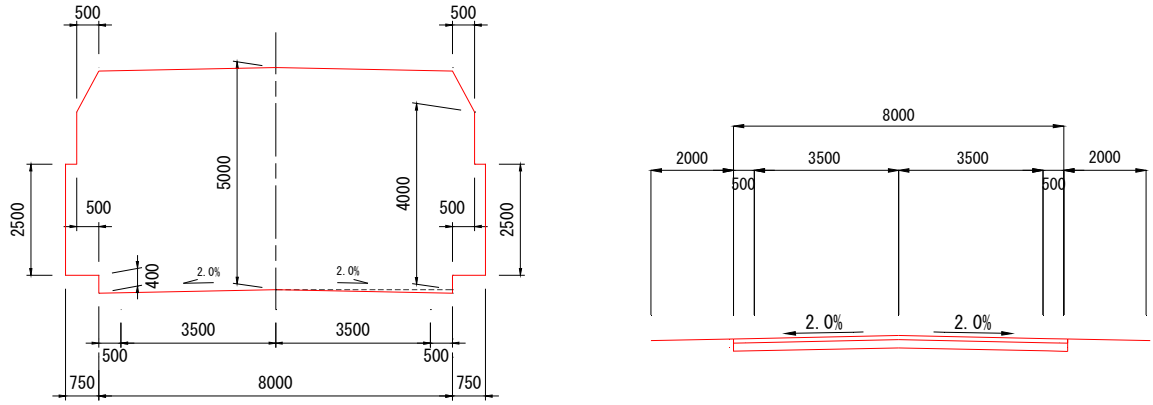
(2) Geometrical Structure

The existing road in the project site is located at the curve where the radius is around 160m. In designing, traveling performance and transit safety shall be considered without aggravating road alignment. Although there is a necessity to widen the carriageway in the blocked section on the curve due to road widening caused by securing the site distance or super-elevation, road alignment shall be planned by applying the minimum radius, in which widening is not necessary, considering the construction stage.

In deciding road geometric structure, the standard of Kyrgyz is covered by the design standard of other countries to meet insufficiency with comparison. Although about 1 m of road widening is necessary for the radius which was applied at the corner according to SNiP, it was agreed with MOT that road widening is not necessary for the radius applied in this project based on the other standards and simulation results of motion path of largest trailer regulated by SNiP.

Table 2.2.2-2 Comparison of Road Geometrical Structure

Category	Applied	SNiP (kg)	Asian Highway	AASHTO	Japanese Standard
Road Category	Category III	Category III	Class II (Steep)	Rural Arterial	Type 3 Class 2
Design Speed (km/h)	**60**	50-80	40	60	60
Clearance Limit (m)	**5.0**	5.0	4.5	4.3-4.9	4.5
Width of Carriageway (m)	**3.5**	3.5	3.5	3.6	3.25
Road Side (m)	**0.5**	0.5	2.0	0.6-2.4	0.75
Shoulder (m)	**2.0**	2.0			
Crossfall (Paved Section) (%)	**2.0**	2.0	2.0	1.5-2.0	1.5-2.0
Crossfall (Unpaved Section) (%)	**4.0**	-	3.0-6.0	1.5-2.0	1.5-2.0
Maximum Super-elevation (%)	**4.0**	4.0	-	6.0	6.0



(a) Snow Shed Section (b) Approach Road Section

Figure 2.2.2-1 Track Clearance and Cross Section

Table 2.2.2-3 Comparison of Road Design Condition

Category		Applied	SNiP (Kg)	Asian Highway	AASHTO	Japanese Standard
Road Category		**Category III**	Category III	Class II (Steep)	Rural Arterial	Type-3 Class-2
Minimum Curve Radius		**330 or more**	150m	115 m	125m **or more**	150m (330m*)
Minimum Curve Length		**100m**	-	N/A	180m	100m
Sight Distance	Stopping Sight Distance	**85m**	85m	50m	85m	75m
	Passing Sight Distance	**N/A**	170m	-	315m	-
Widening at Curve		**0**	1.1m : R=325m 0.9m : R=425m	-	Disregarded	0
Minimum Clososid Curve Length		**100m**	**100m**	50m	50m	50m
Optional Curve Radius of Clososid Curve		**2000m**	2000m	500m	-	500m
Maximum Longitudinal Slope		**4%**	7%	7%	6%	5%

Category		Applied	SNiP (Kg)	Asian Highway	AASHTO	Japanese Standard
Minimum Longitudinal Curve	Crest	**2500m**	2500m	-	1100m	1400m
	Sag	**1500m**	1500m	-	1800m	1000m
Minimum longitudinal curve length	Crest	**3000m**	300m	-	-	50m
	Sag	**100m**	100m	-	-	50m

SNiP (Kg): Highway Design (SNiP KR 32-01:2004)
AASHTO: A Policy on Geometric Design of Highways and Streets, 6th Edition (2011)
Asian Highway: Asian Highway Classification and Design Standards (ESCAP; 2001)
Japanese Standard: Japan Road Structure Ordinance (2012)
* In case of consideration for sight distance widening

(3) Cross Section Planning

1) Earth Work Planning

Soil at the project site is classified into three (3) types namely (a) Cobbly Soil, (b) Rock, and c) Talus. Cut slope shall be designed according to the type of soil as shown in the following figure. Embankment slope shall be designed uniformly as 1:1.5.

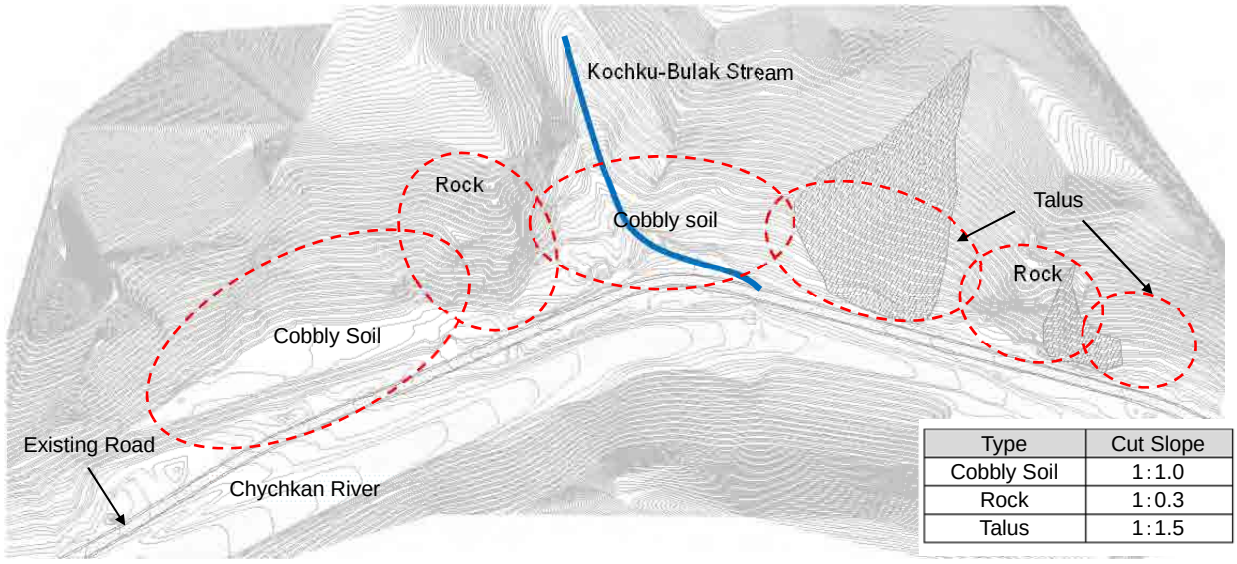


Figure 2.2.2-2 Soil Distribution and Cut Slope

2) Road Structure on Snow Shed Section

A basic road structure on Snow Shed section is shown in Figure 2.2.2-3. To avoid the impact of avalanche, earth covering of 3m from levee crown of the Snow Shed shall be secured by embankment. Shape of embankment shall be set to secure structural stability connecting the two (2) lines, i.e., the one with 45 degree comes from the point where it is drawn from edge of basal plane to horizontal line at levee crown of the Snow Shed, while the another one with 30 degree is from the point to existing ground toward river side. Embankment slope shall be 1:1.5 as mentioned, and coverage area shall be up to excavation line which occurs during construction.

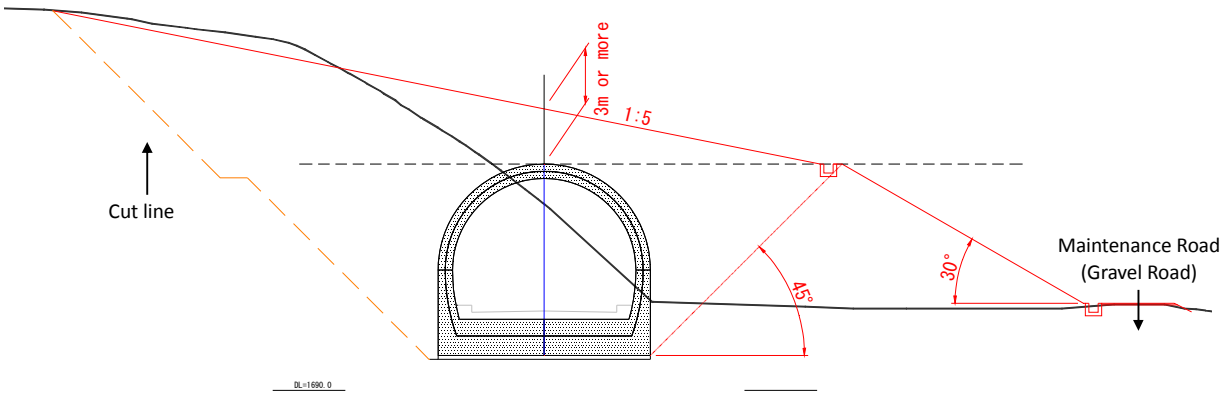


Figure 2.2.2-3 Road Structure on Snow Shed Section

3) Protection for Embankment

To protect from outflow of the embankment from damage by friction force due to avalanche, gabion mattress shall be installed at runway zone of avalanche (refer to Figure 2.2.2-6). Coverage area is mainly on the runway of avalanche which is located from Sta. 0+430 to Sta. 0+600, and depth shall be 1m from the surface.

4) Typical Cross Section

The typical cross section is shown below. For approach road at Osh side, sufficient space of drainage shall be installed at mountain-side for draining off and snow-dumping space. For the approach road at Bishkek side, retaining wall and drainage shall be installed at the mountain-side to reduce volume of earth cut and to drain off. For Snow Shed section, embankment slope shall be basically protected by gabion mattress as mentioned above. Both maintenance roads on mountain-side and river-side shall be constructed for the inspection of embankment, repair of embankment slope and removal of falling rock.

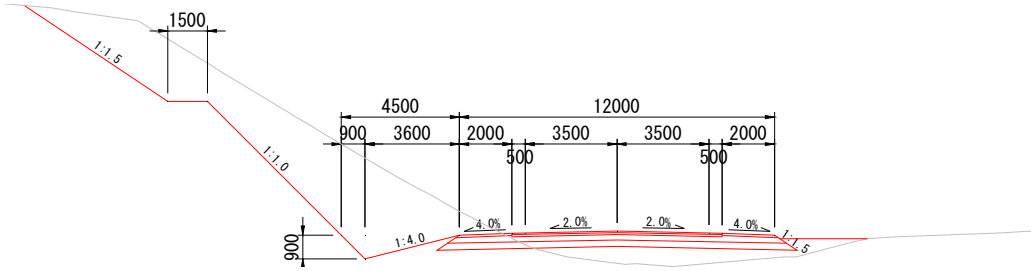


Figure 2.2.2-4 Approach Road Section on the Side of the Starting Point

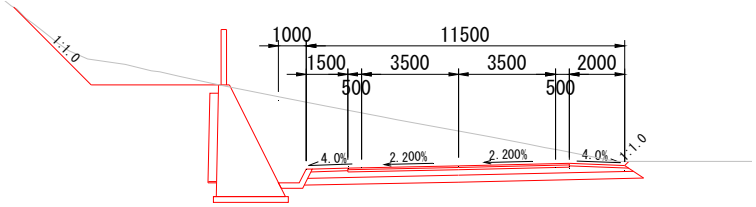


Figure 2.2.2-5 Approach Road Section on the Side of the Ending Point

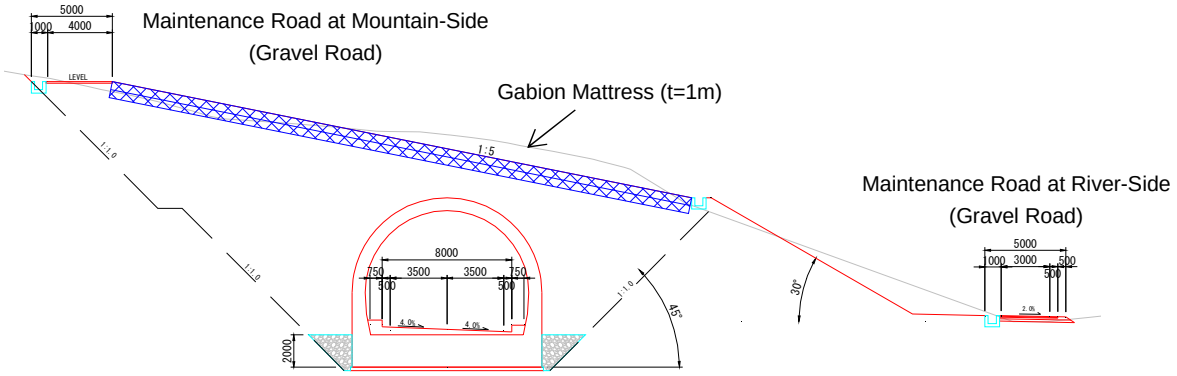


Figure 2.2.2-6 Snow Shed Section

5) Plan and Profile

Based on the control points mentioned in Subsection 2.1.1.2(4), plan and profile alignment were determined. Basic design drawing is attached in the appendix.

2.2.2.3 Road Ancillary Structure Plan

(1) Pavement Design

1) Type of Pavement

In this project, road section can be divided into two (2): approach road section and Snow Shed section. Asphalt concrete pavement shall be applied to the approach road section as well as the existing pavement. Cement concrete pavement shall be applied to the Snow Shed section in order to (i) improve efficiency of lighting; and (ii) reduce time and effort for maintenance in blocked space due to improvement of endurance.

2) Design Policy

Pavement design was done based on SNiP KR 32-01:2004 and pavement composition was checked by AASHTO. Since the project site is located in a snowy cold region, the "Road Design Guidelines, Hokkaido Regional Development Bureau, 2014" which is one of the Japanese standards, was considered. Minimum pavement thickness of SNiP KR 32-01:2004 is given in Table 2.2.2-4.

Table 2.2.2-4 Minimum Pavement Thickness of SNiP KR 32-01:2004

Surface Course and Other Pavement Layers	Layer Thickness (cm)
Coarse asphalt concrete	6 - 7cm
Fine asphalt concrete	3 - 5 cm
Sand asphalt concrete	3 - 4 cm
Macadam (gravel) materials finished with bituminous binders	8 cm
Macadam that is finished with bituminous binders by grouting method	8 cm
Macadam and gravel materials that are not finished with binders:	
On a sand base	15 cm
On a rigid base (rock base or base stabilized with soil)	8 cm
Rock materials and coats that are finished with organic mixtures or macadam-gravel-sand mixtures finished with cement	10 cm

3) Asphalt Pavement Design Condition

i) Design Period

Design period shall be determined as 20 years from 2019 to 2038 in accordance with SNiP KR 32-01:2004.

ii) Traffic Volume for Pavement Design

Based on the pavement design in the Kyrgyz Republic, traffic volume for pavement design has been calculated at a growth rate of 4.0% based on the traffic volume survey result, and estimated 20 years later. Similarly, traffic volume which shall be applied for pavement design in this project was calculated and estimated at the growth rate of 4.0% based on the survey results in March 2014 and July 2014. Table 2.2.2-5 shows the survey result. Since traffic volume in July was more than 50% of the one in March, the traffic volume surveyed on 11 July 2014 was applied for the pavement design.

Table 2.2.2-5 Traffic Survey Result for 24 Hours (Unit: Number of Vehicles)

Winter

Date	Direction	Time	Type of vehicle								Total	Grand total
			Car, Taxi	Mini Bus	Large Bus	2-Axl Truck	3-Axl Truck	Trailer	Motorbike	Pedestrian		
2014/3/26	to Bishkek	10:00-22:00	460	131	0	27	27	63	0	0	**708**	2058
		22:00-10:00	199	53	0	32	10	45	0	0	**339**	
	to Osh	10:00-22:00	452	128	0	31	18	80	0	0	**709**	
		22:00-10:00	170	42	0	52	8	30	0	0	**302**	
2014/3/28	to Bishkek	10:00-22:00	466	121	0	34	20	52	0	0	**693**	2234
		22:00-10:00	239	74	0	62	17	77	0	0	**469**	
	to Osh	10:00-22:00	485	134	0	25	27	30	0	0	**701**	
		22:00-10:00	238	8	0	51	22	52	0	0	**371**	

Summer

Date	Direction	Time	Type of vehicle								Total	Grand total
			Car, Taxi	Mini Bus	Large Bus	2-Axl Truck	3-Axl Truck	Trailer	Motorbike	Pedestrian		
2014/7/9	to Bishkek	10:00-22:00	650	158	0	47	22	77	2	0	**956**	3305
		22:00-10:00	337	143	0	50	19	84	0	0	**633**	
	to Osh	10:00-22:00	618	189	0	45	16	101	6	2	**977**	
		22:00-10:00	399	154	0	73	33	80	0	0	**739**	
2014/7/11	to Bishkek	10:00-22:00	632	120	0	77	39	61	0	0	**929**	3489
		22:00-10:00	418	102	0	56	33	85	0	0	**694**	
	to Osh	10:00-22:00	721	149	0	50	31	106	16	0	**1073**	
		22:00-10:00	507	79	0	59	33	115	0	0	**793**	

iii) Validation of Growth Rate of Traffic Volume

Growth rate of 4% was to be appropriate due to checking and considering the result or reports and GDP growth rate as described below.

A) Road Disaster Prevention Plans and Capacity Building in Kyrgyz Republic, March 2014

Based on the results of traffic survey conducted in the locations and the growth rate of traffic volume that was estimated in the feasibility study in 2011 (Table 2.2.2-6), traffic demand forecast was carried out under the "Road Disaster Prevention Plans and Capacity Building in Kyrgyz Republic, March 2014" (hereinafter, "Road Disaster Prevention Capacity Building"). Table 2.2.3-7 indicates that the growth rate is estimated as 5.5% annually from 2014 to 2019, 4.3% annually from 2019 to 2024, and 2.0% annually from 2024 to 2029.

B) The Project for Reconstruction of Kok-Art River Bridge on the Bishkek-Osh Road

Growth rate of traffic volume was applied as 3.8% in "The Project for Reconstruction of Kok-Art River Bridge on the Bishkek-Osh Road" (Hereinafter, "Reconstruction of Kok-Art River Bridge Project").

C) Report by ADB

According to the final report (September 2012) of "The Master Plan on Road and Transport Sector Development (2010-2025)", traffic volume as of 2025 is estimated to be 5,338 vehicles/day (passenger car: 3,009 vehicle/day, Truck: 2,329 vehicle/day). In comparison with the traffic volume as of 2014 (3,489 vehicles/day), the growth rate a year is about 4.4%. On the other hand, looking at the Kyrgyz Republic as a whole, it was reported that traffic volume of trucks through the neighboring countries such as Uzbekistan, Kazakhstan and China, which are socially and economically important, had either declined or steady.

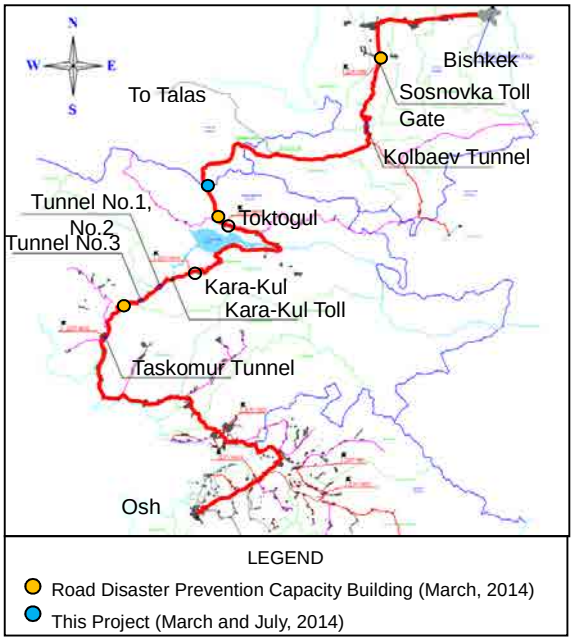


Figure 2.2.2-7 Location Map of Traffic Volume Survey

Table 2.2.2-6 Table Growth Rate of Traffic Volume in the Feasibility Study (2011)

Year	Estimated (No. of Vehicle/day)	Growth Rate
2013	9,776	0.97%
2014	10,121	1.00%
2018	11,499	1.14%
2020	12,884	1.27%
2030	17,826	1.76%
2034	21,245	2.10%
2038	24,664	2.44%

Table 2.2.2-7 Traffic Volume Survey Results

Year	Estimated (No. of Vehicle/day)	Growth Rate
2014	9,556	—
2019	12,186	5.5%
2024	14,811	4.4%
2029	17,741	2.0%

D) Future GDP Growth Rate by IMF (International Monetary Fund)

According to the World Economic Outlook Databases by IMF, the GDP growth rate of Kyrgyz Republic is estimated to constantly increase from 2014, and it is going to be 5.2% as of 2019. (*Estimated value after 2020 has not been disclosed.)

E) Justification

Items A to D above were respectively compared for the design period of 20 years from 2019 to 2038 with interpolation for uncompleted data assuming that growth rate is constant calculated from the last data. The result is summarized in Figure 2.2.2-8. Growth rate of traffic volume applied to this project shall be 4.0% as the average value.

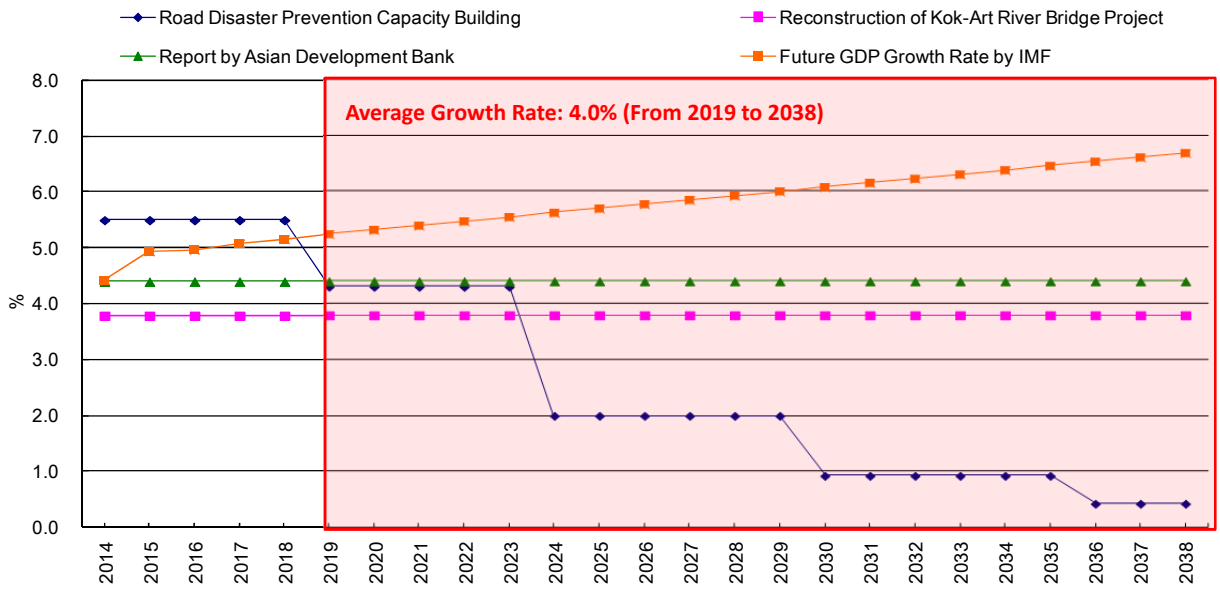


Figure 2.2.2-8 Growth Rate of Traffic Volume

iv) Pavement Structure

Based on the above design conditions, pavement structure was determined according to "ODN[2] 218.046-2001", which is generally used for pavement design, as below.

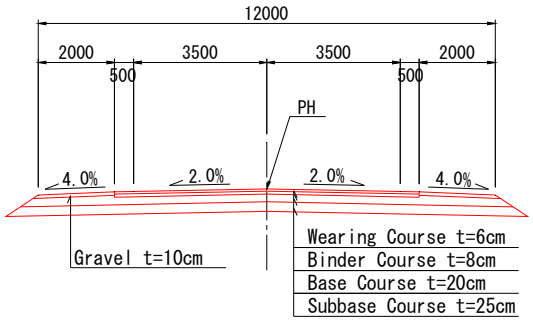
Cross Section	Material and Thickness
	[Wearing Course] High-Density Asphalt-Concrete: t=6cm
	[Binder Course] Aerated Hot Asphalt-Concrete: t=8cm
	[Base Course] Sand and Crushed Stone Mix: t=20cm
	[Subbase Course] Sand and Crushed Stone Mix: t=25cm
	[Shoulder] Crushed Stone: t=10cm

Figure 2.2.2-9 Pavement Structure

v) Validation Study on Asphalt Pavement Structure in accordance with AASHTO

A) Outline

Pavement structure to be applied to this project was checked in accordance with AASHTO.

[2] Acronym for "Отраслевые Дорожные Нормы", the Russian description.

B) Design Condition

Table 2.2.3-8 shows the design condition.

Table 2.2.2-8 Design Condition

Design Period	20 Years (From 2019 to 2038)		
18kip ESAL (Equivalent Single Axle Load)	W18	20,095,543	
Reliability	R (%)	80	Standard value on arterial road
Standard Normal Deviate	ZR	-0.841	R=80
Combined Standard Error of traffic and Performance Prediction	S0	0.45	Average value of asphalt pavement
Initial Serviceability	P0	4.2	Result of AASHTO Test
Terminal Serviceability	P1	2.5	Standard value on arterial road
Difference(P0-P1)	Δ0-P	1.7	
CBR	CBR	20	Result from soil investigation
Resilient Modulus	MR	30,000	MR=1,500t Mo

C) Conclusion

As shown in Table 2.2.2-9, the pavement structure to be designed for this project shall meet the requirements of AASHTO.

Table 2.2.2-9 Calculation Results by AASHTO

Material	Layer Coefficients (a)	Thickness (inch) (D)	Drainage Coefficients (m)	Structural umber SN = a*D*m	Thickness (cm) (D)
Wearing Course	0.400	2.362	―	0.945	6
Binder Course	0.400	3.150	―	1.260	8
Base Course	0.140	7.874	1.0	1.102	20
Sub-base Course	0.080	9.843	1.0	0.787	25
Total		3.353	<	4.094	59

D) Verification by Japanese Standard

In accordance with the Japanese standard (Road Design Guidelines, Hokkaido Regional Development Bureau, 2014), the total minimum thickness of wearing course and binder course is regulated based on traffic volume classification as shown in Table 2.2.2-10. Since traffic volume for pavement design, which is 770 vehicles/day, is classified into “N5” according to this standard, the minimum thickness of asphalt layer shall be 10cm.

Here, based on the proportionally distributed data by calculating difference of boundary values between N5 (250 vehicle/day) and N6 (1,000 vehicle/day), minimum thickness can be calculated as below.

5cm	/	(1000-250)	x	(770-250)	=	**13.5cm**
Difference of boundary values of minimum thickness		Difference of boundary values of traffic volume		Increment		Minimum thickness

Table 2.2.2-10 Minimum Thickness of Asphalt Layer

Classification	Traffic Volume for Pavement Design (vehicle/day)	Minimum Thickness of Asphalt Layer (cm)
N7	3,000≦T	20
N6	1,000≦T<3,000	15
N5	250≦T<1,000	10
N4	100≦T<250	5

Source: Road Design Guidelines, Hokkaido Regional Development Bureau, 2014

Since thickness of asphalt layer in this project is 14cm, the pavement to be designed according to SNiP is considered appropriate.

4) Concrete Pavement Design Condition

i) Surface Layer Concrete

In accordance with SNiP, thickness of surface layer concrete is determined as 18cm and base course consists of leveling concrete. On the other hand, based on the "Pavement Design Manual, Japan Road Association, 2006" steel wire mesh and reinforcing steel bar in the edge shall be installed.

ii) Joint

Joint details are shown in Table 2.2.2-11.

Table 2.2.2-11 Joint Details

Type of Joint	Location and Length	Width
Vertical expansion joint	Edge of carriageway (Not necessary to install in the road center because of simultaneous construction.)	10 mm
Vertical thermal expansion joint	Not necessary because of minimal temperature change in the tunnel	–
Horizontal expansion joint	8m	6 mm
Horizontal thermal expansion joint	Not necessary because of minimal temperature change in the tunnel	–

iii) Pavement Structure

Figure 2.2.2-10 illustrates the pavement structure.

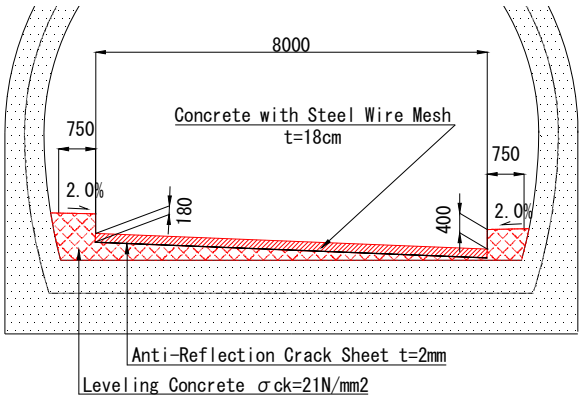


Figure 2.2.2-10 Pavement Structure

5) Measures against Frost Heave

Freezing depth in the project site is shown in Table 2.2.2-12. Since the project site nearby the 246km point is located at the center of both the cities given in this table, the freezing depth would be achieved up to around 2m.

Table 2.2.2-12 Freezing Depth in the Project Site

Soil Type	Ala-Bel City (Height: 3213m)	Toktogul City (Height: 821m)
a) Clayey soil	206 cm	128 cm
b) Sand clay, fine and silty sand	250 cm	156 cm
c) Gravel, coarse and medium-coarse sands	268 cm	167 cm
d) Coarse fragmental soils	304 cm	189 cm

Source: CLIMATIC CHARACTERISTIC ACCORDING TO METEOROLOGICAL STATION (MS), (Characteristic of Climate from reference of climate, USSR, Issue 32)

In general, frost susceptibility is empirically judged by size of soil particles. Frost heave does not almost occur in the case of sand or gravel whose particle size is bigger than 0.1mm, which is called coarse grain. Table 2.2.2-13 shows the sieve analysis results. Soils belong to A-1-a classification of the AASHTO SOIL CLASSIFICATION. This means that the soil in the project site is sand and gravel.

Table 2.2.2-13 Sieve Analysis Result

No.	Sample taking interval, (m)	Sieve analysis: Remains on sieve: >0.075 (Minimum)	0.75mm	0.125mm	0.250	0.425mm	1.25mm	2.5mm	4.75mm	9.5mm	19.0mm	31.5mm	63mm	Plasticity: Limit of liquidity, %	Limit of plasticity, %	Index of plasticity	Optimum moisture content, %	Full density, t/m3	CAR: Level of compaction, %	CAR: Penetration, mm: 2.54	5.08	Soil classification according to PASHTO	Soil classification according to GOST 25100-2011
1	0.00-0.30	9.7	0.4	3.3	3.8	14.5	10.8	6.8	9.4	11.0	10.0	7.6	12.6	16.1	13.9	2.2	6.2	2.220	98.0 - 100.0	28.0 - 38.5	40.0 - 52.0	A-1-a	Coarse medium gravel with sandy clay coarse
2	0.00-0.30	13.0	0.9	2.5	2.3	5.7	5.0	11.4	14.4	19.7	14.6	10.5	-	18.7	14.9	3.8	6.3	2.296	98.0 - 99.5	15.0 - 18.0	21.6 - 31.9	A-1-a	Coarse medium gravel with sandy clay coarse

Although countermeasures against frost heave are specified in SNiP, it has been agreed that countermeasures against frost heave are not carried out based on those mentioned above and the discussion with MOT. The main reasons of MOT are given below.

- There is little possibility for frost heave to occur as indicated in the soil investigation result.
- Percentage content of fine grain fraction is not more than 30%.
- No frost heave has occurred at present. (No countermeasures against frost heave on the existing road.)

(2) Drainage Plan

1) Drainage System

i) Drainage System at Present

Kochku-Bulak Stream flows between two ridges and joins with the Chychkan River. There are three pipe culverts (ϕ1000) and one box culvert (2000 x 2000) nearby the 246km point.

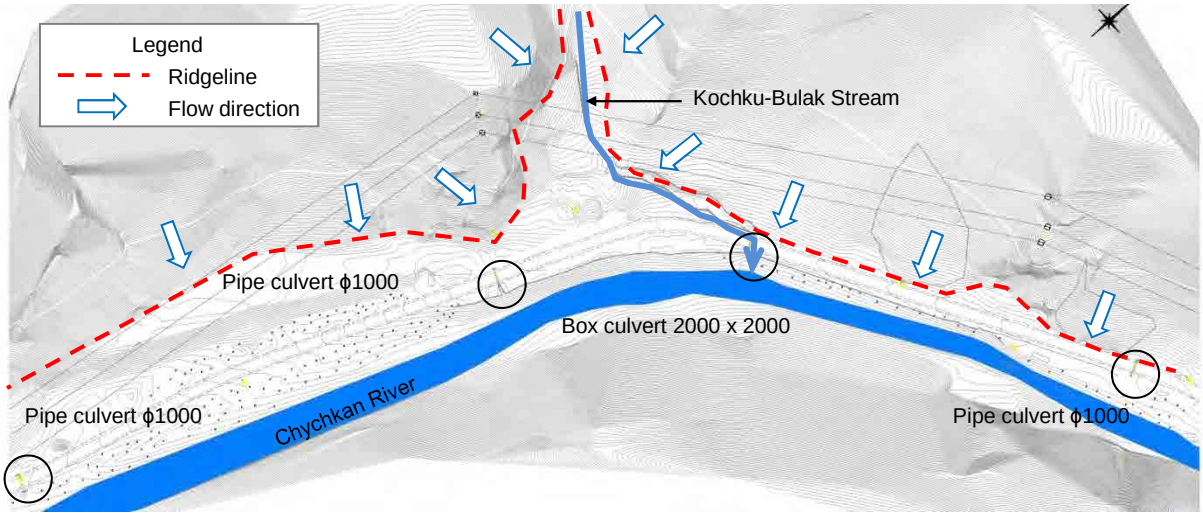


Figure 2.2.2-11 Drainage System at Present

ii) Drainage System Plan

Water flowing from Kochku-Bulak Stream shall be drained on the slope as well. In order not to take in surface drainage inside the Snow Shed, a crossing drainage facility shall be installed in front of the Snow Shed mouth.

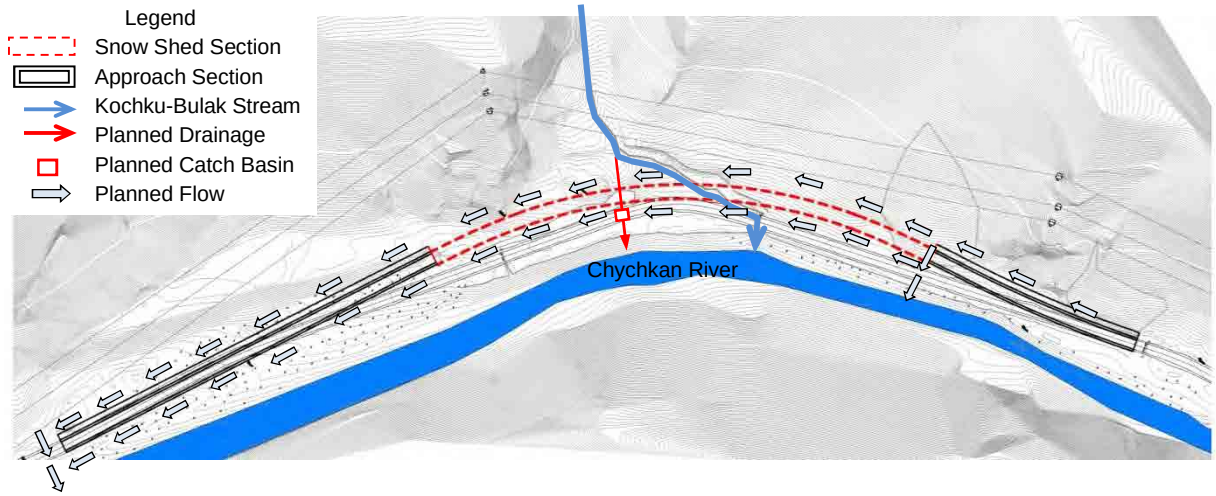


Figure 2.2.2-12 Planned Drainage System

2) Surface Drainage Facility

For the approach road section, drain ditch on both roadsides shall be installed to force drain water due to rainfall or melting snow to outside of road area. For the Snow Shed section, since it will be located in the curve, all sections shall be super-elevated toward the inside. Therefore, drainage facility is not necessary for stagnant water such as snow melt water, water brought by tire or washing water when in maintenance.

3) Open Channel on the Slope

i) Present Condition of Kochku-Bulak Stream

Present condition of Kochku-Bulak Stream (photo taken on 24 June 2014) which is the runway of avalanche is shown in Figure 2.2.2-13. The Kochku-Bulak Stream never freezes throughout the year, and discharge becomes the maximum in spring (from March to April). From the site survey result, the flowing water seems to consist of snowmelt water, rainfall and underground water. The stream crosses the existing road through the box culvert (2.0m x 2.0m) and joins the Chychkan River. Width of the stream on the slope was 3 to 5m, depth on the slope was around 5cm and depth in the box culvert was around 5cm as of 24 June 2014. However, according to the hearing result from the engineers of BO UAD, the depth in the box culvert had never been more than 1m in the past.

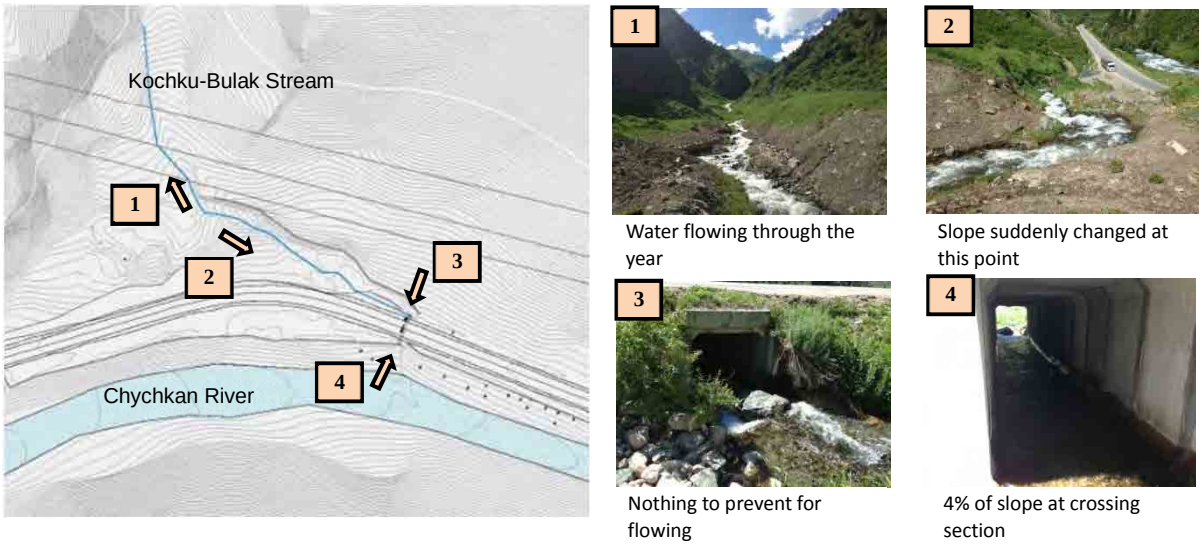


Figure 2.2.2-13 Kochku-Bulak Stream

ii) Open Channel Plan

Planned open channel shall be constructed on the slope of embankment to smoothly drain to the Chychkan River after the construction of Snow Shed. On the other hand, the existing box culvert shall be planned for drainage of percolation water.

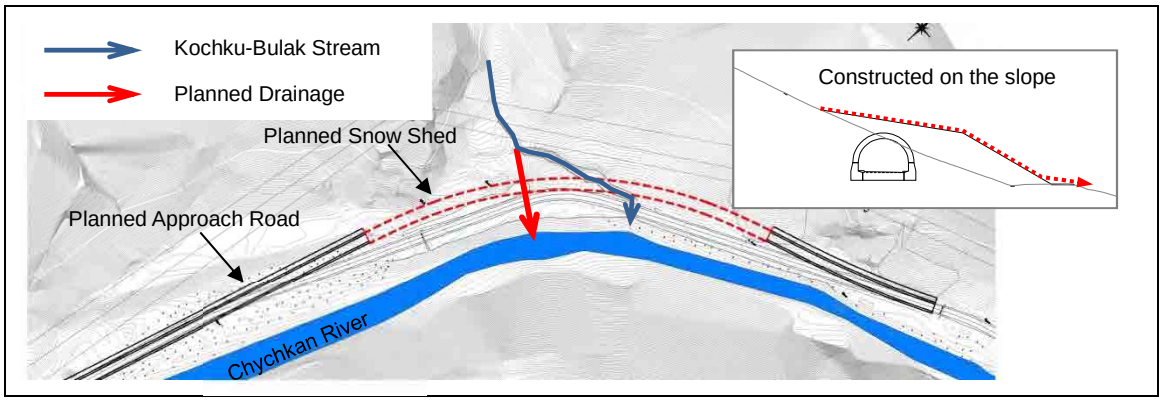
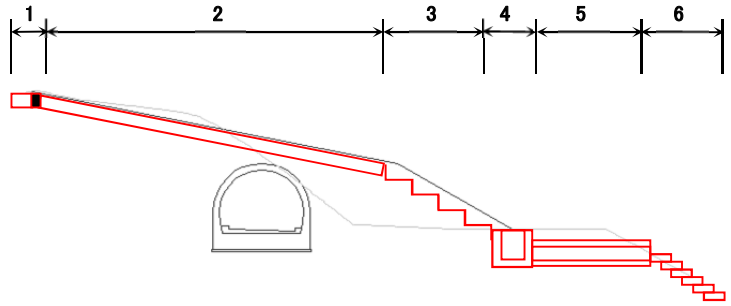


Figure 2.2.2-14 Drainage Plan

iii) Drainage Facilities

Planned open channel consists of six (6) structures according to function and location.

Table 2.2.2-14 Composition of Open Drainage on the Slope

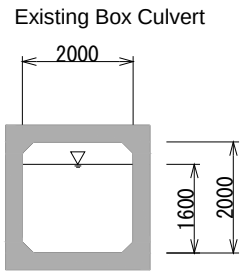
Cross Section			
			
Location		Facility	Function
1	In the joint to Kochku-Bulak Stream	Underground water control, Gabion Mattress, Groundsill	To control underground water and lead it to the channel; to protect the inlet from scouring
2	On the slope of embankment	Open channel	To drain water on the slope
3	On the slope of embankment (30 degree slope)	Stepped Drop	To reduce falling water
4	At toe of slope of embankment (30 degree slope)	Catch Basin	To reduce falling water and connect to box culvert
5	At the crossing point to existing road	Box Culvert	To drain to Chychkan River
6	In the joint to Chychkan River	Gabion Mattress	To protect and prevent outlet of box culvert from drained water

iv) Design Discharge and Cross Section Area of Flow

For deciding cross section area of flow, design discharge shall be determined as 80% depth (1.6m) of existing box culvert based on the hearing survey result with BO UAD staff due to no hydrological data nearby the project site. Cross section area of flow was decided as below by using the rational formula and equation of continuity. The planned drawing is shown in the appendix.

Table 2.2.2-15 Design Discharge

Calculation of Design Discharge			
Length	L=	16.31	M
Difference in height	dH	0.65	M
Gradient of existing box culvert	I=	4.00	%
Roughness coefficient	n=	0.020	
Cross section area	A=	3.16	m2
Wetted perimeter	S=	4.97	m
Hydraulic mean depth	R=	0.64	m
Velocity of flow	v=	7.38	m/s
Design Discharge	**Q=**	**23.32**	**m3/s**



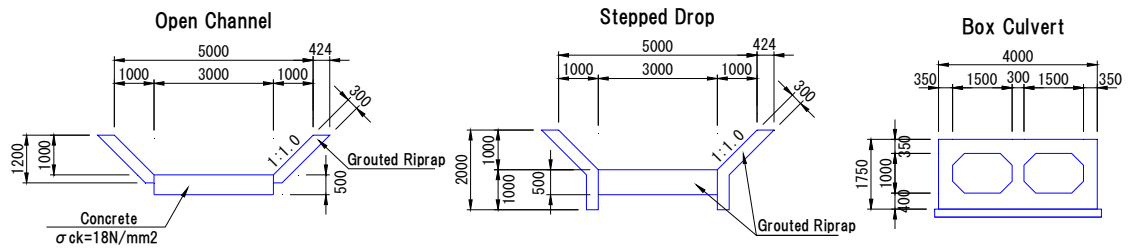


Figure 2.2.2-15 Cross Section of Flow

4) Underground Water Drainage

It seems that percolation water from the slope of natural ground concentrates in Kochku-Bulak Stream due to the terrain. There is less possibility to block flow of percolation water since underground water level is rather low like GL-5.0m at existing road side. However, percolation water level is likely to be high due to Kochku-Bulak Stream. Therefore, underground water drainage by permeable material such as gravel shall be installed on both sides of the Snow Shed.

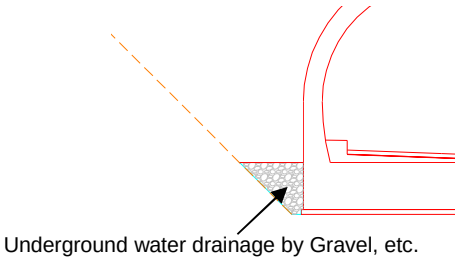


Figure 2.2.2-16 Underground Water Drainage

(3) Traffic Safety Facility

Reflecting road stud (cat's-eye) shall be installed for safe driving in the Snow Shed. Its width is 10cm square and location is on the center line. Considering durability, embedded type shall be applied.

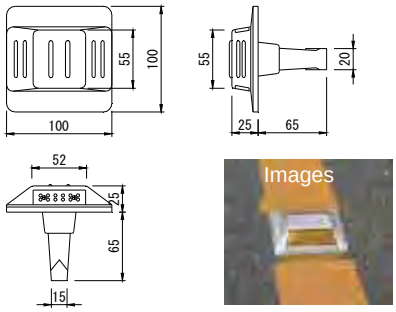


Figure 2.2.2-17 Reflecting Road Stud

(4) U-Turn Space

1) Purpose of Installation

U-Turn space shall be installed at around 100m away from tunnel mouth of the Snow Shed and on both starting and ending side of approach road so that vehicles can turn around when temporary road blocks occur due to small scale avalanche nearby the mouth.

2) Shape and Size

Width of the U-Turn space was determined from the simulation result of motion path of the design vehicle which is a trailer with the maximum length of 20m as per regulation of SNiP so that it can turn around safely. The allowable longitudinal length was secured as much as possible based on geographical constraints.

Table 2.2.2-16 Pavement Structure of U-Turn Space (unit: cm)

Type	CBR			
	4	6	8	12 or More
Wearing Course	5	5	5	5
Binder Course	5	5	5	5
Base Course	35	30	20	15
Total	45	40	60	25

Source: Road Design Guidelines, Ministry of Land, Infrastructure, Transport and Tourism, Kinki Regional Development Bureau, 2014

3) Pavement Structure

CBR of subgrade shall be controlled to be over 12 during the construction. Pavement structure of U-Turn space shall be determined as wearing course (5cm), binder course (5cm) and base course (15cm) in accordance with the criteria of Japan shown in Table 2.2.2-16.

(5) Road Lightning Design

1) Basic Policy

Road is planned with an exterior lighting system, while the Snow Shed is planned with interior and entrance lighting. Luminance of entrance lighting shall be controlled with automatic dimmer device so that drivers could secure visibility.

In case of power outage, power supply shall be automatically switched to the generator established at the project site (Kyrgyz side shall be responsible for the preparation of generator and leading-in to the automatic dimmer device).

2) Selection of Light Source

Light source for Snow Shed could be the normal one generally used for road lightning. However, selection of light source shall be done considering the peculiarity of Snow Shed as follows:

- Efficient and long life
- Stable against temperature change
- Proper light color and color rendering properties
- Good visual performance and induction effect against car fumes and fog.

The following light sources can be considered for this project. The light source shall be LED (Light Emitting Diode) which has been advanced for use in Kyrgyz Republic.

Table 2.2.2-17 Light Source and Characteristics

Type of Lighting		Color	Color Rendering Properties	Influenced by Temperature		Dimming	Instant Re-Start
				Efficiency	Start		
High-pressure sodium vapor lamp	With incorporated starter	Pale yellow	Fair	No	No	Step dimming	No
	With mouthpieces	White				Step dimming	Yes
Fluorescent lamp	For exclusive used as high-frequency lighting, straight tube lump	White	Good	Yes	Yes	Continuous dimming	Yes
	For exclusive use as high-frequency lighting, double tube lamp	White	Good	Yes	Yes	Continuous dimming	Yes
	For exclusive use as high-frequency lighting, electrode-less	White	Good	Yes	Yes	Step dimming	Yes
	For rapid-start lamp	White	Good	Yes	Yes	Continuous dimming	Yes
Metal halide lamp	For low starting voltage	White	Good	No	No	No	No
Ceramic metal halide lamp		White	Good	No	Yes	*	*

Type of Lighting	Color	Color Rendering Properties	Influenced by Temperature		Dimming	Instant Re-Start
			Efficiency	Start		
Fluorescent mercury lamp	White	Good	No	No	Step dimming	No
Low pressure sodium lamp	Orange yellow	Bad	No	No	No	Yes
LED (Light Emitting Diode)	White	Good	Yes	Yes	Step dimming and continuous dimming	Yes

* Metal halide lamp has both “Yes” and “No” in dimming and instant start.
Source: Road Lightning Installation Guidelines and Explanation, Japan Road Association

3) Design Condition

Design condition for road lightning is shown below.

[Design Standard]

- Road Lightning Installation Guidelines and Explanation, Japan Road Association, 2007
- LED Road and Lightning Installation Guidelines (Draft) , Ministry of Land, Infrastructure, Transport and Tourism, 2011

[Type of Lightning] LED

Table 2.2.2-18 Design Condition

	Road Lightning	Lightning in the Snow Shed (L=460m)			Road Lightning
Type of lightning	Exterior light (1 unit)	Entrance lighting (220m)	Lightning for Snow Shed inside	Entrance lighting (220m)	Exterior light (1 unit)
Road surface luminance	Average luminance: 0.5 cd/m2	58 – 1.15 cd/m2	1.15 cd/m2	1.15 - 58cd/m2	Average luminance: 0.5 cd/m2
Blackout lamp	Yes	← Yes (L=460m) * by interpolated lamp →			Yes

Table 2.2.2-19 Design Condition for Lightning Layout

Design Speed	60km/h
Light source of lightning for Snow Shed inside	LED
Light source of entrance lighting	LED
Outdoor brightness	Starting Side: 2500(cd/m2)
Design road surface luminance for lightning for Snow Shed inside	1.15cd/m2
Pavement	Concrete (ρ=25%)
conversion factor of average illuminance	K=13 (lx/cd/m2)
Road Width	W=7.0(m)
Maintenance factor	M=0.7
Coefficient of utilization	Lighting for Snow Shed inside: U=0.597 Entrance lightning: U=0.646
Mounting height of light	Ho=5.5(m)
Installation interval of light	S=28.5(m) “Face to Face” arrangement

4) Light Arrangement

There are generally four (4) types of lighting arrangement: “Face to Face”, “Hound's tooth”, “Centering” and “One side”. “Centering” and “One side” are the single wiring. Single wiring system has the risk that makes power supply stop in the case of breaking wire due to traffic accident. Also, there is a disadvantage that affects traffic flow when in maintenance work.

On the other hand, “Hound's tooth” type is mostly used for straight tunnel for economic reasons in double wiring system. However, if “Hound's tooth” is used for the Snow Shed in this project, dead space being out of lighting in curve section is likely to occur since the Snow Shed will be constructed in the small curve whose radius is 330m. Therefore, “Face to Face” type (double wiring system) shall be applied for securing visual performance and induction effect.

(6) Electrical Wiring System

Since power supply will be provided from Toktogul side, a power receiving equipment shall be installed at Snow Shed mouth of starting point side (Figure 2.2.2-18). Exterior light shall be also installed outside the mouth on both sides so that drivers can recognize existence of connecting point between Snow Shed and approach road.

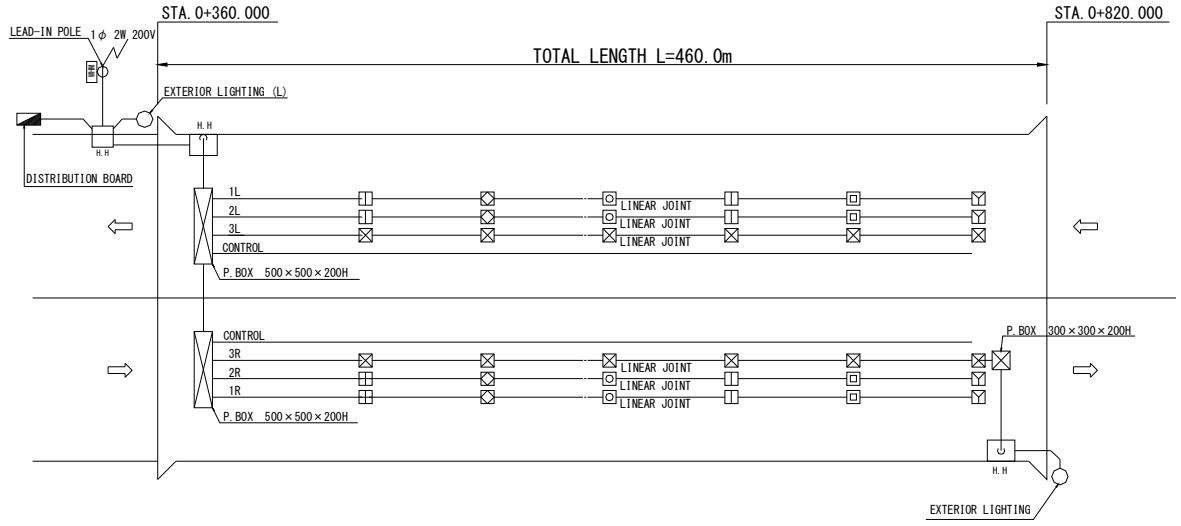
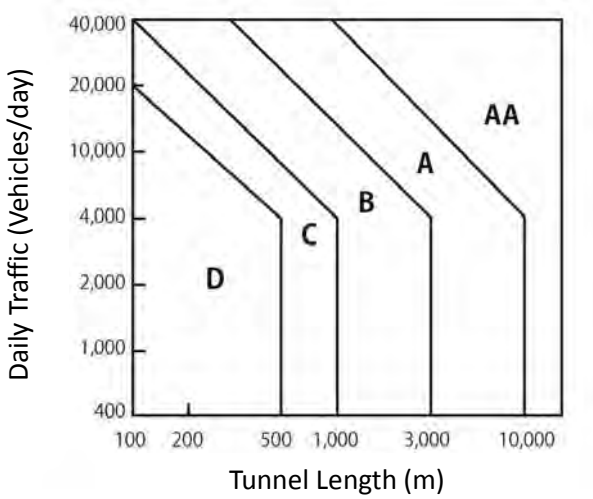


Figure 2.2.2-18 Electrical Wiring System

Installation of emergency facilities in snow shed should be studied in order to minimize the damage when fire and other accidents in the snow shed have occurred. However, there is no criterion for emergency facilities of road tunnel in Kyrgyz. Thus, the Study Team has applied the Japanese “Criteria for Road Tunnel Emergency Facilities Installation”. With reference to the criteria in Japan, tunnel grade has been defined by daily traffic volume and tunnel length (refer to Figure 2.2.2-19), and emergency facilities to be installed shall be decided by tunnel grade defined in the criteria (refer to Table 2.2.2-20).

The Snow Shed to be constructed in the Project has been planned with 460m in length and 3,841 vehicles/day in traffic volume. The Snow Shed shall be Class “D” in accordance with the Japanese criteria. Therefore, it is unnecessary to install emergency facilities in the Snow Shed.



Source: Criteria for Road Tunnel Emergency Facilities Installation, October 2001, Japan Road Association

Figure 2.2.2-19 Tunnel Grade Applied in Japan

Table 2.2.2-20 Emergency Facilities of Each Tunnel Grade

Facilities \ Tunnel Grade		AA	A	B	C	D
Warning facilities	Emergency telephone	○	○	○	○	
	Push button type emergency call unit	○	○	○	○	
	Fire detector	○	△			
	Emergency warning device	○	○	○	○	
Firefighting facilities	Fire extinguisher	○	○	○		
	Fire hydrant	○	○			
Evacuation guidance facilities	Induction display board	○	○	○		
	Flue gas equipment or Evacuation passage	○	△			
Others	Water tap	○	△			
	Wireless communication auxiliary equipment	○	△			
	Radio rebroadcast equipment or Loudspeaker broadcasting equipment	○	△			
	Sprinkler system	○	△			
	Monitoring equipment	○	△			

Note: ○: Install as principle, △: Install as needed

Source: Criteria for Road Tunnel Emergency Facilities Installation, October 2001, Japan Road Association

(7) Others

1) Retaining Wall Plan

i) Leaning Type Retaining Wall

Leaning type retaining wall of which height is 7.9m on average shall be planned at the mouth of Snow Shed on both sides in order to retain the covering soil at river side and to reduce cut volume.

ii) Gravity Type Retaining Wall

Gravity type retaining wall of which height is 5m at maximum shall be planned in order to reduce cut volume as well as the above retaining wall along the mountain side of approach road at the Bishkek side.

2) Rock Fall Prevention Fence

The geographical characteristics was confirmed that talus has accumulated around the mouth at ending point side (from 0+820 to 1+000) and is flowing to the direction of arrow as shown in Figure 2.2.2-20. Since it is expected that accumulation of talus, rock fall and so on will continuously occur even after completion of the Project, rock fall prevention fence of which height is 2m shall be installed on top of the gravity type retaining wall.

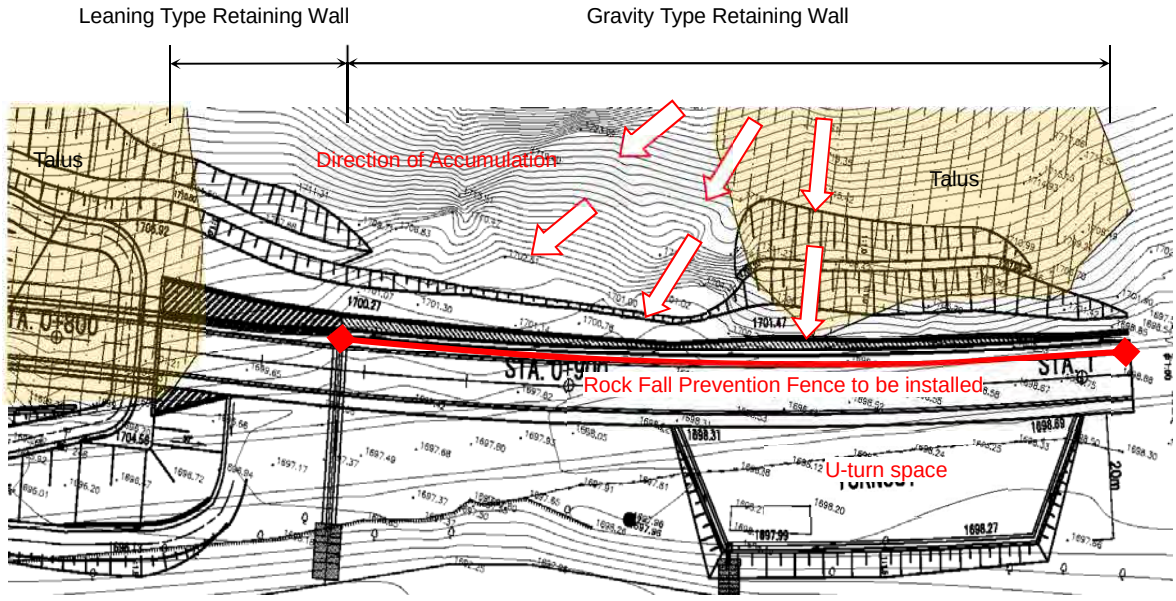


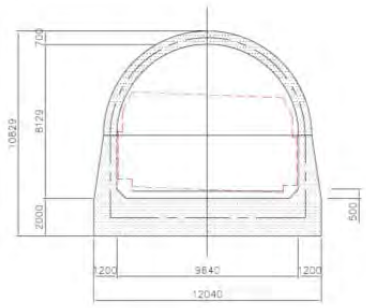
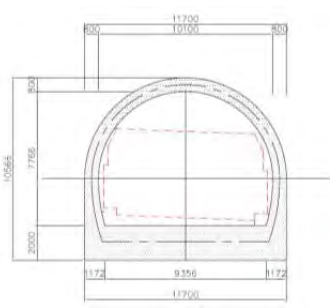
Figure 2.2.2-20 Rock Fall Prevention Fence (Bishkek Side)

2.2.2.4 Design of Snow Shed

(1) Method of Construction

Obstructive type of culvert shall be constructed under the Project. Arch-Culvert shall be adopted due to structural advantage against large scale of snow and/or debris load after avalanche. As the result of comparison below, it was confirmed that horseshoe-shaped arch culvert of cast-in-place concrete constructed by travelling center would be more advantageous in terms of construction cost. Thus Alternative-2 shall be selected for the Project.

Table 2.2.2-21 Type of Arch Culvert and Construction Method

	Alternative-1：Semi-Dome Type Arch Culvert	Alternative-2：Improved Horseshoe-Shaped (2R) Culvert
Cross-section		
General Description	Simple semi-dome type is easy to design and construct.	Horseshoe-shaped is the highest advantage in terms of structural efficiency and construction cost.

	Alternative-1：Semi-Dome Type Arch Culvert	Alternative-2：Improved Horseshoe-Shaped (2R) Culvert
Sample Image during the Construction		
Construction Method	・Bottom part will be constructed of cast-in-place concrete, and semi-arch part will be constructed of pre-cast segment block. ・Large truck crane (100 ton class) will be required for erection of the concrete segment. ・Fabrication yard of the segment block will be set up in the suburb of Toktogul 40 km away from the project site. Special trailer to transport the segment block is required for exclusive use.	・Traveling slide center with skin plate (outer center) will be procured for cast-in-place concrete. ・Three centers will be procured to complete the construction work in three years. ・Effective concreting work can be performed since concrete batcher plant can be established in the vicinity of construction site.
Time Schedule	Transportation of Equipment : 2 months Preparation of Fabrication Yard : 3 months Fabrication of the Segment : 20 months Erection of the Segment : 30 months Total : 36 months	Fabrication of Slide Center : 8 months Transportation of the Center : 2 months Erection of the Slide Center : 1 month Concreting Work : 25 months Total : 36 months
Ratio of Construction Cost	1.00	0.90
Evaluation	Pre-cast segment type can be of disadvantage in the construction cost since fabrication yard of segment block would be away from the project site due to limited space. **Fair**	Width of the structure can be smaller than Alternative-1, excavation volume can be reduced. Construction period can be saved by adding slide center. **Good**

(2) Design Criteria

Design of Snow Shed formed of arch-culvert is based on the "Design Guideline for Culvert (Japan Road Association, 2009)". The Snow Shed to be constructed under the Project is large in scale of over 10 meters in total height, so that seismic design is also carried out by using response acceleration estimated in compliance with the Kyrgyz Seismic Standard (SNiP KR, 20-02: 2009).

Table 2.2.2-22 Summary of Design Criteria

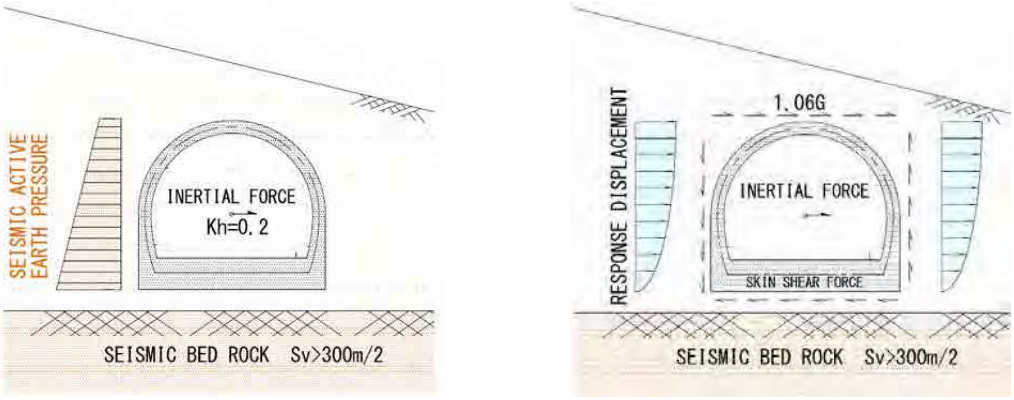
Item	Detail	Values	Remarks
Material	Unconfined Compression Strength of Concrete	30 N/mm^2 or more	
	Reinforcing Bar	SD345 or equivalent	GOST*－A500C can be used since its yield strength is over the SD 345.
Allowable Stress	Bending Tensile Stress of Reinforcing Bar	180 N/mm^2	
	Flexural Compression Stress of Concrete	10 N/mm^2	
	Share Stress of Concrete	0.25 N/mm^2	In case borne by Concrete only
		1.9 N/mm^2	In case borne by Concrete in combination with Stirrup
Miscellaneous	Concrete Cover	40mm: Arch-part 70mm: Bottom Slab	Up to surface of reinforcing bar
	Minimum Thickness of Slab at the Arch Crown	600 mm	

*GOST: Russian National Standard

(3) Seismic Design

1) Seismic Motion and Design Load

In accordance with the policy mentioned in Subsection 2.2.1.3(2), two types of seismic motion are considered for the design of arch-culvert as shown below to ensure the safety in case of earthquake.



Level-1 Seismic Load Model　　Level-2 Seismic Load Model

Figure 2.2.2-21　Model of Seismic Load by Seismic Grade

2) Seismic Load for Level-2

Seismic Load of Level-2 seismic motion is computed by the following formula stipulated in the Kyrgyz Seismic Standard. Stress of reinforcing bars is examined if the stress is below its yield strength under the horizontal seismic load.

Horizontal Seismic Load, $S_{ik}=K_1K_2K_3S_{0i}$

K_1: Importance Factor：1.0 (referred from SNiP KR, 20-02 : 2009 Table 5-3)

K_2: Structural Factor：0.3 (referred from SNiP KR, 20-02 : 2009 Table 5-4)

K_3: Height Factor = 1 + 0.06 (p- 5), 1≤K3≤1.8, (p: floor number): supposed to be 4th Floor

= 1+0.06 (4-5) = 0.94

$$S_{0ik} = Q_k A B_i K_\Psi \eta_{ik}$$

Where;

S_{0ik}: Horizontal Load at "i"

Q_k : Nodal Load

A : Regional Coefficient : 0.40

β_i: Dynamic Coefficient : 2.5

K_Ψ: Horizontal Composite Coefficient : 1.0

ηik : Vibration Mode Coefficient

$$\eta ik = \frac{X_l(x_k)\sum_{j=1}^{n} Q_j X_l(x_j)}{\sum_{j=1}^{n} Q_j X_l^2(x_j)}$$

$$\eta ik = \frac{x_k \sum_{j=1}^{n} Q_j x_j}{\sum_{j=1}^{n} Q_j x_j^2} \quad \text{(in case Ti<0.40s)}$$

Natural Period of the ground (Ts) is computed based on the following formula provided by the "Design Guideline for Public Utility Conduit" (Japan Road Association, 1986).

Ts=1.25T_G＝1.25x0.20=0.25 (s)

Ts：Natural Period of the Ground

T_G：Dynamic Ground Constant

$$T_G = 4\sum_{i=1}^{n}\frac{H_i}{Vi}$$

=4x12(m)/248(m/s)=0.20 (s)

H_i : i[th] Layer Thickness (m)

V_{Si} : Elastic Wave Velocity of i[th] -Layer (m/s)

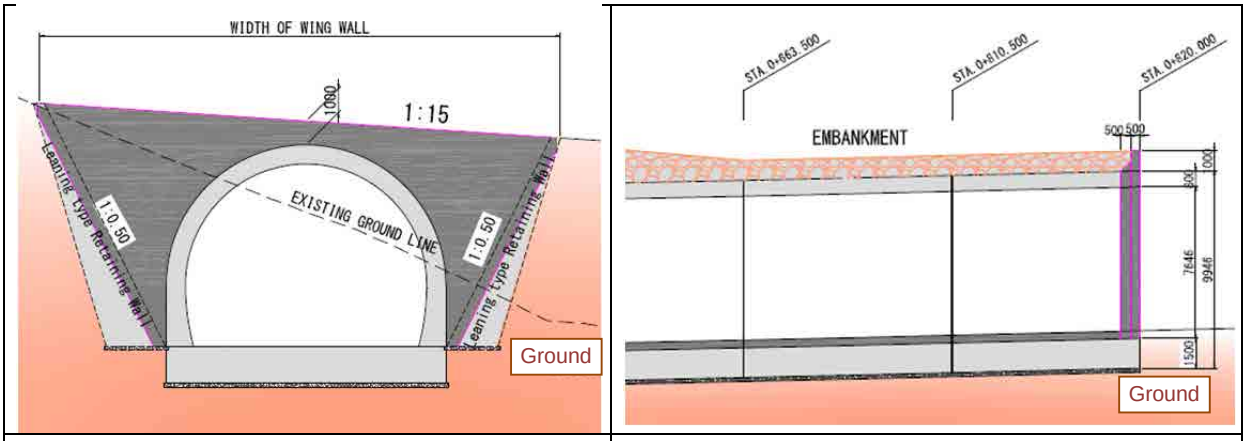
Clay : V_{Si}= 100 $N_i^{1/3}$ (1≦N_i≦25)

Sand : V_{Si}= 80 $N_i^{1/3}$ (1≦N_i≦50)

N_i= 0 : V_{Si}= 50

(4) Portal Type of Snow-Shed

Structure type of portal needs to prevent incoming debris by avalanche and snowfall from outside for safe driving. It is also possible that the avalanche would cause rock-fall at the entrance of Snow Shed. Considering the above condition and to absorb the impact by debris including rocks, covering earth shall be designed to extend up to the entrance of the Snow Shed with 1.0m thickness, and “wall surface type” of portal is designed to accommodate these conditions.



Cross Section | Profile

Figure 2.2.2-22 Design of Portal

(5) Waterproofing System

Following conditions shall be taken into account for the waterproofing system of Snow Shed to be constructed under the Project.

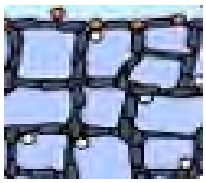
Rainfall Period: Rainfall on the slope will runoff the surface and inside of the embankment and penetrated water inside of the embankment will act as seepage pressure on the Snow Shed.

Ordinary Period: Seepage water by snowfall and rainfall achieves the Snow Shed over a long period and act as seepage pressure directly heading to the Chychkan River.

Snowmelt Period: Accumulated snow and/or debris by avalanche shall have thawed during early spring. It is expected that groundwater pressure becomes higher than usual due to seepage of the melting snow.

Water leakage into the Snow Shed due to groundwater will create ice pillar during winter season, which is a possible obstacle to traffic safety and maintenance work on the Snow Shed. In addition, repeated freeze-thaw of groundwater infiltrated into concrete expedites deterioration of the concrete members. Therefore, sufficient waterproofing measures shall be provided to the Snow Shed taking into account the cost, durability and workability under the condition of project site. Following are typical waterproofing measures to be adopted for the respective locations.

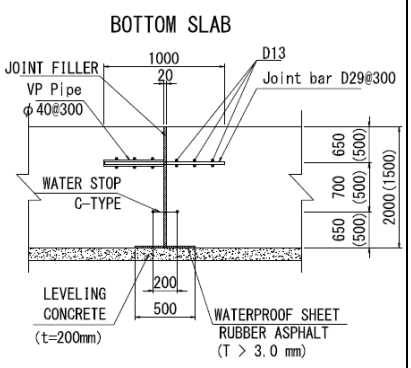
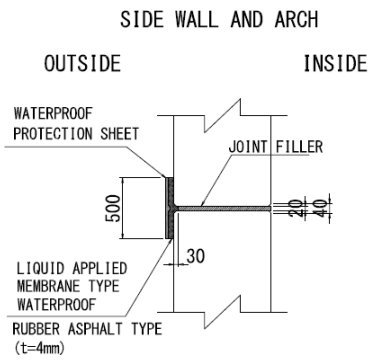
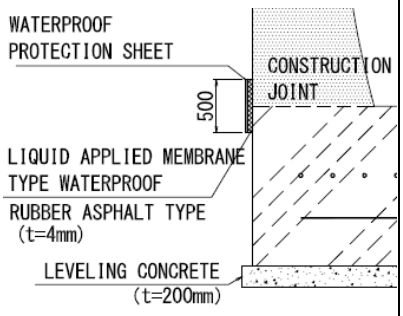
Table 2.2.2-23 Types of Waterproofing Measure and their Application

	Waterproofing Sheet	Liquid Applied Membrane Type	Barrier Penetrant Type	Concrete Admixture Type
Principle	 Impermeable gum sheet is manually pasted with adhering agent.	 Liquid material consisting primarily of "High-Polymerized Compound" is applied to surface of concrete to form the waterproofing layer.	 Silane or Silicate will be impregnated into the concrete to fill up small voids and prevent water penetration.	 Concrete admixture, which induces chemical reaction to generate silica component, creates watertight concrete with self-reactive healing function for crack repair.
Durability	Protection sheet is additionally required since the waterproof sheet is easily damaged by earth filling during the construction. The sheet is inferior in deformational flexibility to cracks in concrete.	Protection sheet is additionally required since the waterproof sheet is easily damaged by earth filling during the construction. The membrane is excellent in deformational flexibility to cracks in concrete.	Re-coating is required every 10 years since this type easily deteriorates. It is unsuitable for underground structures.	Durability is sustained as long as concrete keeps its soundness. There is no fear that damage will occur by the backfilling of embankment during construction.
Workability	Accomplished skills and accuracy in flatness of concrete surface are required in order to firmly adhere to the sheet to the concrete.	Construction work is comparatively easy at shorter time by using spray type.	Construction work is comparatively easy at shorter time by using spray type.	Work Time will be saved due to simple work such as mixing the concrete admixture at the time of concrete batching.
Cost Ratio	1.80	1.20	0.80	1.00
Application	Expansion Joint at Bottom Slab	Expansion Joint at Side Wall and Arch Block / Construction Joint	Not Applicable for the Project	Arch Concrete above Bottom Slab

1) Waterproof at Expansion Joint and Construction Joint

Expansion joints are planned to be provided at every 10.5m due to the size of travelling slide center and these will be weak points in waterproofing. In addition, construction joints between bottom slab and side wall which may develop to cold-joint will come up along the Snow Shed due to the construction sequence. It is most likely that these joints will be the cause of water leakage, so that the following waterproofing measures shall be provided at each joint and/or location.

Table 2.2.2-24 Waterproofing Measures for the Project

Expansion Joint at Bottom Slab	Expansion Joint at Side Wall / Arch Block	Construction Joint
		
Waterproof sheet shall be laid prior to concreting of bottom slab and water-stop shall be installed in the center of slab thickness to prevent groundwater seepage.	Membrane type waterproofing is more effective than water-stop for high pressure groundwater. [Water-stop at the arch block becomes obstacle of concrete pouring and cause air voids in the concrete.] Protection sheet is required to prevent damage to the waterproofing by backfilling earth.	Membrane type waterproof and protection sheet shall be provided similar to the sidewall.

2) Waterproof at Sidewall and Arch Block

The whole Snow Shed will be soaked in artesian groundwater during the thawing and/or the rainy season due to osmosis of water from the slope of mountainside and snowmelt. Even hair-cracks appearing during construction period can be the cause of water leakage under the artesian groundwater. To prevent water leakage from the concrete body through cracks, Concrete Admixture Type Waterproof is proposed in such a wide area as the sidewall and arch block in terms of saving of construction period and construction cost.

2.2.3 Outline Design Drawing

General drawings are attached in Appendix-6 and the contents are as shown below.

Table 2.2.3-1 Contents of Drawings

No.	Title of Drawing	Drawing No.	No. of Sheets
1.	TYPICAL CROSS SECTION	TP - 01 ～ 02	2
2.	GENERAL DRAWING	GD - 01 ～ 02	2
3.	FACILITY PLAN	FP - 01 ～ 03	3
4.	DETAIL OF DRAINAGE STRUCTURE	DS - 01 ～ 11	11
5.	DETAIL OF ANCILLARY STRUCTURE	DA - 01 ～ 02	2
6.	DETAIL OF CONCRETE PAVEMENT	DC - 01	1
7.	GENERAL LAYOUT OF ARCH CULVERT	GL - 01	1
8.	DETAIL OF ARCH CULVERT	AC - 01 ～ 03	3
9.	LAYOUT OF LIGHTING IN ARCH CULVERT	LL - 01	1
10.	WIRING SYSTEM OF LIGHTING	WS - 01	1
11.	INSTALLATION OF LAMP AND WIRING	IL - 01	1
12.	DISTRIBUTION BOARD	DB - 01	1
13.	LEAD-IN POLE AND SWITCH BOX	LP - 01	1
14.	EXTERIOR LIGHT	EL - 01	1
	TOTAL		31

2.2.4 Implementation Plan

2.2.4.1 Implementation Policy

Basic policy for construction works of the Project is as follows:

- Construction materials, equipment and labor should be procured in Kyrgyz as much as possible. If impossible, it may be procured from a third country or Japan with consideration on quality, supply capacity, economic efficiency and certainty.
- Construction method and schedule should be considered with climate, geographical, and geological conditions in local region.
- Construction method should be planned without special equipment and technology as much as possible.
- Appropriate specifications and construction management standards should be set, and both the Contractor and the Consultant should formulate the organization to satisfy these standards.
- Diversion road, signboards providing information on the construction work, watchmen, etc. should be put in place in order to ensure traffic route and traffic safety.

- Influx of sediment to the river and water pollution of the river due to construction work shall be prevented. Borrow pit, temporary soil disposal area and waste treatment area shall use the area selected and specified by the Kyrgyz side in order to reduce the environmental impact.
- Construction plan should sufficiently consider and assure safety, because the Project site is in the avalanche high risk region.

2.2.4.2 Implementation Conditions

Considerations for construction planning are described below:

- Effect to existing road traffic should be minimized by construction of diversion road.
- Construction work on Snow Shed with possibility of occurrence of avalanche in snow season should be paused to ensure safety.
- Concrete placing work in winter season (December to March) should be paused since mean temperature becomes subzero and quality control of concrete is difficult. In addition, all outdoor work in midwinter season (December to February) should be paused because of snow. The Project Manager of the Contractor and the Chief Engineer should stay in Kyrgyz and manage the Project site in order to respond to unexpected accidents such as avalanche. The Contractor and the Consultant shall properly arrange and organize their respective personnel.
- Construction procedure is to construct diversion road to river side firstly, and then excavate for Snow Shed structure. After excavation completion, concrete bottom slab, arch member, and backfill shall be constructed in order.
- Batching plant for concrete mixing shall be installed in a space near the Snow Shed construction site.
- Temporary stockyard for construction materials and equipment is assumed to be in the location of DEP23 storehouse 2km away from the construction site.
- Asphalt bitumen and aggregate for concrete and pavement shall be procured in Toktogul City.
- Temporary water passage shall be installed to treat groundwater and osmosis water.

2.2.4.3 Scope of Work

The responsibilities to be borne respectively by Japan and the Kyrgyz are summarized in Table 2.2.4-1.

Table 2.2.4-1 Responsibilities of Japan and Kyrgyz Republic

Items	Contents	Responsible		Remarks
		Japan	Kyrgyz	
Land acquisition (ROW) and house relocation			○	
Procurement	Procurement of materials and equipment	○		
	Customs clearance of materials and equipment		○	
Construction Preparation	Land acquisition necessary for construction		○	Project office, accommodation, equipment storage yard, workshop, etc.
	Installation of electric and communication cables		○	Primary power source and communication line to the project office
	Preparation other than above	○		
Removal/relocation of obstruction to construction	Relocation of obstruction		○	Rare plants, monument and communication cable, etc.
Diversion Road during Construction Work	Construction of diversion road	○		
	Maintenance work for diversion road		○	
Main Construction Work	Snow Shed, approach road and lighting facilities	○		
	Management house, emergency generator and power receiving equipment		○	

2.2.4.4 Consultant's Supervision

Basically, the Japanese Consultant shall enter into an agreement with the GOK to undertake the detailed design and construction supervision of the Project.

(1) Detailed Design

The major works to be carried out by the detailed design consultant are as follows:

- Undertake consultations with concerned authorities of Kyrgyz; field surveys,
- Detailed design and drawings preparation
- Project cost estimate

The duration to carry out the detailed design work is about 5 months.

(2) Tender Assistance

The major tasks to be undertaken from tender announcement to construction agreement include:

- Preparation of tender documents (in parallel with detailed design)
- Tender announcement
- Prequalification of Tenderers
- Implementation of Tender
- Tender Evaluation
- Preparation of Contract Agreement

The duration of the tender assistance is expected to be about 3.0 months.

(3) Construction Supervision

The Consultant shall carry out construction supervision for construction work executed by the Contractor based on the contract of the Project. Major items of construction supervision are as follows:

- Verification/Approval of related surveys and quantities
- Review/Approval of construction plan
- Quality Control
- Construction Schedule Management
- Work Output Control
- Safety Management
- Handover Inspection and Acceptance

The duration of consulting services for construction supervision is approximately 36 months.

The construction supervision team is to consist of one (1) Resident/Chief Engineer (Japanese), one (1) Civil Engineer (Local), and one (1) Utility Man (Local). The Chief Engineer is to be in charge of assistance for the commencement of the work and completion inspection, and may dispatch inspector(s) for handover inspection during completion. It should be noted that the Chief Engineer shall engage in construction supervision in Kyrgyz continuously during the non-construction period in winter season for safety control of the construction site and for site management when avalanche occurs.

The Consultant shall carry out construction supervision with attention to safety management, in particular, in cooperation with the Contractor because the Project will partially occupy existing road.

2.2.4.5 Quality Control Plan

(1) Quality Control Items and Applicable Criteria

Major items which need quality management during the construction period are the following:

- Concrete work
- Rebar and formwork
- Embankment
- Pavement work

Among the above, typical quality management items are as indicated in Table 2.2.4-2 for concrete work, and Table 2.2.4-3 for embankment and pavement work. Regarding quality confirmation of rebar, the mill sheet must be checked in order to confirm whether or not it satisfies GOST5781-82 A500C or equivalent international standards when rebar is delivered.

Table 2.2.4-2 Quality Control Plan for Concrete Works

Items	Test Item	Specification	Test Frequency
Cement	Physical test of cement	AASHTO M85	Once before trial mixing, and once every 500m^3 batch of concrete; or change in source/quarry location (Mill sheet).
Aggregate	Physical test of fine aggregate for concrete	AASHTO M6	Once before trial mixing, and once every 500m^3 batch of concrete; or change in source/quarry location (check supplier data).
	Physical test of coarse aggregate for concrete	AASHTO M80	Once before trial mixing, and once every 500m^3 batch of concrete; or change in source/quarry location (check supplier data).
	Sieve analysis	AASHTO T27	Once before placing, and once a month or change in source/quarry location (check supplier data).
	Evaluation of Alkali Silica Reactivity (ASR) Mortar Bar. Testing	ASTM C1260	Once before trial mixing, and once by concrete specimen of 6 months during construction work or change in source/quarry location.
	Petrographic Examination of Aggregates for Concrete	ASTM C295	Once before trial mixing, and change in source/quarry location
Water	Quality of water	AASHTO T26	Once before trial mixing, and when necessary
Admixture	Chemical Admixtures for Concrete	ASTM C494	Once before trial mixing, and when necessary (Mill sheet)
Concrete	Slump test	AASHTO T119	Every 75m^3 or batch
	Air Content of Freshly Mixed Concrete by the Pressure Method	AASHTO T152	Every 75m^3 or batch
	Compressive Strength of Cylindrical Concrete Specimens	AASHTO T22	6 samples per batch or 6 samples for every 75m^3 of concrete (3 samples each for 7-day strength and 28-day strength.
	Temperature	ASTM C1064	Every 75m^3 or batch

Table 2.2.4-3 Quality Control Plan for Embankment and Pavement Works

Items	Test Item	Specification	Test Frequency
Embankment	Density Test (Compaction)	AASHTO T191	Every 500m2
Roadbed	Sieve analysis	AASHTO T27	Once before placing, and once every 1,500m3 or change in source/quarry location
	Material Test (California Bearing Ratio)	AASHTO T193	Once before placing, and once every 1,500m3 or change in source/quarry location
	Dry Density Test (Compaction)	AASHTO T180	Once before placing, and once every 1,500m3 or change in source/quarry location
	Field Density Test (Compaction)	AASHTO T191	Every 500m2

(2) Consideration on Construction in Cold Climate Region

It is absolutely required to note temperature management of the materials (concrete work, pavement work, storing of construction materials, etc.) because the Project site locates in cold climate.

(3) Prevention of Initial Crack

Concrete cracking after placement of concrete is liable to occur because thermal stress occurs with heat of hydration of cement. Mix design of concrete, procedure for placing concrete, temperature control for concrete, curing method and period, and timing of formwork removal should be studied in

detail during the detailed design phase. The criteria should be specified in the specifications. Moreover, the contractor should consider thorough review during construction plan preparation.

2.2.4.6 Procurement Plan

(1) Procurement of Major Materials and Equipment

1) Policy of Procurement Plan

Materials produced locally are cement, sand, aggregate, roadbed material, timber, etc. Others shall be imported. Procurement sources of major construction materials are as indicated in Table 2.2.4-4.

The procurement policy is as follows:

- If imported materials are provided constantly in the local market and their quality is sufficient, materials for the Project would be procured from the local market.
- If materials are impossible to procure from the local market, it would be procured in Japan or 3rd country. Procurement sources should be decided with consideration on cost, quality, and the period for Customs clearance.

Table 2.2.4-4 Procurement Sources of Major Construction Materials

Items		Sources			Procurement Method
Materials	Specification	Kyrgyz	Japan	3rd Country	
Materials for Structure					
Cement	50kg	○			Procured locally
Rebar	Less than D25	○			Procured locally
	Thicker than D29		○		
Aggregate for concrete		○			Produced locally
Asphalt		○			Procured locally
Material for subgrade and roadbed		○			Produced locally
Lighting facilities		○			Procured locally
Waterproofing material			○		
Concrete admixture			○		
Gabion			○		
Water-stop			○		
Temporary Materials					
Fuel, oil		○			Procured locally
Timber for formwork		○			Procured locally
Plywood for formwork		○			Procured locally
Temporary steel materials		○			Procured locally
Travelling arch center			○		Manufactured in Japan

Table 2.2.4-5 Procurement Sources of Major Construction Equipment

Items		Sources		
Equipment	Specifications	Kyrgyz	Japan	3rd Country
Backhoe	0.45m^3	○		
Backhoe	0.8m^3	○		
Dump truck	10t	○		
Dump truck	4t	○		
Bulldozer	21t	○		
Bulldozer	15t	○		
Rubber tired roller	8-20t	○		
Road roller	10-12t	○		
Vibrating roller	Hand guiding type		○	
Motorized grader	W=3.1m	○		
Wheel loader	3m^3	○		
Truck crane	20-22t	○		
Crawler crane	55t		○	
Concrete Pump Truck	90-100m^3/h		○	
Other special equipment			○	
Hydraulic breaker	1,300kg class		○	
Diesel generator	60KVA	○		
Diesel generator	200KVA		○	
Rammer (for compaction)		○		
Agitating truck	5m^3	○		
Pickup truck		○		

2) Procurement of Rebar

It is possible to procure the re-bars to be used in the Project in Kyrgyz. However, re-bars locally available are only up to 25mm in diameter because large construction works are rare. Therefore, re-bars of over 29mm in diameter shall be procured in Japan.

3) Gabion

Gabion has been used in Kyrgyz, but the wire is thin and reinforcement is not enough. Therefore, it is undesirable to apply the gabion in Kyrgyz in the Project because the material in Kyrgyz does not have sufficient strength. Gabion conforming to the JIS standard shall be procured from Japan.

4) Travelling Arch Center

Travelling arch center should be required for arch culvert construction because culvert size is large. Travelling arch center should be procured from Japan because it is necessary to be manufactured by a professional fabricator.

(2) Transportation Route

There are two (2) transportation routes from Japan to Kyrgyz. Transportation which means from Bishkek to the project site would be by land vehicle transportation. Transportation using container should be via China, and in case transportation with container is impossible (e.g. large construction equipment), it should be via Russia.

(1) Route via China: Cargo from Japan will be carried by ship to Tsingtao Port or Lianyungang in China, and be transported from there by railway to the border of Kazakhstan. Transshipment at the border of China and Kazakhstan is necessary because the rail widths of China side and Kazakhstan side are different. After transshipment, the cargo is transported to Bishkek. This route has only experience of container transport because of the limit of transshipment. The period of transportation using this route is 1.5 to 2.0 months.

(2) Route via Russia: Cargo from Japan will be carried by ship to Vladivostok Port in Russia, and carried from Vladivostok Port to Bishkek by the Trans-Siberian Railway. The period of transportation using this route is 2.0 to 2.5 months.

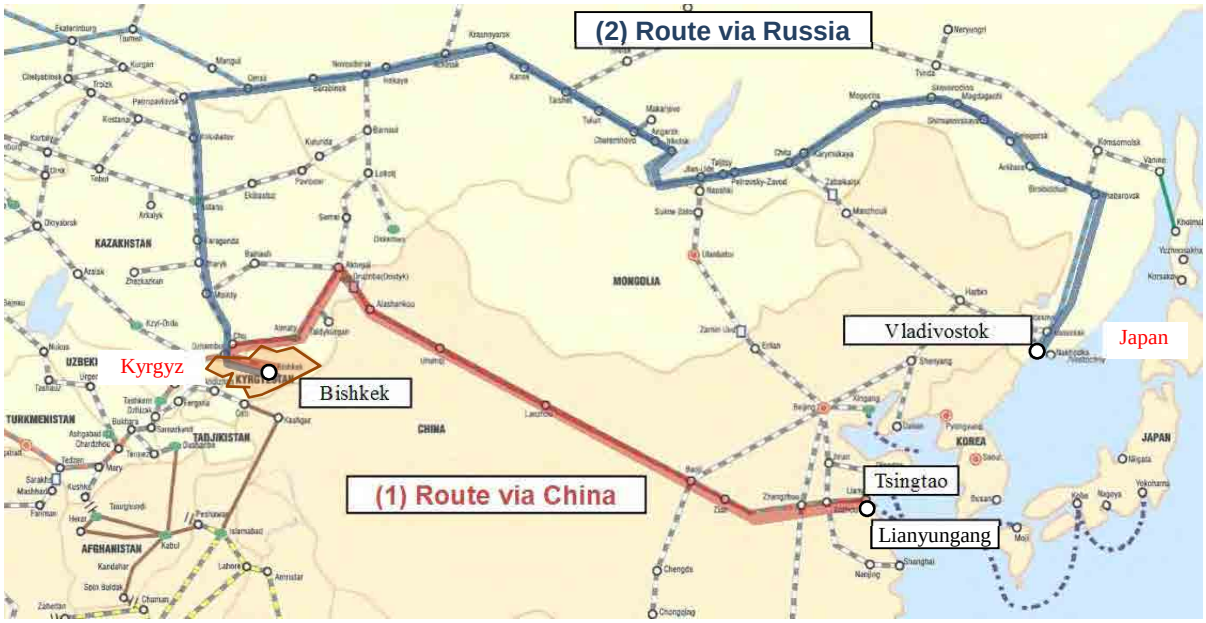
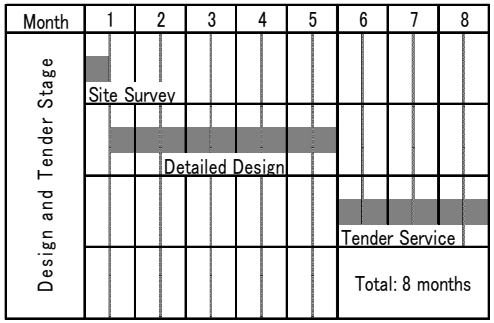


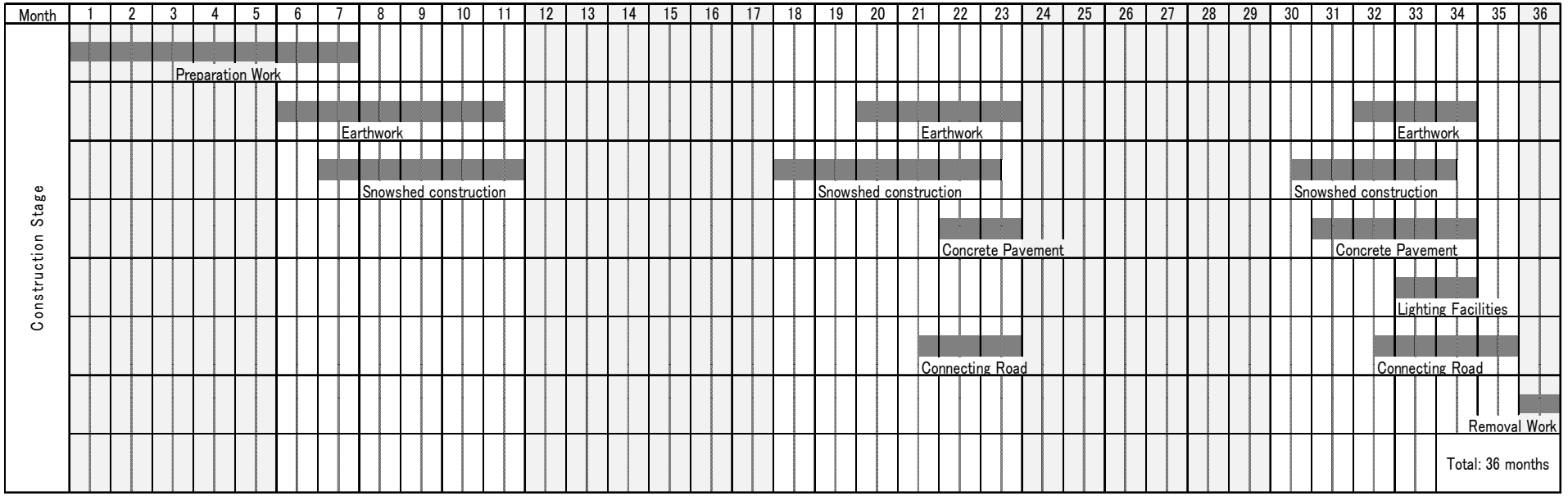
Figure 2.2.4-1 Transportation Routes

2.2.4.7 Implementation Schedule

The implementation schedule for detailed design, tendering services and construction activities is as indicated in Table 2.2.4-6.

Table 2.2.4-6 Implementation Schedule





2.3 Obligations of Recipient Country

The obligations of the Government of Kyrgyz (GOK) during the project implementation period are as described below.

2.3.1 General Obligations of GOK under the Japan's Grant Aid Project

The general obligations of GOK under the Japan's Grant Aid Project are as follows:

- Provision of necessary data and information for the Project.
- Ensuring of necessary land (for road, construction work, contractor's camp, equipment storage, etc.) for the Project.
- Opening of the bank account in the name of the GOK in a Bank in Japan, and issuance of the Authorization to Pay (hereinafter referred to as A/P).
- Unloading of the cargo and tax exemption and Customs clearance in Kyrgyz shall be carried out smoothly and certainly.
- Japanese corporations and Japanese personnel involved in the Project shall be exempted from payment of all taxes and Customs fees related to the Project and imposed in Kyrgyz.
- Kyrgyz shall permit personnel involved in the Project to enter Kyrgyz and stay for the Project based on the authorized contract.
- Permission of the implementation of the Project and give the other privileges, if necessary.
- The structure constructed by the Project shall be maintained, managed and conserved correctly.
- All costs other than the cost burdened by Japan's Grant Aid shall be shouldered by the Kyrgyz side.

2.3.2 Particular Obligations of GOK for the Project

The particular obligations of GOK for the Project are as follows:

- Electrical works for power supply to lighting facilities: Electrical works for power supply (15kVA, 220-240V) for lighting facilities, including power receiving facilities, shall be executed up to July 2018 at the project site.
- Procurement and installation of emergency generator: If electrical power failure occurs, electrical power for lighting in the Snow Shed would be supplied from the generator (60-65kW) procured by the Kyrgyz side.
- Communication cable laid by Kyrgyz Telecom along BO Road should be relocated to riverside location before the start of the Project, so that it will not be affected by the Project.
- Maintenance work for diversion road in the construction period of the Project should be executed by DEP-23 located in Toktogul.
- Alternative land for relocated residents currently engaged in the apiary by the Project site shall be provided up to 2015.
- To carry out the consultations on felling of trees specified in protected species with SAEPF, acquisition of felling permission, and planting for felling compensation.
- To provide necessary land for the Project for temporary disposal yard and construction yard other than location of existing road.

2.4 Project Operation Plan

The organization for road maintenance management in Kyrgyz is shown in Figure 2.4-1. The Road Maintenance Division (RMD) under the Road Department in MOTC is set to be responsible for road maintenance. Nine (9) PLUADs/UADs have been organized under RMD for road maintenance management of main roads in Kyrgyz (UAD) and in each region (PLUAD). PLUAD/UAD has some DEPs in their managed area, and actual maintenance work such as road inspection and repair work has been executed by each DEP concerned. BO UAD is in charge of road maintenance for the BO Road. DEP-23 in BO UAD is in charge of maintenance work around the project site. The total number of personnel in DEP-23 is 86, which consists of 11 in the Bishkek office and 75 contractual maintenance workers.

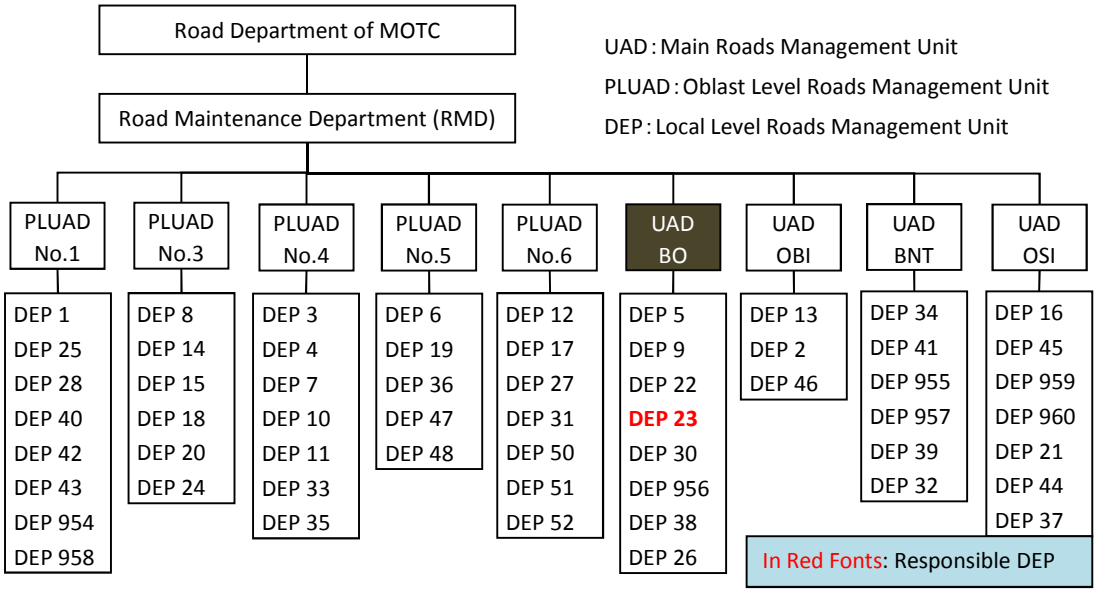


Figure 2.4-1 Organizational Chart of the Road Maintenance Department (RMD)

The major items for daily maintenance to be implemented after the Project are cleaning of sediment or weeds and investigation of earth cover which will not require special technology. Technology on periodical maintenance for structures such as crack investigation learned through "The Project for Capacity Development for Maintenance Management of Bridges and Tunnels" implemented by JICA in 2013-2015 is expected to be utilized effectively for the Snow Shed constructed under this Project.

The major maintenance items and estimated annual expenses for maintenance and operation are summarized in Table 2.4-1. It is deemed that MOTC could manage the operation and maintenance of the Project under the present condition of budget and organization, since the operation and maintenance cost required is only around 0.75 million KGS which is equivalent to 0.05% of the annual budget of MOTC for the year 2014 which amounts to 1,473 million KGS.

Table 2.4-1 Operation and Maintenance Cost

Type	Work Items	Frequency	Formula	Cost
Daily Maintenance	Patrol, weeding, cleaning and removal of rocks	Bi-weekly	2 persons ×1,000KGS×100 days	200,000 KGS/year
Periodical Maintenance	Inspection of embank condition and structure condition such as deformation and damages	Every year	2 persons×1,000KGS×5 days	10,000 KGS/year
	Inspection of Concrete Crack	Once every five years	5 persons×1,000KGS×3 days Vehicle: 25,000KGS×3 days Tools: 50,000KGS	140,000 KGS/5years (28,000 KGS/year)
	Checking of Road Lighting	Every year	2 persons ×1,000KGS×2 days Vehicle: 25,000KGS×2 days	54,000 KGS/year
Electricity Rate	Lighting in Snow Shed	―	15kW × 24h×365 days × 1.4KGS	183,960 KGS/year
Repair Work	Treatment of Shoulder and Slope	Bi-yearly	5 persons ×1,000KGS×3 days Vehicle : 35,000KGS×3 days	120,000 KGS/2years (60,000 KGS/year)
	Crack Sealing and Pothole Repairing	Every year	7 persons × 1,000KGS×5 days Equipment:25,000KGS×5 days Material: 50,000KGS	210,000 KGS/year
Maintenance & Operation Cost (per Year)				745,960 KGS/year
(0.05% to O&M Cost of MOTC in 2014)				

Table 2.4-2 Budget of MOT

(Unit: 1,000KGS)

Year	National Budget of Kyrgyz	Budget of MOTC ( ): Ratio to National Budget		O&M Cost of Road
2008	46,596,388.2	1,835,680	(3.9%)	1,012,942
2009	55,634,364.9	1,901,903	(3.4%)	1,426,471
2010	58,013,219.2	1,855,431	(3.2%)	1,067,818
2011	77,880,385.6	1,648,698	(2.1%)	898,611
2012	87,008,116.1	1,990,753	(2.3%)	1,274,132
2013	101,922,664.8	2,057,662	(2.0%)	1,368,785
2014	102,899,212.7	2,136,444	(2.1%)	1,472,900 (Planned)

2.5 Project Cost Estimation

2.5.1 Initial Cost Estimation

The initial cost estimation in this Preparatory Survey is based on the expectation that the MOTC will fund the costs summarized in Table 2.5.1-1.

Table 2.5.1-1 Project Cost to be Borne by the Kyrgyz Side

Items	Cost (Unit: Kyrgyz Som)
(1) Banking Commission	4,400,000
(2) Relocation of Communication Cable	780,000
(3) Transplanting of Protected Flora	35,000
(4) Electrical Work	21,040,000
(5) Maintenance of Detour Road during Construction	1,512,000
Total	27,767,000

2.5.2 Operation and Maintenance Cost

Operation and Maintenance Cost (O&M Cost) for the Project is to be borne by the Kyrgyz side as discussed in Section 2.4. Therefore, no financial issue is involved since the Kyrgyz side had agreed to bear the O&M Cost and budgetary allocation with a certain allowance has already commenced.

The amount to be borne by the Kyrgyz side, which is estimated to be around 27.8 million KGS, is equivalent to only 1.3% of the 1,369 million KGS annual budget of MOTC for the year 2014. Therefore, the O&M Cost can be sufficiently managed by MOTC since major items of the total costs to be borne by the Kyrgyz side such as “(4) Electrical Work” and “(5) Maintenance of Detour Road during Construction” are equivalent to only 1.0% and 0.05% of the annual budget, respectively.

Chapter 3 Project Evaluation

3.1 Preconditions

The preconditions for the Project with regard to the obligation of Kyrgyz are the following:

- An apiary is located at the Bishkek side of the project site and needs to be relocated for construction of the U–Turn space. The relocation shall be completed by the Kyrgyz side immediately after the Exchange of Notes (E/N).
- The communication cable buried underground at the project site shall be relocated by the Kyrgyz side immediately after the E/N.
- Temporary yard, stockyard, borrow pit and waste treatment area for the construction works shall be secured by the Kyrgyz side immediately after the E/N.
- Since the aggregates for concrete and pavement are to be procured from the quarry in Toktogul, the license for the operation shall be obtained by the Kyrgyz side immediately after the E/N.
- Valuable tree species in Kyrgyz exists at the project site. Approval for the felling of these trees shall be obtained by the Kyrgyz side before the felling work.
- The E/N and G/A shall be followed and duty exemptions requested shall be provided.
- Customs procedures for products from third countries shall be taken rapidly.
- Consultation and support shall be provided by the Kyrgyz side, if any problem comes up between the local people and third parties during the construction phase.

3.2 Necessary Input by Recipient Country

The following matters should be dealt with by the recipient country to develop and sustain the effect of the Project:

- The budgets described in “2.5.1. Initial Cost Estimation”, of this report shall be secured in advance in order to smoothly implement the Project.
- The removal and relocation of affected assets and securing temporary yard, etc., shall be completed before the start of construction work.
- The power supply for lightning shall be secured by June 2018 which is the time for completion of construction of the Snow Shed.
- Maintenance work shall be implemented and the necessary personnel and budget shall be secured in accordance with “2.4. Project Operation Plan”, in this report.

3.3 Important Assumption

Nothing is noteworthy as important assumption.

3.4 Project Evaluation

3.4.1 Relevance

Implementation of the Project under Japanese Grant Aid has been determined to be valid for the following reasons:

- As described above, the BO Road is the most important road in the road network of Kyrgyz because it is the main arterial road and the only route connecting to the capital city of Bishkek and the second largest city of Osh. Therefore, it is expected that the Project will benefit a considerable number of the people in Kyrgyz and the neighboring countries and as the international arterial road, will also contribute to the stabilization and speedup of goods transportation.
- The effect of the Project is the improvement of transportation network including the BO Road as an international road, stabilization and facilitation of road traffic in winter season and revitalization of society and economy. These would consequently contribute to the improvement of people's living condition that is serious issue in Kyrgyz.
- Operation and management after the Project can be implemented by the GOK under its own budget and staff without very advanced skill and technology.
- Negative environmental impacts of the Project are small.
- The Project could be implemented without difficulty under Japan's Grant Aid.
- There is a strong necessity for the Project to utilize Japanese technology on design and construction since Kyrgyz has no experience in constructing a Snow Shed using special construction methods.

3.4.2 Effectiveness

3.4.2.1 Quantitative Effects

The expected quantitative effects of the Project are the reduction of impassable days due to avalanche disaster at the 246km section of the BO Road, the increase of traffic volume in winter season, and the reduction of maintenance cost (snow removal cost) at the occurrence of avalanche.

Table 3.4.2-1 Achievement Indicator of the Project

Indicators	Reference Value (Actual value in 2012)	Target Value (2021) (After 3 years in service)
Impassable days by avalanche at the 246km section of Bishkek-Osh Road (days/year)	7	0
Average daily traffic in winter season (December-March) between Bishkek and Toktogul (vehicles/day of 24 hours)	About 1,650	2,000
Maintenance cost for snow removal at the 246km section of Bishkek-Osh Road when avalanche occurs (million KGS)	2.3	0

(1) Target Value of Average Daily Traffic in Winter Season

The daily traffic in winter season as surveyed in the first site survey is 2,058 vehicles/day on weekdays, 2,234 vehicles/day on holidays and 2,108 vehicles on average. Although snowmelt was

observed, the volume of snow was not much at the time of survey. Therefore, the difference of 3,000 vehicles between the volume in summer season and that in winter season is presumed to be due to the decline of social and economic activities in the whole region in winter season. The average daily traffic from December to March decreased further to 1,600 vehicles (see Table 3.4.2-2**)** and the reason is presumed to be the condition of the road surface which was not as good as the condition during the first site survey. Therefore, the target value at the 246km point should be set to between 1,600 and 2,108 vehicles/day because the risk of road surface freezing, etc., remains even if the Snow Shed has been constructed. The target value is estimated as follows:

[Basis of Estimation]

- Traffic in December: 2,100 vehicles/day (from the traffic survey result in the first survey)
- Traffic in January: 1,474 vehicles/day (assuming that traffic volume is average)
- Traffic in February: 1,623 vehicles/day (assuming that traffic volume is average)
- Traffic in March: 2,100 vehicles/day (from the traffic survey result in the first survey)

According to the above estimation, the average daily traffic in winter season is 1,820 vehicles and this value is assumed as the volume at the time of completion of the Project, assuming that the rate of traffic increase is 4%.

$1{,}820 \text{ vehicles} \times 1.04^3 = 2{,}047 \text{ vehicles}$

From the above results, the target value of average daily traffic in winter season is set to 2,000 vehicles/day. The increase of traffic volume in December and March, in particular, is highly expected since these periods have fewer events to disturb traffic other than the avalanche.

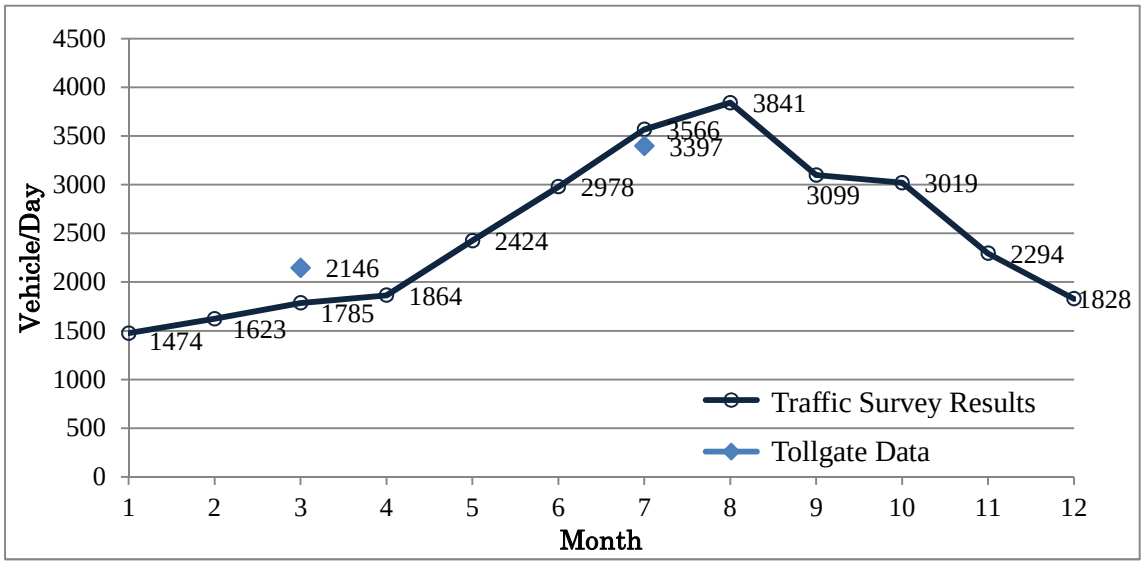


Figure 3.4.2-1 Traffic on the BO Road

Table 3.4.2-2 Average Daily Traffic in Winter Season (December to March)

Season (December to March)	2011	2012	2013
Average Daily Traffic in Winter Season	1,130	1,686	1,644

(2) Maintenance Cost

Maintenance cost for the BO Road in winter season from 2012 to 2014 is as shown in the table below. The cost makes up 52% to 76% of the whole maintenance cost for the BO Road. Upon construction of the Project, however, cost for the removal of snow would not be necessary because the Project will contribute to the reduction of cost. In short, the bottleneck on the most important road in Kyrgyz is to be solved by the Project.

Table 3.4.2-3 Cost for Snow Removal in Winter Season

Year	Maintenance Cost in Winter (thousand KGS)	Snow Removal Cost (thousand KGS)	
		The BO Road	246km Point
2012	30,325.5	4,474.4	2,328.0 (52%)
2013	51,955.9	2,327.4	1,327.4 (57%)
2014 (Jan – Nov)	42,897.7	691.3	527.1 (76%)

3.4.2.2 Qualitative Effects

The qualitative effects of the Project are as follows:

- Improvement of safety of transportation at the occurrence of avalanche.
- Enhancement of transportation capacity to neighboring countries and domestic regions in winter season.

APPENDICES

Appendix-1

Member List of the Study Team

Members of the JICA Survey Team

No.	Name	Job Title	Occupation
1	Nobuyuki TSUNEOKA	Leader	JICA
2	Kota WAKABAYASHI	Planning Coordinator	JICA
3	Yuzo MIZOTA	Chief Consultant/Transport Planner	CTII
4	Akio OKAZAKI	Sub-Chief Consultant/ Avalanche Protection Planner 2	CTII
5	Sinichi HONMA	Avalanche Protection Planner 1 (avalanche analysis)	KOKUSAI KOGYO CO., LTD.
6	Eiji WATANABE	Road Design/Construction Plan/ Transport Planner (winter season)	CTII
7	Junichiro OGAWA	Design of Road Structure	CTII
8	Hiromitsu OGATA	Procurement Planner/Cost Estimator	CTII
9	Masatoshi WATANABE	Natural Condition Survey (Topography, Geology & Meteorology)	CTII
10	Minami KATO	Environment & Social Impact Specialist	CTII

Appendix-2

Study Schedule

Appendix-2-1

Study Schedule (1st Site Survey)

Appendix2-1-1

Itirerary of the JICA Survey Team in 1st Site Survey

Implementation Schedule:
キルギス「ビシュケク-オシュ道路雪崩対策計画」準備調査
Preparatory Survey of the Project for Avalanche Protection on Bishkek-Osh Road

			JICA		Consultants			
			総括 Team Leader 恒岡　伸幸 Mr. Nobuyuki Tsuneoka	計画管理 Planning Coordinator 若林　康太 Mr. Kota Wakabayashi	業務主任/交通計画 Chief Consultant/ Transport Planner 溝田 祐造 Mr. Yuzo Mizota	雪崩対策計画1（雪崩分析） Avalanche Protection planner1(avalanche analysis) 本間 信一 Mr. Shinichi Honma	道路設計・施工計画/冬季交通計画 Road Design/construction plan/Transport Planner(winter season) 渡辺 栄二 Mr. Eiji Watanabe	自然条件調査 (地形・地質) Natural Condition Sueveyer(Topography,Geology & meteorology) 渡邉 正俊 Mr. Masatoshi Watanabe
1	3/19	Wed			NARITA (12:55) → ISTANBUL(18:10) TK051			
2	3/20	Thu			ISTANBUL(00:40)—BISHKEK(06:25)TK348		NARITA (12:55) → ISTANBUL(18:10) TK051	
3	3/21	Fri			Preparatory day for site visit		ISTANBUL(00:40)→BISHKEK(06:25)TK348	
4	3/22	Sat			Site visit to the BO 246km point		Site visit to the BO 246km point	
5	3/23	Sun	NARITA (12:55) → ISTANBUL(18:10) TK051		Site visit to the BO 246km point		Site visit to the BO 246km point	
6	3/24	Mon	ISTANBUL (00:40) → BISHKEK (06:25) TK348 Meeting with JICA KYRGYZ REPUBLIC OFFICE (AM) Explanation of Inception Report to MOTC (AM) M/D discussion with MOTC (PM)		Arrangement of the documents for the meetings		Arrangement of the documents for the meetings	NARITA(12:55)→ISTANBUL(18:10)TK051
7	3/25	Tue	AM: Meeting with Avalanche Security Department, Hydrometeorology Agency PM: Move to the BO 246km point (Site visit)		Meeting with Avalanche Security Department, Hydrometeorology Agency	NARITA(12:55)→ISTANBUL(18:10)TK051	Move to the BO 246km point (Site visit)	ISTANBUL(00:40)→BISHKEK(06:25)TK348 Move to the BO 246km point (Site visit)
8	3/26	Wed	AM:Site visit to the BO 246km point PM:Meeting with It Agar office of MES		Site visit to the BO 246km point	ISTANBUL(00:40)→BISHKEK(06:25)TK348 Move to the BO 246km point (Site visit)	Site visit to the BO 246km point	Site visit to the BO 246km point Traffic Survey
9	3/27	Thu	Site visit to the BO 246km pcint		Site visit to the BO 246km point	Site visit to the BO 246km point	Site visit to the BO 246km point	Site visit to the BO 246km point
10	3/28	Fri	Move back to Bishkek		Site visit to the BO 246km point	Site visit to the BO 246km point	Site visit to the BO 246km point	Site visit to the BO 246km point Traffic Survey
11	3/29	Sat	Internal meeting/Summarizing the data/Modification of M/D (Site visit to the BO 246km point in case the weather condition was bad from 26th to 28th.)		Preparatory day for site visit	Arrangement of the documents	Arrangement of the documents	Arrangement of the documents
12	3/30	Sun	Internal meeting/Summarizing the data/Modification of M/D (Site visit to the BO 246km point in case the weather condition was bad from 26th to 28th.)		Preparatory day for site visit	Arrangement of the documents	Arrangement of the documents	Arrangement of the documents
13	3/31	Mon	M/D discussion with MOTC		Internal meeting	Arrangement of the documents	Internal meeting Preparation of the meeting	Internal meeting Preparation of the meeting
14	4/1	Tue	AM: Meeting with Department on State Ecological Expertise and Natural Resource Managemet, State Agency of Environment Protection and Forestry (SAEPF, Discussion on EIA) Meeting with Division on natural reserved areas PM: Signing of the M/D, Report to JICA KYRGYZ REPUBLIC OFFICE		Meeting with JICA before return	Arrangement of the documents	Meeting with surveyors	Meeting with surveyors
15	4/2	Wed	BISHKEK (10:25) → ISTANBUL(13:15) TK345 ISTANBUL(17:10)→ TK050		Meeting with geological engineers	Visit to the MES for the application of obtaining weather data	Site visit to the BO 246km point	Site visit to the BO 246km point
16	4/3	Thu	NARITA(10:25) TK050		Summarising the survey data	Site visit to the BO 246km point	Site visit with geological engineers	Site visit with geological engineers
17	4/4	Fri			Summarising the survey data	Site visit to the BO 246km point	Site visit to the BO 246km point	Site visit to the BO 246km point
18	4/5	Sat			Summarising the survey data	Preparation of Report	Preparation of Report	Preparation of Report
19	4/6	Sun			Summarising the survey data	Preparation of Report	Preparation of Report	Preparation of Report
20	4/7	Mon			Preparation of the technical note	Meeting with engineers in charge of related organizations	Preparation of Report	Meeting with engineers in charge of related organizations
21	4/8	Tue			Preparation of the technical note	Preparation of Report	Preparation of Report	Preparation of Report
22	4/9	Wed			Preparation of the technical note	Preparation of Report	Preparation of Report	Site visit to the BO 246km point
23	4/10	Thu			Meeting with MOTC	BISHKEK(6:20)→ISTANBUL(9:10)TK349	Internal meeting	Internal meeting
24	4/11	Fri			Explaination and submission of the tecnical note to MOTC	ISTANBUL(17:10)→NARITA(10:25)TK050	BISHKEK(10:25)→ISTANBUL(13:15)TK345	Preparation of Report
25	4/12	Sat			Preparation of documents		ISTANBUL(17:10)→NARITA(10:25)TK050	Preparation of Report
26	4/13	Sun			Preparation of documents			Preparation of Report
27	4/14	Mon			Internal Meeting			Internal Meeting
28	4/15	Tue			Explaination and submission of the tecnical note to MOTC			BISHKEK(6:20)→ISTANBUL(9:10)TK349
29	4/16	Wed			BISHKEK(10:25)→ISTANBUL(13:15)TK345			ISTANBUL(17:10)→NARITA(10:25)TK050
30	4/17	Thu			ISTANBUL(17:10)—NARITA(10:25)TK050			

Appendix-2-2

Study Schedule (2nd Site Survey)

Appendix2-2-1

Itinerary of the JICA Survey Team in 2nd Site Survey

TENTATIVE SCHEDULE:
キルギス「ビシュケク-オシュ道路雪崩対策計画」準備調査 第2次現地調査
Preparatory Survey of the Project for Avalanche Protection on Bishkek-Osh Road

			JICA		Consultants					
			総括 Team Leader 恒岡　伸幸 Mr. Nobuyuki TSUNEOKA	計画管理 Planning Coordinator 若林　康太 Mr. Kota WAKABAYASHI	業務主任/交通計画 Chief Consultant/ Transport Planner 溝田 祐造 Mr. Yuzo MIZOTA	副業務主任/雪崩対策計画2（施設設計） Sub-Chief Consultant/ Avalanche Protection planner 2 岡崎 亮男 Mr. Akio OKAZAKI	道路施設設計 Design of road structure 小川 淳一郎 Mr. Junichiro OGAWA	積算/調達計画 Procurement Planner/ Cost Estimator 緒方 博充 Mr.Hiromitsu OGATA	自然条件調査（地形・地質） Natural Condition Sueveyer(Topography,Geology & meteorology) 渡邉 正俊 Mr. Masatoshi WATANABE	環境社会配慮 Environment & Social Impact Specialist 加藤未波 Ms. Minami KATO
1	5/16	Fri							NARITA (12:55) → ISTANBUL(18:10) TK051 ISTANBUL (21:15) → TK348	
2	5/17	Sat							BISHKEK(05:25)TK348	
3	5/18	Sun							Preparation for reconsignment of geological survey and topographical survey.	
4	5/19	Mon							Preparation for reconsignment of geological survey and topographical survey.	
5	5/20	Tue							Preparation for reconsignment of geological survey and topographical survey.	
6	5/21	Wed							Move to BO246km point	
7	5/22	Thu							Site visit to BO246km point	
8	5/23	Fri							Implementation of the survey	
9	5/24	Sat							Implementation of the survey	
10	5/25	Sun							Implementation of the survey	
11	5/26	Mon							Implementation of the survey	
12	5/27	Tue							Implementation of the survey	
13	5/28	Wed							Implementation of the survey	
14	5/29	Thu							Summary of survey results	
15	5/30	Fri	MANAGUA (12:14) → INTERCONTINENTAL AIRPORT(16:34) UA1432 INTERCONTINENTAL AIRPORT (20:00) → TK 34						Summary of survey results	
16	5/31	Sat	ISTANBUL(15:45) TK 34 ISTANBUL (18:35) →TK346	NARITA (12:55) → ISTANBUL(18:10) TK051 ISTANBUL (21::5) → TK348						
17	6/1	Sun	BISHKEK(02:40)TK346 Move to BO 246km point (PM)	BISHKEK(05:25)TK348 Move to BO 246km point (PM)	Join to the Project. Move to BO 246km point (PM)					
18	6/2	Mon	Site visit to the BO 246km point Move to Bishkek							
19	6/3	Tue	Explanation of interim report to MOTC(PM) M/D discussion with MOTC(PM)							
20	6/4	Wed	M/D discussion with MOTC (AM) Modifying M/D (PM)							
21	6/5	Thu	Signing on M/D Report to JICA Kyrgyz office, if necessary							
22	6/6	Fri	BISHKEK (06:40) →ISTANBUL(09:30) TK 349 ISTANBUL(17:10)→ TK050		Discussion with relevant organizations					
23	6/7	Sat	NARITA(10:25) TK050		BISHKEK (06:40) → ISTANBUL(09:30) TK 349 ISTANBUL(17:10)→ TK050					
24	6/8	Sun			NARITA(10:25) TK050					
25	6/9	Mon								
26	6/10	Tue								
27	6/11	Wed								
28	6/12	Thu								
29	6/13	Fri								
30	6/14	Sat								
31	6/15	Sun			NARITA (12:55) → ISTANBUL(18:10) TK051 ISTANBUL (21::5) → TK348					
32	6/16	Mon			BISHKEK(05:25)TK348					
33	6/17	Tue			Preparation of design condition for road design		NARITA (12:55) → ISTANBUL(18:10) TK051 ISTANBUL (21::5) → TK348			NARITA (12:55) → ISTANBUL(18:10) TK051 ISTANBUL (21::5) → TK348
34	6/18	Wed			Discussion with relevant organizations		BISHKEK(05:25)TK348			BISHKEK(05:25)TK348
35	6/19	Thu			AM: Move to the site. PM: Site visit to BO246km point		AM: Move to the site PM: Site visit to BO246km point			AM: Move to the site. PM: Site visit to BO246km point
36	6/20	Fri			Site visit to BO246km point		Site visit to BO246km point			Site visit to BO246km point
37	6/21	Sat			Move to Bishkek		Move to Bishkek			Move to Bishkek
38	6/22	Sun			Summary of the results of site visit		Summary of the results of site visit	NARITA (12:55) → ISTANBUL(18:10) TK051 ISTANBUL (21::5) → TK348		Summary of the results of site visit
39	6/23	Mon			Summary of the results of site visit		Summary of the results of site visit	BISHKEK(05:25)TK348		Summary of the results of site visit
40	6/24	Tue			Preparation of design condition for road design Discussion with relevant organizations		Preparation of design condition for road design Discussion with relevant organizations	Survey of procurement and cost estimation in Kyrgyz		Preparation of design condition for road design. Consultations with relevant organizations.
41	6/25	Wed								
42	6/26	Thu								
43	6/27	Fri								
44	6/28	Sat								
45	6/29	Sun								
46	6/30	Mon								
47	7/1	Tue				NARITA (12:55) → ISTANBUL(18:10) TK051 ISTANBUL (21 15) → TK348				
48	7/2	Wed				BISHKEK(05:25)TK348				
49	7/3	Thu				Site visit to BO246km point				

			JICA		Consultants					
			総括 Team Leader 恒岡　伸幸 Mr. Nobuyuki TSUNEOKA	計画管理 Planning Coordinator 若林　康太 Mr. Kota WAKABAYASHI	業務主任/交通計画 Chief Consultant/ Transport Planner 溝田 祐造 Mr. Yuzo MIZOTA	副業務主任/雪崩対策計画2（施設設計） Sub-Chief Consultant/ Avalanche Protection planner 2 岡崎 亮男 Mr. Akio OKAZAKI	道路施設設計 Design of road structure 小川 淳一郎 Mr. Junichiro OGAWA	積算/調達計画 Procurement Planner/ Cost Estimator 緒方 博充 Mr.Hiromitsu OGATA	自然条件調査（地形・地質） Natural Condition Sueveyer(Topography,Geology & meteorology) 渡邉 正俊 Mr. Masatoshi WATANABE	環境社会配慮 Environment & Social Impact Specialist 加藤未波 Ms. Minami KATO
50	7/4	Fri				Preparation of design condition for facilities planning Discussion with relevant organizations				
51	7/5	Sat								
52	7/6	Sun					BISHKEK (10:25) → ISTANBUL(13:15) TK 345 ISTANBUL(17:10)→ TK050			BISHKEK (10:25) → ISTANBUL(13:15) TK 345 ISTANBUL(17:10)→ TK050
53	7/7	Mon					NARITA(10:25) TK050			NARITA(10:25) TK050
54	7/8	Tue								
55	7/9	Wed								
56	7/10	Thu								
57	7/11	Fri						BISHKEK (10:25) → ISTANBUL(13:15) TK 345 ISTANBUL(17:10)→ TK050		
58	7/12	Sat						NARITA(10:25) TK050		
59	7/13	Sun								
60	7/14	Mon								
61	7/15	Tue								
62	7/16	Wed								
63	7/17	Thu			BISHKEK (06:40) → ISTANBUL(09:30) TK 349 ISTANBUL(17:10)→ TK050					
64	7/18	Fri			NARITA(10:25) TK050					
65	7/19	Sat								
66	7/20	Sun				BISHKEK (10:25) → ISTANBUL(13:15) TK 345 ISTANBUL(17:10)→ TK050				
67	7/21	Mon				NARITA(10:25) TK050				

Appendix-2-3

Study Schedule (Explanation of Draft Final Report)

Schedule of Explanation of Draft Final Report

				Team Leader Mr.TSUNEOKA Nobuyuki	Planning Coordinator Mr. WAKABAYASHI Kota	Chief Consultant/ Transport Planner Mr. MIZOTA Yuzo	Sub-Chief Consultant/Avalanche Protection planner 2 Mr. OKAZAKI Akio
1	11/29	Sat	-			Preparation Work	11:40-13:50 (TK343) Ulaanbaatar-Bishkek
2	11/30	Sun	-			Internal Meeting	
3	12/1	Mon	AM			Curtesy Call at MOTC	
			PM			Preparation Work	
4	12/2	Tue	AM			Explanation of DFR : MOTC (RMND, RMD, BO UAD, IPIG, DI)	
			PM			Discussion on O&M Cost: BO-UAD	
5	12/3	Wed	AM			Explanation of Outline Design : I PIG (Engineering Section)	
			PM			Confirmation on process of EIA and Resettlement Action Plan：MOTC (IPIG)	
6	12/4	Thu	AM			Discussion for Comments on Outline Design MOTC(IPIG, Engineering Section)	
			PM			Internal Meeting	
7	12/5	Fri	AM	11:25-12:15(GA7310) Dili- Dennpasar		Explanation of Outline Design (DI)	
			PM	15:45-18:25 (GA842) Dennpasar-Changi		Internal Meeting	
8	12/6	Sat	-	00:30-06:30 (TK067) Changi – Istanbul	12:55 - 18:10 Narita- Istanbul (TK051)	Internal Meeting	
				18:20-03:35 (TK346)			
9	12/7	Sun	-	Istanbul- Bishkek	00:50 - 09:55 Istanbul to Bishkek (TK344)	Data Arrangement	
10	12/8	Mon	AM	Internal Meeting			Explanation of Outline Design (DI)
			PM	14:00 ~ 16:00 Explanation of DFR & Discussion on draft of M/D (MOTC)			
11	12/9	Tue	AM	10:00~12:00 Discussion on M/D with MOTC			Explanation of Outline Design (DI)
			PM	14:00~16:00 Discussion on M/D (MOTC) 18:00~19:00 Discussion on M/D (Vice Minister of MOTC)			Data Arrangement
12	12/10	Wed	AM	10:00~11:00 Explanation of the Project & M/D (MOF) 11:30~15:00 Discussion on M/D with MOTC			Data Arrangement
			PM	18:00~19:00 Signing of M/D(MOTC)			
13	12/11	Thu	AM	10:30~12:00 Internal Meeting (JICA Office)			Data Arrangement
			PM	16:00~17:30 Courtesy Call at Japanese Embay			Explanation of Outline Design (DI)
14	12/12	Fri	AM	Internal Meeting			
			PM	14:00~15:00 Meeting with MES. 16:00~17:00 Meeting with JICA Office			
15	12/13	Sat	-	07:55-09:45 Bishkek - Istanbul (TK349) 17:15-11:30 Istanbul - Narita (TK050)		Data Arrangement	4:45-10:25 (TK-342) Ulaanbaatar-Bishkek
16	12/14	Sun	-	11:30 Arrival at Narita			

MOF : Ministry of Finance
MOTC : Ministry of Transport and Communication
IPIG : Investment Project Implementation Group
RMD : Road Maintenance Department
RMND : Road Management Department
DI : Kyrgyz Design Institute
MES : Ministry of Emergency Situations

Appendix-3

List of Parties Concerned in the Recipient Country

List of Parties Concerned in the Recipient Country

1. MOTC(Ministry of Transport and Communications)	
Mr. Murzabekov A.	Deputy Minister
IPIG (Investment Project Implementation Group)	
Mr. Mamaev K.	Director
Mr. Asanaliev S.	Specialist
Mr. Keshikbaev A.	Specialist on Ecology and Social issues
Mr. Abdygulov A.	Specialist on Ecology and Social issues
RMND (Road Management Department)	
Ms. Milovatskaya N.	Chief Specialist
BO UAD	
Mr. Aliyazov J.	Director
DEP 23	
Mr. Jashytbaev B.	Head
Mr. Chotubaev A.	Chief Engineer
2. Relevant Organs	
Design Institute	
Mr. Kalilov J.	Director
Mr. Alibegashvili L.	Deputy Director
SAEPF	
Mr. Chyngojoev A.	Deputy Director, SAEPF
Mr. Jumabekov K.	Head, Department of state ecological exanimation and management of natural resources
Mr. Yrsaliev B.	Deputy Director, Department of development forest ecosystem and specially protected natural sites
Mr. Chukumbaev S.	Deputy Director, Department of forest and hunting planning
Mr. Ryspekov A.	Head, Section of state ecological examination
Mr. Kalygulova R.	Chief specialist, Section of state ecological examination
Mr. Seitkasymov M.	Chief specialist, Section of international cooperation
MES	
Mr. Ajikeev A.	Head, Avalanche Security Department
Mr. Maihadjaev R.	Specialist, Avalanche Security Department
Mr. Andashev A.	It-Agar Avalanche Station under the State Agency of Hydrometeorology of MES
3. Private Enterprises	
MOCT Group	
Mr. Kalabin Alexandr V.	Executive director