The Kyrgyz Republic
Ministry of Transport and Roads

THE PREPARATORY SURVEY REPORT

ON

THE PROJECT

FOR

RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD

IN

THE KYRGYZ REPUBLIC

AUGUST 2018

JAPAN INTERNATIONAL COOPERATION AGENCY

KATAHIRA & ENGINEERS INTERNATIONAL
INGÉROSEC CORPORATION

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the joint venture consisting of Katahira & Engineers International and Ingérosec Corporation.

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

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

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

August, 2018

Itsu Adachi
Director General,
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Summary

1. Outline of the Country

The Kyrgyz Republic is located in Central Asia and it is a landlocked country surrounded by the People's Republic of China, Kazakhstan, Uzbekistan and Tajikistan. Kyrgyz Republic is a republic democratic country which was previously part of the former Soviet Union, and 40% of the land of this country is mountainous terrain with an altitude of over 3,000m.

The population of the Kyrgyz Republic is 639 million (2018: IMF), the land area is 19.85 million km2. Gross Domestic Product (GDP) is US $ 6,500 million (IMF estimate), the GDP per capita is US $ 1,072 (IMF estimate). The main industries of the Kyrgyz Republic are agriculture, livestock industry (about 30% of GDP) and mining (gold mining). In terms of GDP, agriculture account for 14.9%, industry 29.2%, service 55.9% (2016: World Bank).

2. Background of the Project

The Kyrgyz Republic is a landlocked country bordered by Kazakhstan, China, Tajikistan and Uzbekistan, and 95% of the transportation of people and goods relies on its roads. The roads of the area have a vital role for the people's life, as well as, representing important transportation means within Central Asia and South-West Asia. Most of the roads and bridges in the Kyrgyz Republic were constructed during the former Soviet Union era. After the full independence in 1991, the deterioration of the roads and bridges progressed due to the lack of maintenance due to the economic downturn. Currently about 200km of the roads are necessary for large-scale maintenance, and the deterioration of roads and bridges hinders the transportation of goods necessary for the people's lives and foreign trade between the neighboring countries, and became the obstacles for the economic growth.

Under such circumstances, the Government of the Kyrgyz Republic positioned "Development of Strategic Industries of the Economy" as one of the priority areas in the "National Sustainable Development Strategy 2013-2017" (hereinafter referred to as "NSDS"). In the NSDS the transportation and road sector, especially the rehabilitation of international transportation corridor and domestic road network is a priority issue. "The Project for Reconstruction of Urmaral River Bridge on Talas- Taraz Road" (hereinafter referred to as "the Project") is the most prioritized project in the NSDS. The project consists of reconstruction of Urmaral River Bridge which is located 82km from Talas-Taraz Road (From Taraz side) and is the only asphalt paved road which connects Kazakhstan and the north-west part of the country.

The target bridge suffers from the severe damage. In the inspection carried out by the technical cooperation project "The Project for Capacity Development for Maintenance Management of Bridges and Tunnels" the reconstruction of the target bridge was judged as high priority in terms of transport network among the bridges of high urgency for reconstruction. In June 15, 2016 due to an increase of river flow, steel pile pier flowed out and inclined, thus the bridge was closed temporally and causing traffic disturbances. After this incident, the Ministry of

Transportation and Roads in Kyrgyz Republic repaired this bridge, and now the traffic regulation of the bridge has been lifted.

3. Outline design of the study and contents of the project

JICA dispatched the preparatory survey team to the Kyrgyz Republic for the execution of outline design for Urmaral River Bridge of Talas Taraz Road. The 1st field survey is from 11 June to 2 July 2017 and the 2nd field survey is from 10 September to 12 October 2017. During the field surveys, the team conducted the discussions with the respective Kyrgyz Republic officials and the site survey of the project. The team carried out the outline design for the appropriate contents of the Project based on the results of the field surveys and prepared the draft report of the survey.

JICA dispatched the team to the Kyrgyz Republic from 18 to 29 April 2018 for the explanation of the draft report and the team had discussions, confirmation and agreement regarding the contents of the draft report.

The finally agreed contents of the Project are shown below.

- Reconstruction of the Urmaral River Bridge on Talas- Taraz Road
- Construction of Revetment Adjacent to the Urmaral River Bridge
- Approach road improvement of around 1.1km from 82k700 to 81k300 including improvement of two small radius curves and excluding the bridge crossed irrigation channel
- Traffic safety countermeasures such as the installation of the large reflectors shaped arrow, road signs, road markings and street lights

Road design requirements are as follows.

Table-1: Overview of Facilities (Improved Components)

Section	Improved Components	Improved Item
Talas Taraz Road 1.2km	Existing Road Improvement	Reconstruction existing bridge. Improvement alinement for access road
	Revetment Improvement	Installation of revetment.
	Drainage Facilities	Installation of end-slop U- drainage facilities Installation of RC pipe (φ450mm) facilities
	Road Facilities	Street light
	Curb Stones	Installation of curb stone for both sides
	Side walk Pavement	Installation of sidewalk
	Safety Facilities	Installation of road sign and warning sign Guard rail and fence

Typical cross sections of subject road are as below.

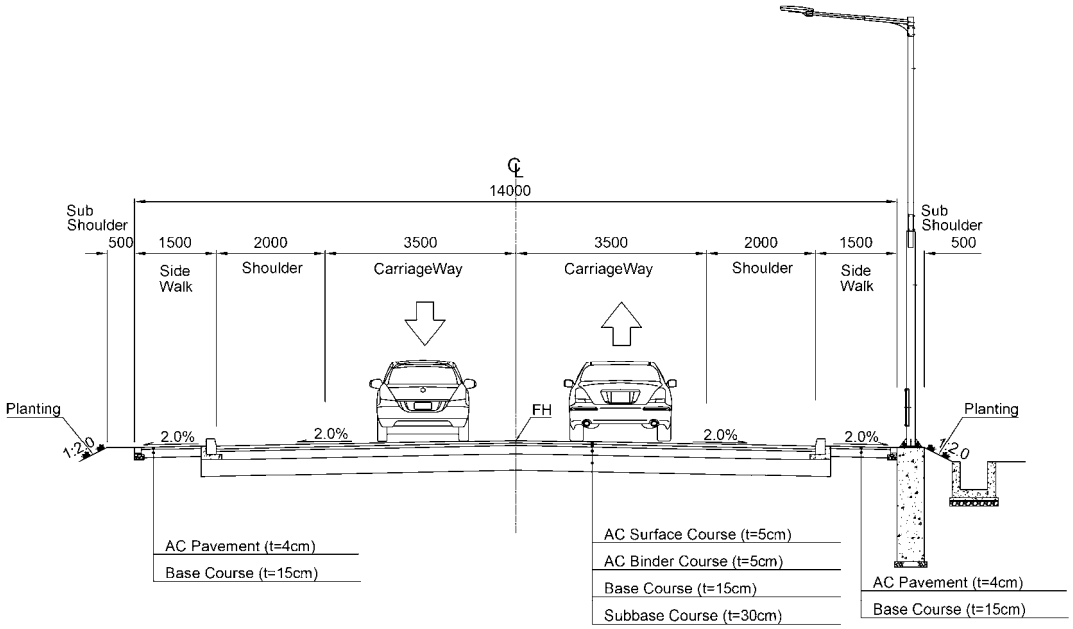


Figure-1: Typical Cross Section

Contents of the facilities under outline design scheme are as below.

Table-2 Contents of the Facilities under Outline Design Scheme

Facilities	Specifications	Quantity
Bridge Length	3-spans continuous PC T-shape Girder Bridge	90.5 m
Revetment Length	Stacking gabion	300 m
Road Length	W=12.5 – 14.0m	1.1 km
Carriage way Pavement	Asphalt pavement (Hot asphalt concrete)	12,570 sq.m
	Upper subbase course (Mechanical stabilized aggregate)	13,241 sq.m
	Lower subbase course (Crusher run)	13,241 sq.m
Sidewalk Pavement	Asphalt pavement (Hot asphalt concrete)	1,750 sq.m
	Subbase course (Mechanical stabilized aggregate)	1,750 sq.m
Drainage	U-shape concrete gutter (Bottom Width = 300mm-1200mm)	755 m
	RC pipe culvert (Inner diameter = 450mm)	109 m
Curb Stone	Curb stone	1,637 m
	Verge block	2,209 m
Traffic Sign	Road signs and warning signs	9 places
	Large-scale electrical display board	2 places

Road Marking	Center line, outer line, broken line, cross walk, dot line.	5,106 m
Street	Street light H=10m	29 units
Protection Fence	Guard rail with reflecting-plate	229 m
	Guard fence	642 m
	Guard post	72 units

4. Implementation Schedule and Project Cost

The Project is implemented by Japan's Grant Aid, and the total implementation period of the project is 36.0 months including 6.0 months for a detailed design. The cost borne by Kyrgyz Republic side is estimated at 73,700USD.

5. Project Evaluation

(1) Validity

- ✓ Talas Taraz Road is one of the international roads in Kyrgyz and it is necessary for residents' life. Reconstruction of Urmaral River Bridge which was in danger of collapsing, and improvement of the approach road are planned in this project. The improvement of a safe and stable bridge and road contribute to the goal 9 of the SDGs.
- ✓ The project corresponds to the principal development goals of National Sustainable Development Strategy which includes rehabilitation of international arterial roads.
- ✓ Installation of sidewalk and traffic safety facilities is planned, as well as, sufficient traffic safety measures.
- ✓ Operation and maintenance of this project bridge and road will be conducted by the Kyrgyzstan budget, manpower, equipment and engineering skill without special equipment and technology.
- ✓ It is expected that this project will be implemented without difficulties by the Japanese Grant Aid scheme.

(2) Effectiveness

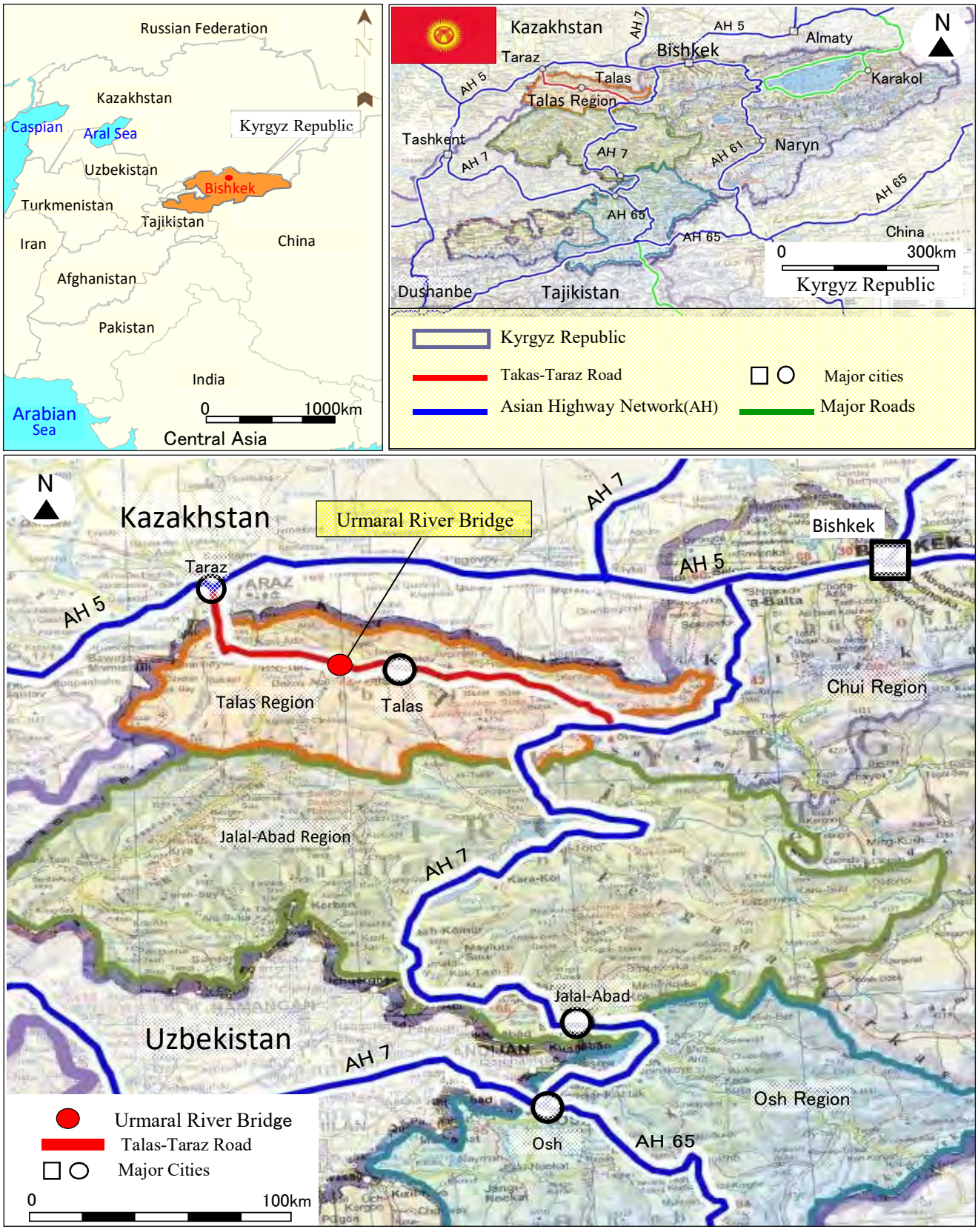
1) Quantitative Effect

Expected effect	Basic Value (Present, 2017)	Target Value (3 years after implementation, 2024)
Transport Volume (vehicles/day)	3,600	4,600
Number of Passengers (persons/year)	3,434,000	4,387,000
Freight volume (tons/year)	696,000	907,000

2) Qualitative Effect

- ✓ Secure traffic safety of Non-Motorized Transportation
- ✓ Facilitate traffic smoothness and traffic safety by improving road linearity

Contents



Location Map

Perspective（Urmaral River Bridge）

Perspective（Curve section）

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Abbreviations

Abbreviation	Complete Expression
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ACG	The Arab Coordination Group
ADB	Asian Development Bank
AE	Air Entrained (Concrete)
AH	Asian Highway
AIDS	Acquired Immunodeficiency Syndrome
ALEF	Axle Load Equivalent Factor
ARAP	Abbreviated Resettlement Action Plan
BM	Bench Mark
CBD	Convention on Biological Diversity
CBR	California Bearing Ratio
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	The Convention on The Conservation of Migratory Species of Wild Animals
CO	Carbon Monoxide
D/D	Detailed Design
dB	Decibel
DEU	Local Level Roads Management Unit
DO	Dissolved Oxygen
EAEU	Eurasian Economic Union
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
E/N	Exchange Note
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ESAL	Equivalent Single Axle Load
EU	European Union
F/A	Filler/Asphalt
FS	Feasibility Study
GDP	Gross Domestic Product
GNI	Gross National Income
GOJ	The Government of Japan
GOK	The Government of Kyrgyz Republic
HID	High-Intensity Discharge Lamp
HIV	Human Immunodeficiency Virus

Abbreviation	Complete Expression
HWL	High Water Level
IEE	Initial Environmental Examination
IMF	International Monetary Fund
IRI	International Roughness Index
IsDB	Islamic Development Bank
ITS	Intelligent Transport System
IUCN	International Union for Conservation of Nature and Natural Resources
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
JRA	Japan Road Association
LED	Light Emitting Diode
LRTAP	Long-Range Transboundary Air Pollution
M/D	Minutes of Discussion
M/P	Master Plan
MES	Ministry of Emergency Situations
ML	Missing Link
MLIT	Ministry of Land, Infrastructure, Transport and Tourism, Japan
MOTC	Ministry of Transport and Communication
MOTR	Ministry of Transport and Roads
MR	Resilient Modulus
MWL	Middle Water Level
NEMA	National Environment Management Authority
NO2	Nitrogen Dioxide
NSDS	National Sustainable Development Strategy
ODA	Official Development Assistance
PAPs	Project Affected Persons
Pb	Plumbum
PC	Prestressed Concrete
pH	Potential of Hydrogen
PLUAD	Oblast Level Roads Management Unit
PVC	Polyvinyl-Chloride Pipe
RAMS	Road Asset Management Section
RAP	Resettlement Action Plan
RC	Reinforced-Concrete
RMD	Road Maintenance Department
ROW	Right of Way
RPM	Respirable Particulate Matter

Abbreviation	Complete Expression
SAEPF	State Agency for Environmental Protection and Forestry
SD	Steel Deformed Bar
SDGs	Sustainable Development Goals
SN	Structural Number
SNiP	Stroitelnye Normy I Pravila (Russian Construction Codes and Regulations)
SO2	Sulfur Dioxide
SOX	Sulfur Oxide
SPM	Suspended Particulate Matter
SS	Suspended Solids
Sta.	Station
TOR	Terms of Reference
TSP	Total Suspended Particular
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value Added Tax
W18KIP	Weight 18 Kilo Pound
WB	World Bank
WHO	World Health Organization

CHAPTER 1 BACKGROUND OF THE PROJECT

1-1 Background of the Project

1-1-1 Background

The Kyrgyz Republic is a landlocked country bordered by Kazakhstan, China, Tajikistan and Uzbekistan, and 95% of the transportation of people and goods relies on its roads. The roads of the area have a vital role for the people's life, as well as, representing important transportation means within Central Asia and South-West Asia. Most of the roads and bridges in the Kyrgyz Republic were constructed during the former Soviet Union era. After the full independence in 1991, the deterioration of the roads progressed due to the lack of maintenance of roads and bridges due to the economic downturn. Currently about 200km of the roads are necessary for large-scale maintenance, and the deterioration of roads and bridges hinders the transportation of goods necessary for the people's lives and foreign trade between the neighboring countries, and have become obstacles for the economic growth.

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1-2 Natural Condition of Around the Project Site

(1) River

The Urmaral River originates from the Tenshan Mountain range (Top of the mountain is altitude around 4,000m) and rapidly flows down up to the confluence of the Talas River (altitude around 1,000m). The total river length is around 70km, and the difference of elevations is around 3,000m. The gradient of the river bed is steep,with the gradient at the confluence of Talas being around 1/100.

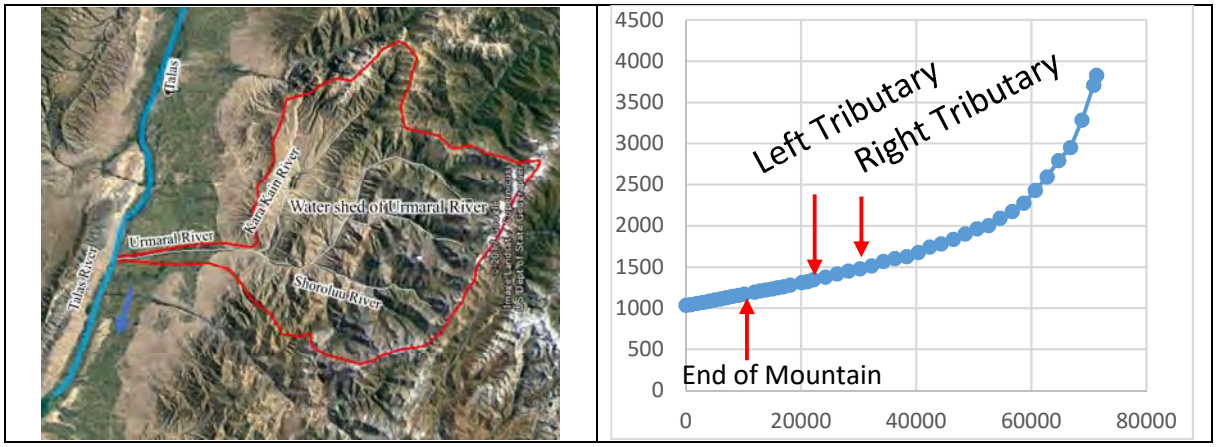


Figure 1-2-1 Water Shed and Gradient of River Bed of Urmaral River

Especially, a steep river tends to increase its velocity and then go straight in times of floods. Urmaral River normally meanders to the right bank side at the upstream of the bridge, however, the river tends to go straight in times of floods. In the flood of June 2016, the flood flow broke down the concrete revetment

on the left bank side and went straight and hit the left bank side approach road of the bridge.

The concrete revetment on the left bank side is considered to have been constructed to control that the river flows on the right bank side, but the river flow in the flood of June 2016 reached the concrete revetment on the left bank side, and then reflected to the right bank side and scoured behind the right bank abutment.

Generally, a steep river channel formed by small and medium-sized flood may be different from the river channel formed by large flood, therefore, there are many similar cases to plan to protect both river banks by setting wider river channel whose capacity has more than the planned flow rate considering adequate range of the river channel transition in the future.

The maximum flow rate of a year in the Ulmaral River is caused by snowmelt flooding, but the flood flow rate is not large. However, the river bed gradient is steep as 1/100, the flow velocity in the flood is very fast. Therefore, it is necessary for the project to consider not only river erosion but also impact force from driftwood, stones and gravel flowing down.

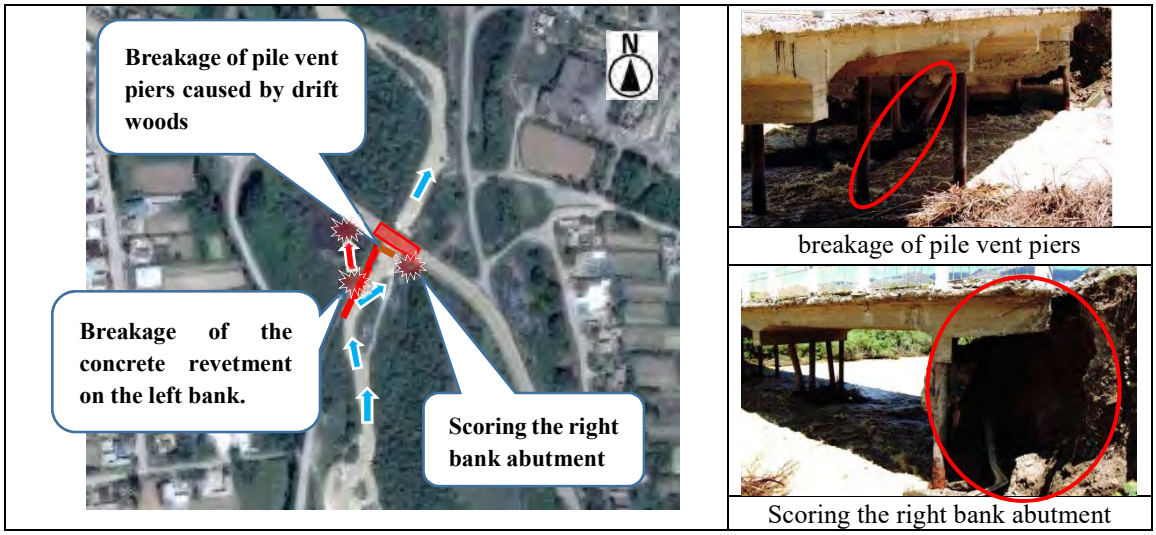


Figure 1-2-2 Damage of Urmaral River Bridge on June 16, 2016

1-3 Environmental and Social Considerations

1-3-1 Outline of the Project Component Affecting Environment and Society

According to the JICA Guidelines for Environmental and Social Considerations, 2010 (JICA Guidelines), the Project is classified into Category "B" based on the reasons the Project is not large-scale road and bridge project, their potential adverse impacts on the environment and society are not serious, and doesn't correspond to sensitive characteristics and areas listed in JICA Guidelines.

The outline of the Project components affecting the environment and society around the Project site is as follows.

- Reconstruction of Urmaral River Bridge: 90.5m
- Improvement of approach road: 1,106.5m
- Improvement of sidewalk: Both sides 690m, one side 510m
- Protection dike: Right side 180m. left side 120m

1-3-2 Environmental and Social Condition

(1) Administrative District, Area, Population and Ethnicity

Talas region is divided into Talas city and 4 districts, and the Project site is located in Ak-Dobo and Kyzyl-Sai village, Ak-Dobo ayil okmotu (village administration), Bakai-Ata District. Area and population of each city and districts of Talas region are shown in Table 1-3-1. More than 30 ethnic groups inhabit in Talas region, and Kyrgyz represents 92% of population in Talas region and 99% of Bakai-Ata district.

Table 1-3-1 Administrative District, Area, Population of Talas Region

Administrative District	Area (km^2)	2009			2017
		Population	Male	Female	Population (Estimate)
Talas Region	13,406	226,779	113,519	113,260	255,200
Talas City	13	32,886	15,697	17,189	36,700
Bakai-Ata District	2,928	44,057 (Kyrgyz 43,679) (Russian 148) (Others 230)	22,255 (Kyrgyz 22,092) (Russian 75) (Others 88)	21,802 (Kyrgyz 21,587) (Russian 73) (Others 142)	50,300
Kara-Buura District	4,216	58,056	29,396	28,660	64,700
Manas District	1,198	32,913	16,522	16,391	36,100
Talas District	5,051	58,867	29,649	29,218	67,400

Source: 2009 population census of the Kyrgyz Republic Talas Region, National Statistical Committee of the Kyrgyz Republic

(2) Land Use

Project site is rural communities, with private houses lining along the road, fruit trees and vegetables etc. are grown behind the private houses. A part of the river bed is used as a feeding place for livestock of private use.

(3) Natural Environment

1) Protected Area

Protected areas of Kyrgyz cover 1,476,121.6 hectares and account for 7.38% of the country's total area. Protected areas are classified into 4 categories as shown in Table 1-3-2.

Table 1-3-2 Classification of Protected Area

Classification	No.	IUCN Category	Objective
State Nature Reserves	10	I	Protected areas managed mainly for academic research or protection of native wilderness
State Natural Parks	13	II	Regions managed for the purpose of protecting ecosystems and recreation
Natural Monuments	19	III	Regions managed with the primary objective of protecting special natural phenomena
Habitats/Species Management Areas	49	IV	Regions managed for mainly purpose of maintenance by adding management

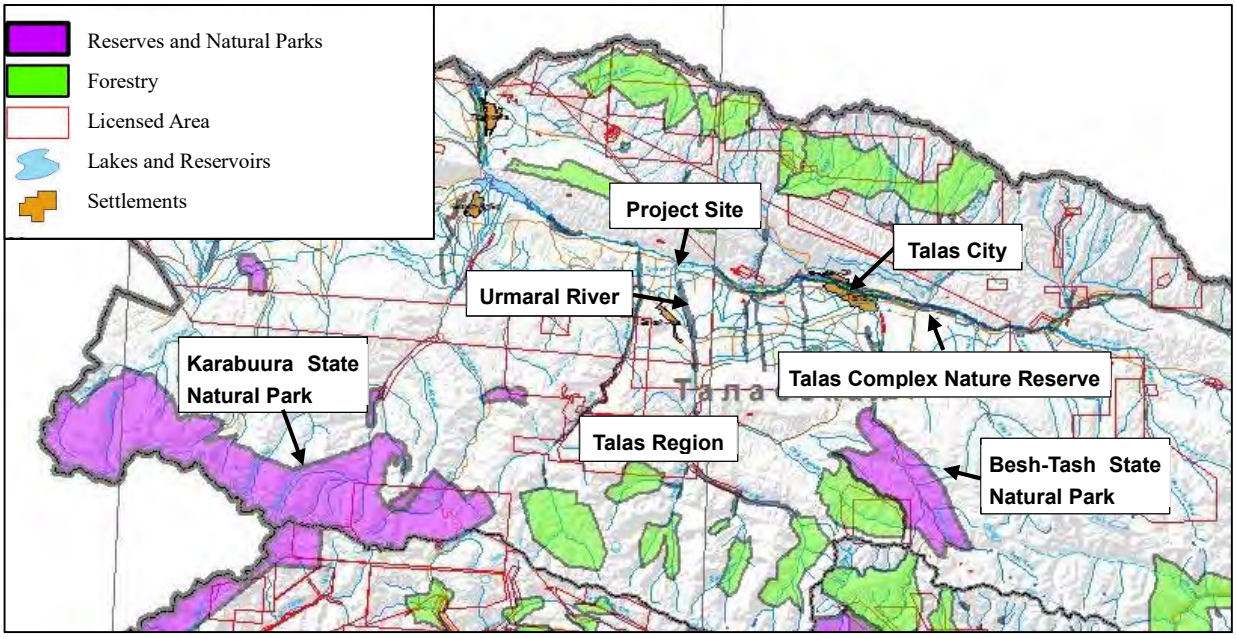
Source: State Agency on Environment Protection and Forestry

Protected areas in Talas region are shown in Table 1-3-3 and Figure 1-3-1.

Table 1-3-3 Protected Areas in Talas Region

Name	IUCN Category	Established year	Area (ha)
Karabuura State Natural Park	II	2013	61543.9
Besh-Tash State Natural Park	II	1996	13731.5
Talas Complex Nature Reserve	IV	1986	2,511

Source: State Agency on Environment Protection and Forestry



Source: State Agency on Environment Protection and Forestry

Figure 1-3-1 Location of Protected Areas in Talas Region

As shown in Figure 1-3-1, Karabuura State Natural Park and Besh-Tash State Natural Park are 40~50km away from the project site, thus this project will not affect to these natural parks. Talas Complex Nature Reserve is a floodplain forest in the Talas River basin across Bakai-Ata district and Talas district. It is located about 10 km upstream of the confluence of Urmaral River and Talas River, therefore, it is not affected by the project.

2) Rare and Endangered Species (Flora and Fauna)

Table 1-3-4 shows the number of rare and endangered species designated by GOK.

Table 1-3-4 Number of Rare and Endangered Species in Kyrgyz

Type of Ecosystem	Number of species						
	Plants and Mushrooms	Arthropods	Fishes	Amphibians and reptiles	Birds	Mammals	Total
Forest	20	10	0	0	9	3	42
Shrubby	14	0	0	2	2	4	22
Meadow	14	4	0	1	6	5	30
Steppe	13	10	0	7	14	7	51
Savannoides	22	0	0	0	2	5	29
Deserted	30	6	0	8	6	5	55
Near-water	0	2	6	1	23	2	34
Total	113	32	6	19	62	31	263

Source: State Agency on Environment Protection and Forestry

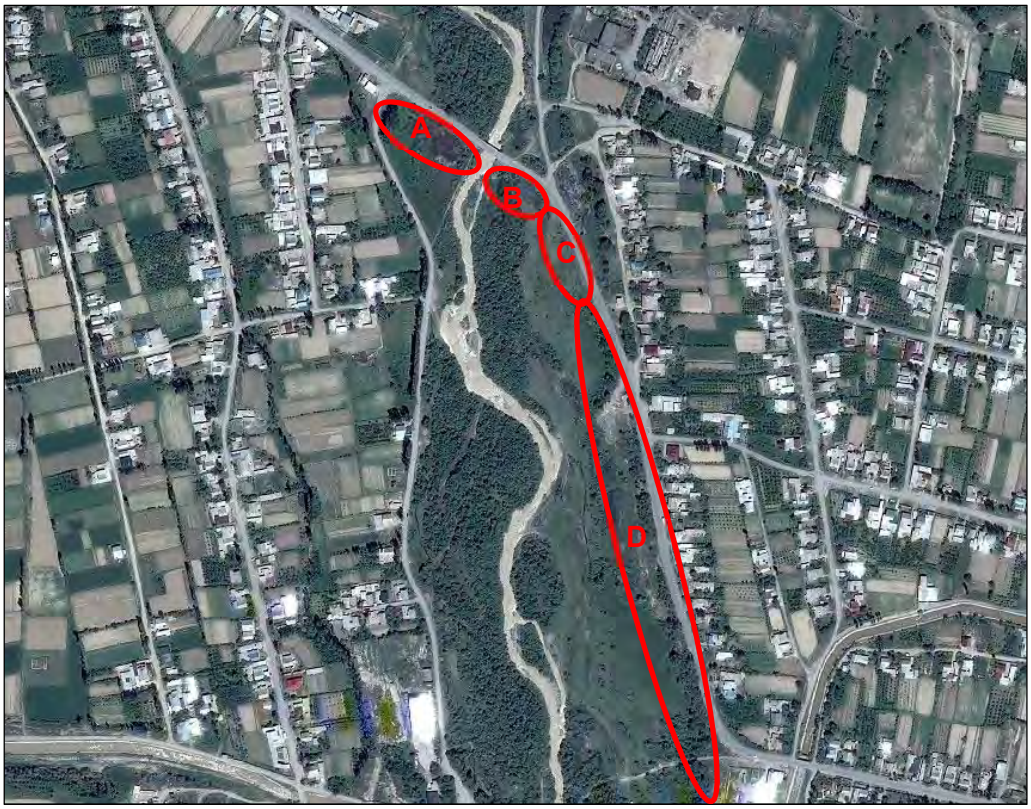
According to the hearing from Head of Talas Territorial Environment Protection Department Mr. Bolot Kadyrbekov and Engineer Maksat Bazarbaev, Head of Ak-Dobo village administration Mr. Djamal Orozbaev and 5 local residents, flora and fauna designated as rare and endangered species are not confirmed around project site. Table 1-3-5 shows the Wildlife diversity according to interviews and visual survey on the project site. Village inhabitants informed, that brown trout (*Salmo trutta*) and Issyk Kul marinka (*Schizothorax*) are more common in the gorges upstream the Urmaral river, but no fish observed around project site.

Table 1-3-5 Wildlife Diversity

Species	Common Name	Scientific Name	IUCN Red List Category
Mammals	Field mouse	Microtus arvalis	Least concern
	Long-eared Hedgehog	Hemiechinus auritus	Least concern
	Corsac Fox	Vulpes corsac	Least Concern
	Coyote	Canis latrans	Least Concern
Birds	Rook	Corvus frugilegus	Least Concern
	Raven	Corvus corax	Least Concern
	Sparrow	Passer domesticus	Least Concern
	Pigeon	Columba livia	Least Concern
Amphibians	Frog	Rana temporaria Linnaeus	Least Concern
Herptiles (snakes)	Water snake	Nerodia sipedon	Least Concern
Fish	N/A	-	-
Crustacean	N/A	-	-

Source: JICA Study Team

According to the results of visual observation, plant diversity is poor which is typical for small scale forests. Tree species observed along the project site is as follows. The trees and bushes count is approximate.



Source: JICA Study Team

Figure 1-3-2 Location of Flora Survey

Table 1-3-6 Result of Flora Survey

Location	Common Name	Scientific Name	IUCN Red List Category	Number
A: River Bank in the Area of Drilling Works	Chinese elm	Ulmus parvifolia	N/A	1
	Brere	Rosa canina	Least Concern	15
	Sea buckthorn	Hippohae	N/A	6
	Osier	Salix gen.	Least Concern	2
	Total number of trees			**24**
B: Along the Axis in the Urmaral River Bed	Chinese elm	Ulmus parvifolia	N/A	3
	Osier	Salix gen.	Least Concern	10
	Brere	Rosa canina	Least Concern	20
	Poplar	Populus gen.	N/A	12
	Sea buckthorn	Hippohae	N/A	10
	Total number of trees			**55**
C: In the River Floodplain	Sea buckthorn	Hippohae	N/A	1
	Brere	Rosa canina	Least Concern	10
	Total number of trees			**11**
D: Along the Road at the Western Skitrts of Ak Dobo Village	Chinese elm	Ulmus parvifolia	N/A	50
	Apricot	Prunus armeniaca	Data Deficient	20
	Caragana	Caragana franchetiana	Least Concern	90
	Osier	Salix gen.	Least Concern	2
	Oleaster	Eleagnus agnustifolla	Least Concern	20
	Total number of trees			**182**
Grand Total number of trees				**272**

Source: JICA Study Team

A: River Bank in the Area of Drilling Works

B: Urmaral River Bed

C: River Floodplain

D: Along the road at the western skirts of Ak Dobo village

Source: JICA Study Team

Photo 1-3-1 Flora of the Project Site

(4) Socio Economic Condition

1) Public facilities

There are no public facilities along the project road. In the vicinity of the project site, there are public facilities such as schools, village administration office, museum, mosque, clinic. The cross point of the irrigation canal intakes water from the Talas River with the project road is the starting points of the project. Figure 1-3-3 shows the public facilities around the project site.

Source: JICA Study Team

Figure 1-3-3 Public Facilities around the Project Site

2) Education

Table 1-3-7 shows the school attendance status of Bakai-Ata district. About 80% of the students have completed high school or a lower level, and approximately 20% of those receiving vocational and higher education at vocational schools and above, the number of women is slightly larger than that of men. The illiteracy rate is 1%, and the literacy rate is very high.

Table 1-3-7 School Attendance Status of Bakai-Ata District

	Population aged 10 years or above	University graduate	%	University drop out	%	College	%	Vocational school	%	High school	%	Junior high school	%	Primary school	%	Primary school not complete	%	Illiterate	%
Total	33,586	2,749	8%	655	2%	1,984	6%	1,422	4%	16,165	48%	2,882	9%	5,800	17%	1,929	6%	350	1%
Male	16,973	1,192	7%	311	2%	620	4%	786	5%	8,761	52%	1,506	9%	2,947	17%	850	5%	118	1%
Female	16,613	1,557	9%	344	2%	1,364	8%	636	4%	7,404	45%	1,376	8%	2,853	17%	1,079	6%	232	1%

Source: 2009 population census of the Kyrgyz Republic, Talas Region
Note: Total of each item and the population aged 10 years or above do not match, but the number of source is quoted as it is.

3) Employment

Table 1-3-8 shows the employment situation of Bakai-Ata district. Overwhelmingly more workers are engaged in agriculture, forestry and fisheries. 90.8% of men work in agriculture, forestry and fisheries (only one in the fishery industry), then civil servants, education is about 2%. 77.3% of women also work in agriculture and forestry, then education 10.8%, health services 4.5%. The number of women engaged in education is 3.7 times more than men, and 2.3 times more than men in medical and health service. The number of women working in commerce is more than twice than men. On the other hand, there are only a few women engaged in the construction industry.

Table 1-3-8 Employment Situation of Bakai-Ata District.

Industry	Total		Male		Female	
Agriculture, forestry and fisheries	**14,560**	**85.3%**	**9,209**	**90.8%**	**5,351**	**77.3%**
Mining	19	0.1%	16	0.2%	3	0.0%
Processing	115	0.7%	58	0.6%	57	0.8%
Electricity, gas, water supply	87	0.5%	73	0.7%	14	0.2%
Construction	51	0.3%	47	0.5%	4	0.1%
Commerce	187	1.1%	55	0.5%	132	1.9%
Hotel, restaurant	33	0.2%	2	0.0%	31	0.4%
Traffic, communication	71	0.4%	36	0.4%	35	0.5%
Finance	36	0.2%	20	0.2%	16	0.2%
Real estate	42	0.2%	21	0.2%	21	0.3%
Civil servant	362	2.1%	**211**	**2.1%**	151	2.2%
Education	**955**	**5.6%**	**205**	**2.0%**	**750**	**10.8%**
Medical and health service	**447**	**2.6%**	137	1.4%	**310**	**4.5%**
Public utilities	94	0.6%	49	0.5%	45	0.6%
Others	10	0.1%	4	0.0%	6	0.1%
Total	17,069	100.0%	10,143	100.0%	6,926	100.0%

Source: 2009 population census of the Kyrgyz Republic, Talas Region

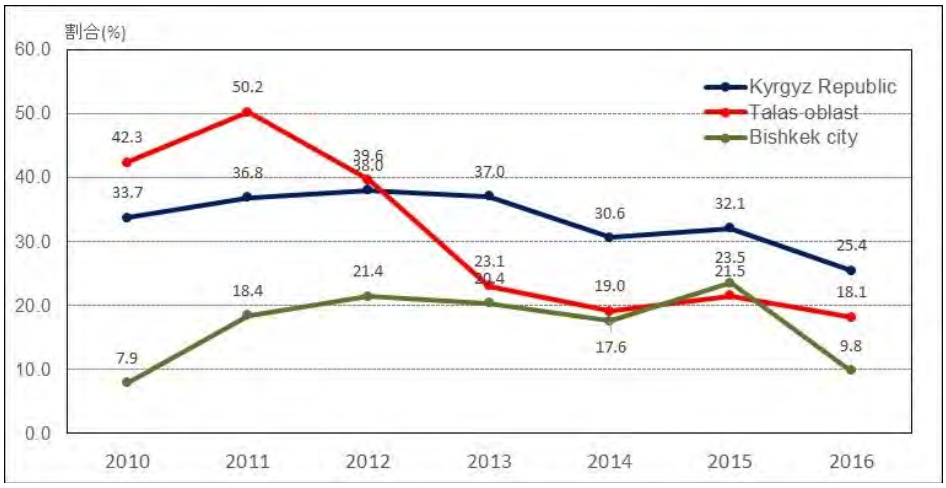
4) Poverty Rate

Table 1-3-9 shows the poverty rate of Kyrgyz, Figure 1-3-4 shows the trends of poverty rates of country average, Talas region and Bishkek city from 2010 to 2016. Talas region exceeded the country average until 2012, but it has declined rapidly since 2013, and in 2016 the poverty rate is lower following Bishkek City. However, the data obtained from the Bakai Ata district Social Development Office (January 2017) shows an average poverty rate of 28% in Bakai-Ata district and 29.8% in Ak-Dobo ayil-okmotu (village administration), exceeding the national average.

Table 1-3-9 Poverty Rate of Kyrgyz (%)

Items	2010	2011	2012	2013	2014	2015	2016
Kyrgyz Republic	**33.7**	**36.8**	**38.0**	**37.0**	**30.6**	**32.1**	**25.4**
Batken oblast	33.6	35.6	34.2	53.9	40.7	41.2	37.0
Jalal-Abat oblast	44.7	45.3	55.7	46.4	46.4	45.1	32.2
Yssyk-Kul oblast	38.0	29.5	28.1	39.5	26.0	28.9	24.7
Naryn oblast	53.5	49.9	39.9	43.8	30.6	38.0	37.8
Osh oblast (until 2012 y. including Osh city)	41.9	44.7	51.4	43.4	31.7	28.9	22.0
Talas oblast	42.3	50.2	39.6	23.1	19.0	21.5	18.1
Chui oblast	21.9	28.6	16.6	23.6	21.6	24.8	30.3
Bishkek city	7.9	18.4	21.4	20.4	17.6	23.5	9.8
Osh city	-	-	-	40.9	33.4	38.3	24.6

Source: National Statistical Committee of the Kyrgyz Republic



Source: National Statistical Committee of the Kyrgyz Republic

Figure 1-3-4 Trend of Poverty Rates of Country Average, Talas Region and Bishkek City

5) Cultural Heritage

The hero Manas which is the hero of the Kyrgyz traditional epic poem of "Manas" is said to have been born near Talas city, and the historic park is located in a place that is regarded as a burial place of Manas around 22 km northeast from Talas city. On the banks of the Talas river, the "Battle of Talas River" that broke out over the hegemony of Central Asia took place between the Chinese Tang dynasty and the Arab Abbasid Caliphate in 751. However, there is no cultural heritage near the project site.

1-3-3 System and Organization of Environmental and Social Consideration in Kyrgyz

(1) Laws and Regulation related to Environmental and Social Considerations

1) National Environmental Policy and Plan

"The Concept of Ecological Safety of the Kyrgyz Republic" (Decree of the President No. 506, 23 November 2007) summarizes the key environmental problems which are divided into global, regional and national. This Concept is the basis for carrying out state policy in the field of environmental protection and environmental management in order to achieve sustainable development of Kyrgyz.

2) Outline of the Environmental Laws and Regulations

Environmental laws and regulations of Kyrgyz are shown in Table 1-3-10. The laws and regulations related to the Environmental Impact Assessment (EIA) are shown in bold letter.

Table 1-3-10 Environmental Related Laws and Regulations

Laws and Regulations	No.	Year Enacted
Constitution of Kyrgyz Republic	-	2010
Law on Biosphere Reserves in the Kyrgyz Republic	48	1999
Law on Environmental Protection	**53**	**1999**
Law on Specially Protected Natural Territories	18	2011
Law on Production and Consumption of Wastes	89	2001
Law on the Protection of Atmospheric Air	51	1999
Law on the Protection of Ozone Layer	206	2006
Law on Protection and Use of Flora	53	2001
Law and General Technical Regulation on Ensuring Environmental Safety	**151**	**2009**
Law on Environmental Expertise	**54**	**1999**
Law on Water	1422-XII	1994
Law on Mountain Territories	151	2002
The Law on State Regulation and Policy in the Field of Emission and Absorption of Greenhouse Gases	71	2007
The law on access to information administered by state bodies and local self-government bodies of the Kyrgyz Republic	213	2006
Law on Fauna	59	1999
Law on the Prohibition of Cutting, Transporting, Acquiring and Marketing, Harvesting and Use, Export of Especially Valuable (walnut and juniper) Tree Species	15	2007
Law on Subsoil	160	2012
Law on Pastures	30	2009
Law on Radiation Safety of the Population	58	1999
Law on Fisheries	39	1997
The Law on the Transfer (Transformation) of Land	145	2013
Water Code	8	2005
Land Code	45	1999
Forest Code	66	1999
Regulations on the Procedure for Conducting State Ecological Expertise	**248**	**2014**
Regulation on the Procedure for Conducting Environmental Impact Assessment	**60**	**2015**
Resolution of Methodology of Determining Payment for Environmental Pollution	559	2011

Source: Final Report of Data Collection Survey on Osh City Road Transportation in the Kyrgyz Republic

Outlines of the law and regulations related to EIA are as follow;

i) Law on Environmental Protection

This law is the most basic law on environmental protection in Kyrgyz. This Law determines the policy and regulates legal relations in the field of nature management and environmental protection in Kyrgyz. Article16 of Section IV describes that EIA is conducted to prevent possible adverse impact of planned economic and other activities on the environment.

ii) Law on Environmental Expertise

This law provides whole matters on EIA of Kyrgyz Republic. Section I describes objectives and principles of EIA and Section II stipulates the power, rights and duties of the specially authorized state body on EIA. Section V stipulates that initiators and developers of projects are required to submit documentation for state environmental review and carry out the planned activities in accordance with the documentation, which received a positive conclusion of the state environmental review.

iii) Law and General Technical Regulation on Ensuring Environmental Safety

Appendix 1 of the Law lists 25 economic activities subject to mandatory EIA. According to the lists, construction of roads and railways is a subject of EIA. Appendix 2 of the Law stipulates that the hazard category of economic and other activities is categorized into I~III depending on the amount of pollution of the natural environment, the amount and species composition of harmful substances as well as the waste placed. Depending on the hazard category, the scope and content of environmental management of the projects, the frequency of inspections over compliance with environmental legislation and standards, is established.

Table 1-3-11 Type of Economic Activities Subject to Mandatory EIA

1. Energy facilities	14. Facilities for wastewater treatment, flue gases
2. Reservoirs	15. Underground water intakes
3. Enterprises for extraction and processing of oil, oil products, gas	16. Water supply systems in populated areas, irrigation and drainage systems
4. Manufacture of building materials (cement, asphalt, slate, asbestos-cement pipes and others)	**17. Construction of roads and railways**
5. Agriculture and forestry	18. Airports, aerodromes, testing grounds, ports of inland navigation, motor racing tracks
6. Mining industry	19. Construction of recreational and tourist facilities
7. Metalworking industry	20. Organization of industrial units
8. Manufacture of glass	21. Sewer networks
9. Manufacture of pharmaceutical, biological, protein preparations	22. Mountain lifts and cable cars
10. Chemical production	23. Recycling, processing and disposal of industrial and domestic waste
11. Food industry	24. Petrol stations
12. Textile, leather, paper industry	25. Stations of maintenance and pre-sale preparation of vehicles
13. Warehouses of toxic, dangerous, radioactive substances	

iv) Regulations on the Procedure for Conducting State Ecological Expertise

This Regulation establishes the procedure for the organization and conduct of the state environmental review. Section 4 indicates the list of materials submitted for state environmental review and Section 5 stipulates the organization and the procedure of the state environmental review. Section 7 stipulates that the beginning of the period for carrying out the state environmental review is established from the moment of transfer of all necessary documentation and the period of which should not exceed two weeks. The period for carrying out state ecological expertise should not exceed three months.

v) Regulation on the Procedure for Conducting Environmental Impact Assessment

This regulation establishes the procedure for conducting and EIA of the proposed activity. Article 3 describes participants in the EIA process and their roles, article 4 stipulates stages of the EIA and article 6 concretely provides the EIA documentation. Appendix 1 is same as iii, the list of 25 types of economic activities subject to EIA, Appendix 2 is the form of the statement on environmental impact, Appendix 3 is the form of the statement on environmental consequences, and Appendix 4 is the list of objects with a low level of environmental impact.

3) Gap Analysis Regarding EIA

The requirements of JICA guidelines and the system of Kyrgyz were compared, confirming gaps between them. Finally, the project policy was determined.

Table 1-3-12 Gap Analysis regarding EIA

Subject	JICA Guidelines	System of Kyrgyz	Gap and Project Policy
Underlying Principles	- Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. (JICA Guidelines, Appendix 1.1)	- Act No. 54 "Law on Environmental Expertise", Article 2 stipulates that the objectives of EIA are to prevent the possible negative impact of the planned activities on public health and the environment, and an assessment of the planned activities shall be conducted at the stages preceding the decision on their implementation. - Act No. 60 "Procedure for Conducting Environmental Impact Assessment", Item 1.3 stipulates the main principles of EIA and preventive and alternativeness including the option of abandoning the proposed activity are required in these principles. In addition, Item 1.4 requires that the results of EIA include main conclusions about the nature and extent of the environmental impact of alternative options and description of measures to prevent, minimize or compensate for possible significant adverse effects.	None/Same as JICA GL
Information Disclosure	- EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them. - EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted. (JICA Guidelines, Appendix 2)	- Act No. 213 "Law on access to information held by state bodies and local self-management bodies of the Kyrgyz Republic" Article 3 guarantees everyone the right of access to information held by state bodies and local self-government bodies. - Act No. 60 "Procedure for Conducting Environmental Impact Assessment" Item 3.7 stipulates the participants in the EIA process and the public (public organizations, population) are included in it. Item 3.13 stipulates that the public receive information on any proposals concerning activities with possible adverse effects on the environment and public health in cases where the EIA procedure is necessary.	Language is not clearly stated. / EIA will be prepared in Russian for local residents and examination of SAEPF. English version will be submitted for JICA review.
Consultations with Local Stakeholders	- For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage,	- Act No. 60 "Procedure for Conducting Environmental Impact Assessment" stipulates as follows; 3.13 The public participate in the consultations held within the framework of the EIA at all stages of its implementation, and receive information on any proposals concerning activities with possible adverse	In case of category A of JICA GL, it is desirable that the stakeholder meetings are conducted at the time when the scoping of the

Subject	JICA Guidelines	System of Kyrgyz	Gap and Project Policy
	at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans. (JICA Guidelines, Appendix 1.5 Social Acceptability 1) - In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared. - Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. (JICA Guidelines, Appendix 2. EIA Reports for Category A Projects)	effects on the environment and public health in cases where the EIA procedure is necessary. 3.14. Objectives of consultations with the public are to inform the public about issues related to environmental protection, to participate in the discussion, to take into account the comments and proposals of the public, and to search for mutually acceptable solutions in the issues of preventing or minimizing the harmful impact on the environment when implementing the planned activity. 3.15 Consultations with the public are carried out to familiarize the public with the EIA documentation. In case of public interest, a meeting to discuss the EIA documentation will be held. 3.16 stipulates the procedure for conducting public discussions and it requires ensuring public access to the EIA documentation from the project initiator and / or other accessible locations, and collecting and analyzing comments and suggestions, preparing a summary of feedback on the results of public discussions of the EIA documentation. 3.17 stipulates the details of notification of public discussions such as information about the initiator of the project, description of the proposed activity, information of public discussions and comments on the EIA documentation, information on where you can get acquainted with the EIA documentation and where to send comments and suggestions on it.	environment assessment items takes place and preparation the draft of the EIA report occurs. According to the law of Kyrgyz, public participation in all stages of EIA implementation and explanation of EIA report to the stakeholders are required but the number of consultations is not stipulated. Though this project is classified as category B, it is desirable that the consultations with stakeholders are hold at the time before and after the EIA survey. Therefore, they are set to be hold 2 times. Also, it is desirable to have stakeholder meetings before construction to explain the construction work.
Scope of Impacts to Be Assessed	- The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social	- Act No. 60 “Procedure for Conducting Environmental Impact Assessment” Item 4.28-4.30 stipulates as follows; 4.28 Conducting an EIA in full is mandatory for activities related to hazard category I, as well as facilities with possible significant harmful transboundary impact. 4.29 Conducting an EIA in a reduced scope is carried out for activities related to the II and III categories of danger. 4.30 For objects with a low level of environmental impact, the list of which is given in Appendix 4 to this Regulation, for obtaining state environmental expertise, a sufficiently completed form of statement for ecological expertise. - Annex 5 of Act No. 60 “Procedure for	There is partially a gap in the scope of impacts to be assessed / Follow JICA GL

Subject	JICA Guidelines	System of Kyrgyz	Gap and Project Policy
	institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. (JICA Guidelines, Appendix1.3 Scope of Impacts to Be Assessed 1) - In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project. (JICA Guidelines, Appendix1.3 Scope of Impacts to Be Assessed 2)	Conducting Environmental Impact Assessment" shows the requirements for assessing the existing state of the environment as follows; ✓Environmental and other restrictions in the use of a land plot (specially protected natural areas, protected areas of historical and cultural heritage sites, etc.) ✓Climate and meteorological conditions ✓The existing level of atmospheric air pollution ✓The existing state of surface water bodies ✓Geological, hydrogeological and engineering-geological conditions ✓Land resources and the soil cover ✓Soil contamination, flora, animal world, radioactive contamination ✓The existing socio-economic conditions (economic conditions, socio-demographic conditions, public health, Historical and cultural value of the territory) - Act No. 60 "Procedure for Conducting Environmental Impact Assessment" Item 2.6 defines the basic concepts applied in this regulation. In this item, zone of possible significant impact is defined as the territory within which, as a result of the EIA, direct or indirect significant changes in the environment and / or its individual components may result from the implementation of the planned activity. In addition, Item 4.31 stipulates that EIA contains forecast and assessment of changes in the state of the environment during the construction, operation and decommissioning of the planned activities.	
Monitoring, Grievance Mechanism	- Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. (JICA Guidelines, Appendix1.8 Monitoring 3) - When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project	- Act No. 60 "Procedure for Conducting Environmental Impact Assessment" Item 3.9 stipulates that the executor of works on EIA develops a resource-based monitoring program for the component state of the environment in the process of construction, operation and liquidation of the enterprise. At the project implementation stage, environmental monitoring of the facility is carried out. Item 4.33 stipulates post-project analysis of EIA and it defines that the organization of post-project analysis and monitoring of this work is provided by the initiator of the project. The report on the results of the post-project analysis is submitted to the initiator of the project for taking the necessary measures to reduce the negative impact. The report	No gap regarding monitoring. Grievance mechanism will be established according to JICA GL

Subject	JICA Guidelines	System of Kyrgyz	Gap and Project Policy
	proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems. (JICA Guidelines, Appendix 1.8 Monitoring 4)	should be accessible to the public too. - Grievance mechanism regarding EIA is not clearly specified, but "Law on Grievances" guarantees that every citizen has the right to apply personally or through his representative to state authorities, local self-government bodies and to their officials who are obliged to provide a reasoned response.	
Ecosystem and Biota	Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. (JICA Guidelines, Appendix 1.6)	Not clearly specified, but Act No.54 "Law on Environmental Expertise" Article 13 defines that the legal consequence of the negative conclusion of the state environmental review is the prohibition of the sale of the object of examination.	Although there is a gap between JICA GL and system of Kyrgyz, the project does not involve significant conversion or significant degradation of critical natural habitats and critical forests.
Indigenous Peoples	Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses. (JICA Guidelines, Appendix 1.8)	Not specified.	Although there is a gap between JICA GL and system of Kyrgyz, impact to indigenous peoples is not assumed by the project.

Source: JICA Study Team

4) International Environmental Treaty

International Environmental Treaty ratified by Kyrgyz are shown in Table 1-3-13.

Table 1-3-13 International Environmental Treaty ratified by Kyrgyz

Treaty	Ratification
Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention)	2001
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1996
Cartagena Protocol on Biosafety to the Convention on Biological Diversity	2005
Convention on Biological Diversity (CBD),	1996
Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington Convention, CITES)	2007
Convention on the Conservation of Migratory Species of Wild Animals (CMS)	2014
Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention)	2001
Kyoto Protocol to the United Nations Framework Convention on Climate Change	2003
Convention on Long-Range Transboundary Air Pollution (LRTAP)	2000
Montreal Protocol on Substances that Deplete the Ozone Layer	2000
Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity	2015

Treaty	Ratification
Paris Agreement on climate change	2016 (Signatory)
Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat	2002
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	2000
Stockholm Convention on Persistent Organic Pollutants	2006
The United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD)	1997
The United Nations Framework Convention on Climate Change (UNFCCC)	2000

Source: UN Law & Environment Ontology

5) Environmental Standards

i) Ambient Air Quality

Hygienic standards of air quality in Kyrgyz is shown in Table 1-3-14.

Table 1-3-14 Maximum Permissible Concentration (MPC) of Pollutants in the Atmospheric Air (abstract)

Pollutants	Maximum single MPC (20 - 30 minutes) (mg/m^3)	Daily Average MPC (mg/m^3)
SPM	0.5	0.15
SO_2	0.5	0.05
NO_2	0.085	0.04
CO	5	3
Lead	0.001	0.0003

Source: Hygienic Standards "Maximum Permissible Concentrations of Pollutants in the Atmospheric Air of Populated Areas" of April 11, 2016 NO. 201

ii) Water Quality

Hygienic standards of water quality in Kyrgyz is shown in Table 1-3-15.

Table 1-3-15 Maximum Permissible Concentrations of Chemicals in Water (abstract)

Parameter	Standard (mg/l)
Arsenic	0.01
Mercury	0.0005
Lead	0.01
Cadmium	0.001

Source: Hygienic Standards the Maximum Permissible Concentrations of Chemicals in Water in Water Bodies of Domestic, Drinking and Cultural and Domestic Water Use as of April 11, 2016 NO. 201

iii) Noise and Vibration

Sanitary rules and regulations on noise level in Kyrgyz is shown in Table 1-3-16. Maximum permissible noise level at workplaces of road construction and similar machineries is 80 dB(A).

Kyrgyz doesn't have own vibration standards and Russian standards are utilized. Category 2 of Russian vibration standards applied to construction site is shown in Table 1-3-17.

Table 1-3-16 Maximum Permissible Noise Level (abstract)

Appointment of premises or territories	Equivalent Levels L_{eq} (dB)	Maximum Permissible Level L_{max} (dB)
Hospitals, Sanatoriums	35	50
Territories directly adjacent to the buildings of hospitals and sanatoria	7～23 hours: 45 23～7 hours: 35	7～23 hours: 60 23～7 hours: 50

Appointment of premises or territories	Equivalent Levels L_{eq} (dB)	Maximum Permissible Level L_{max} (dB)
Schools and other educational institutions, conference halls, library reading rooms	40	55
Territories directly adjacent to residential buildings, the buildings of polyclinics, schools and other educational institutions, libraries, social stationary institutions for the elderly	7～23 hours: 55 23～7 hours: 45	7～23 hours: 70 23～7 hours: 60
Territories directly adjacent to the buildings of hotels and hostels	7～23 hours: 60 23～7 hours: 50	7～23 hours: 75 23～7 hours: 65

Source: Sanitary Rules and Regulations "Noise in the Workplaces, in the Premises of Residential, Public Buildings and on the Territory of Residential Buildings" on April 11, 2016 No. 201

Table 1-3-17 Maximum Allowable Vibration Level at Workplaces 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

6) Acquisition of Environmental Approval

Regulation on the Procedure for Environmental Impact Assessment indicates following the implementation procedure. The cost of state environmental review is free.

This Project is categorized as a road project which corresponds to the economic activities subject to mandatory EIA. Preliminary EIA report (Draft) was compiled and submitted to MOTR in the middle of March 2018. MOTR submitted Preliminary EIA report to SAEPF and received a positive conclusion at the beginning of April. EIA report has been unconditionally approved.

- First Stage: Decision on the need for an EIA

The need for an EIA is determined whether it is necessary to evaluate the planned activity in terms of the environmental impact. The decision is made by the initiator of the project on the basis of the

list of activities subject to the EIA specified in Annex 1 to this Regulation. Conducting an EIA in full is mandatory for activities related to hazard category I, and EIA in a reduced scope is carried out for activities related to the II and III categories of danger.

- Second Stage: Preliminary EIA (Pre-EIA)

The second stage of the EIA is the preliminary EIA accompanying the feasibility study of the project, which is carried out for the purpose of comprehensive analysis of the possible consequences of project implementation, evaluation of alternatives, development of an environmental management plan, and containing following items. The results of the preliminary impact assessment are documented in the form of an EIA report (Statement on Environmental Impact: EIS).

1) A brief description of the proposed activity;
2) An assessment of the existing state of the environment of the territory within the potential zone of potential impact of the proposed activity;
3) Assessment of possible types of impact of the proposed activity on the environment;
4) Assessment of the impact of alternative options on the proposed activity on the environment;
5) Forecast and assessment of changes in the state of the environment during the construction, operation and decommissioning of the planned activities;
6) Development of measures for the prevention, minimization and / or compensation of significant adverse environmental impact during the construction, operation and decommissioning of the planned activities;
7) Conclusions on the results of the EIA;
8) EIS.

- Third Stage: EIA

The third stage of the EIA is the assessment of the environmental impact of the planned activity, which accompanies the project documentation, containing a more detailed integrated assessment of the impact, specified technical solutions and a set of measures to prevent, mitigate and minimize the impact of planned activities, monitoring of the environment, design standards for emissions, discharges of pollutants, generation and disposal of waste, and statement on environmental consequences. The results of the impact assessment are documented in a section of "Environmental Protection" of the project document.

- Fourth Stage: Post-Project Analysis

The fourth stage of the EIA is a post-project analysis carried out one year after the start of the activity to confirm the environmental safety and adjust the environmental measures.

(2) Participants in the EIA Process and Their Roles

Participants in the EIA process is the initiator of the project, the executor of EIA, local administrations and self-government bodies, the authorized state body in the field of environmental protection, and the public (public organizations, population). Participants and their responsibilities are shown in Table 1-3-18.

Table 1-3-18 Participants in the EIA Process and Their Responsibility

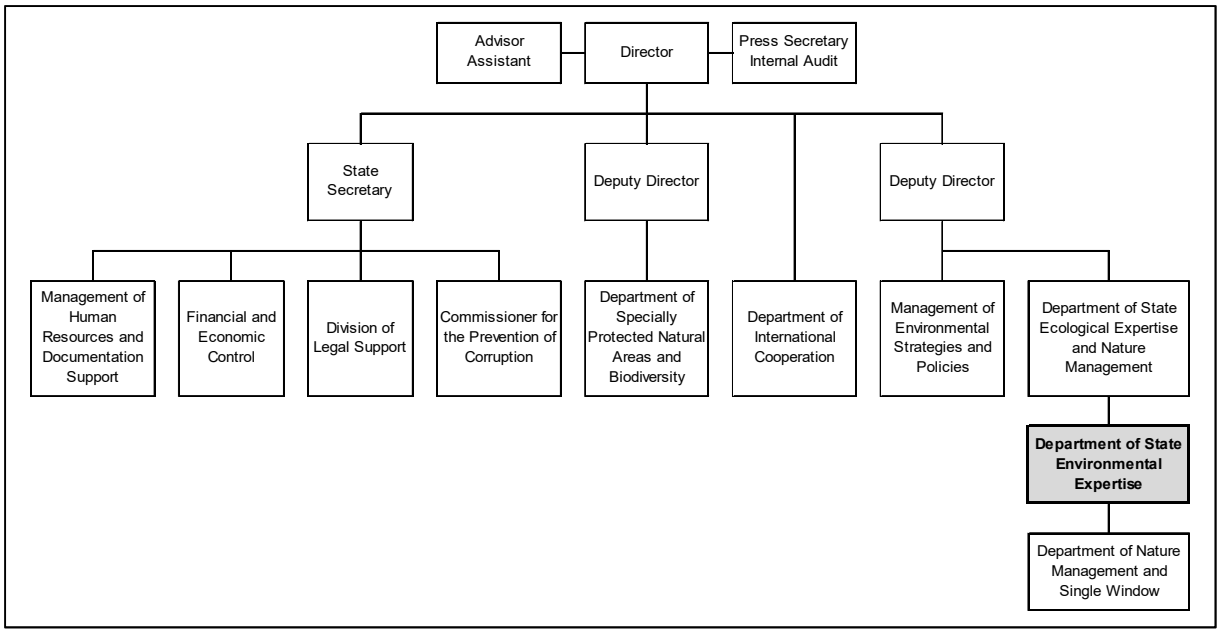
Participants	Responsibilities
Initiator of the project	・ To organize an EIA during the design process ・ To provide information and data concerning the planned activities, and consult with the public ・ To submit EIA documentation for state environmental review and provide access to EIA documentation for the public concerned ・ To provides funding for the EIA
Executor of EIA (EIA consultant)	・ To collect and analyze information on the state of the environment and the socio-economic conditions in the territory where the activities is planned ・ To determine the scope and degree of detail of the EIA work ・ To conduct EIA work including analysis of alternative options, forecast of the impact, development of prevention/ mitigation measures and monitoring plan ・ To prepare EIS and EIA documentation
Local administrations and self-government bodies	・ To inform the public about the planned activity ・ To assist in organizing and conducting public consultation
Authorized state body	・ To provide consulting assistance to all participants in the EIA process ・ To conduct state environmental review of EIA documentation and provide information on the results of the review ・ To carry out environmental monitoring at the project implementation stage
The public	・ To participates in the consultations held within the framework of the EIA at all stages of its implementation ・ To receive information on any proposals concerning activities

Source: Regulation on the Procedure for Conducting Environmental Impact Assessment

The state executive authority in the field of environmental protection is the State Agency for Environmental Protection and Forestry (SAEPF). The task of SAEPF are as follows;

- implementation of policy and regulation in the field of environmental protection and use of natural resources, as well as, accounting, assessment of the state of natural components and resources, including forestry;
- prevention of the impact of possible negative consequences of the implementation of the planned management, economic and other activities on the environment by conducting state ecological expertise;
- establishment and development of international cooperation in the field of environmental protection, environmental safety and nature management.

Organization structure of SAEPF central office is shown in Figure 1-3-5



Source: Prepared by study team based on website of SAEPF

Figure 1-3-5 Organization Structure of SAEPF Central Office

Department of State Environmental Expertise is responsible for the EIA review. SAEPF has regional office in each province, and EIA review for the activities classified in hazard category I is conducted at central office and those in hazard category II and III is conducted at regional office. SAEPF regional office is authorized to approve tree cutting in that region.

1-3-4 Comparative Study of Alternatives

Figure 1-3-6 and Table 1-3-19 show the results of comparative study of alternatives of this project including no project case (zero option). Three routes other than the zero option, route A (bridge position is downstream of the existing bridge), route B (rehabilitation of the existing bridge), route C (bridge position is upstream of the existing bridge), are considered from the point of stream condition, road alignment, workability, environmental and social impact, construction cost, etc. As a result, route C was selected by the reason that stream condition is relatively stable in the future, the sharp curve can be improved sufficiently, and high accident prevention effect can be expected although cutting trees is necessary, and workability and construction cost are also good.

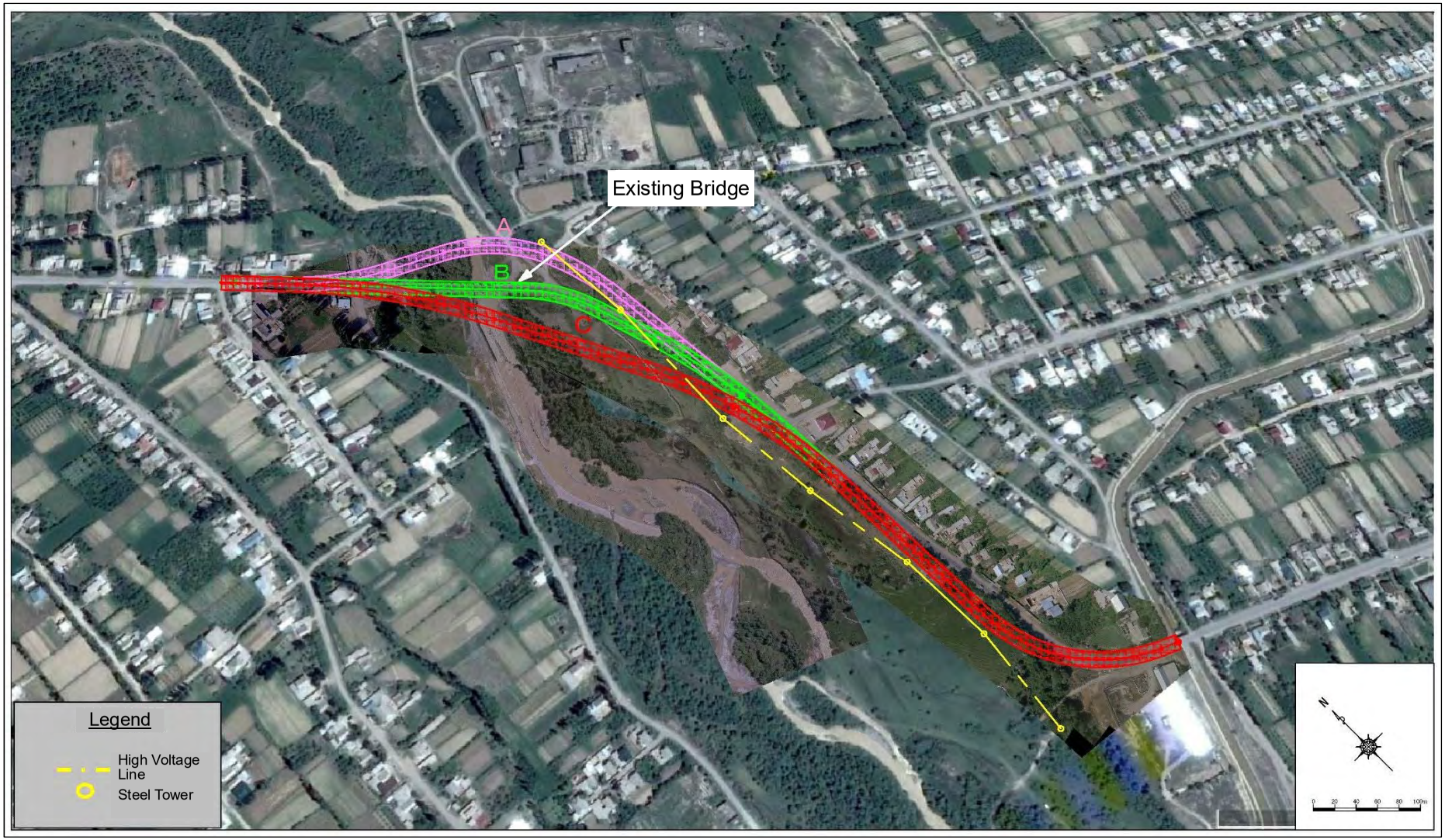


Figure 1-3-6 Alternative Routes

Table 1-3-19 Result of Comparative Study of Alternatives

Items	Zero Option (No project)	Route A (Downstream of the existing bridge)	Route B (Rehabilitation of the existing bridge)	Route C (Upstream of the existing bridge)
Stream conditions at river crossing point	There is a high possibility of the river channel transition in the future Fair △	There is a high possibility of the river channel transition in the future Fair △	There is a possibility of the river channel transition in the future Good ○	There is a possibility of the river channel transition slightly in the future Very Good ◎
Measures against flood	Crossing pipe is installed under the approach road on Taraz side, but capacity might be insufficient Fair △	Install a crossing pipe under the approach road on Taraz side Good ○	Install a crossing pipe under the approach road on Taraz side Good ○	Install a crossing pipe under the approach road on Taraz side Good ○
Road Alignment	・Number of curves ;4 (R=100,500,1000,60) ・It is existing alignment, the curve radius is small and not suitable for GOK's request Poor ×	・Number of curves ; 5 (R=300,150,210,1000,150) It is not suitable for other requests because the number of curves is the largest and the curve radius is small Fair △	・Number of curves ; 4 (R=150,500,1000,150) It is existing alignment, and the first curve is modified, but it is not enough for other requests because the number of curves is large Good ○	・Number of curves ; 3 (R=1000,650,150) It is suitable for other requests because the number of curves is the small and the curve radius is large Very Good ◎
Length	–	・Bridge 125m ・Road 1115m ・Total 1,240m Fair △	・Bridge 105m ・Road 1115m Total 1,220m Good ○	・Bridge 90.5m ・Road 1,112m Total 1,203m Very Good ◎
Workability	–	・Existing bridge can be used during construction ・Bridge length is long at 125 m, it takes time to construct Fair △	・Detour route (temporary bridge) is necessary to replace existing bridge Fair △	・Existing bridge can be used during construction Very Good ◎
Additional measures to be taken by GOK	There is no burden by GOK, but maintenance of existing bridges is necessary continuously Poor ×	Relocation of telephone poles are necessary Good ○	There is no burden on GOK since existing ROW is used Very Good ◎	Relocation of telephone poles are necessary Good ○
Environmental and social impact	・Land acquisition and tree cutting are not necessary ・Since road Alignment does not change, accidents may occur frequently in the future ・There is a risk of falling bridge, which has a great influence on residents' lives and economic activities Poor ×	・Private land acquisition is necessary ・Pond on right side of road is affected ・Tree cutting along the road and left bank is necessary ・The risk of falling brigde disappear and the safety of traffic increases, but the effect of accident prevention by alignment improvement is low Fair △	・Land acquisition is not necessary ・Tree cutting along the road is necessary, but the number of tree to be cut is smallest ・The risk of falling bridges disappear and the safety of traffic increases, but the effect of accident prevention by alignment improvement is low Good ○	・It is necessary to change the public land to road ROW, but land acquisition of the private land is not necessary ・Tress cutting along the road and right bank is necessary ・The risk of falling bridges disappear and the safety of traffic increases, in addition the effect of accident prevention by alignment improvement is high Very Good ◎
Construction Cost	–	1.2 Fair △	1.1 Good ○	1.0 Very Good ◎
Evaluation	Because there is a risk of falling bridge, the study team will not recommend it	Construction cost is the highest compared to other routes, stream condition is also unstable in the future, and environmental and social impact is bigger than other routes. So study team dose not recommend route A	Construction cost is high compared to other routes, stream condition is also unstable in the future, and accident prevention effect can not be obtained. So study team dose not recommend route B	Stream condition is relatively stable in the future, Alignment is suitable for the request of GOK, and accident prevention effect is high despite the impact on the natural environment. So study team recommend route C

1-3-5 Scoping

The scoping of the Project is shown in Table 1-3-20.

Table 1-3-20 Scoping for the Project

Cate-gory	#	Environmental and Social Item	Assessment		Reason of Assessment
			Before/Under Construction	Operation	
Pollution Measures	1	Air Quality	B-	B±	Construction Stage : Tentatively air quality is expected to deteriorate because of the emission gas arising from construction machinery and vehicles. Operation Stage : Due to the increase of traffic volume, emission gas arising from vehicles is expected to affect air quality. On the other hand, impact of dust will be mitigated because of the improvement of road surface.
	2	Water Quality	B-	B-	Construction Stage : Water quality of Urmaral river is expected to deteriorate due to muddy water during earth work. Also, discharged water from construction machinery and worker's camp might contaminate water. Operation Stage : When raining, oil spilled on the road and dust are concerned to flow into the rivers.
	3	Wastes	B-	D	Construction Stage : Abandoned soil and wastes arising from construction works are expected to generate. Operation Stage : Waste generation affecting circumstances are not expected because this project is reconstruction of existing bridge and road.
	4	Soil Contamination	B-	D	Construction Stage : Oil and concrete mortor spill from the construction machinery and vehicles might affect soil. Operation Stage : Soil Contamination affecting circumstances are not expected because this project is reconstruction of existing bridge and road.
	5	Noise & Vibration	B-	B-	Construction Stage : Noise and vibration arising from the operation of construction machinery and vehicles is expected. Operation Stage : There are houses along the Project road. Due to the increase of traffic volume, noise level is assumed to deteriorate.
	6	Subsidence	D	D	No work triggering subsidence is expected because this project is reconstruction of existing bridge and road.
	7	Offensive Odor	B-	D	Construction Stage : Offensive odor generated from emission gas of construction machinery and vehicles, and daily waste is expected. Operation Stage : Offensive odor generation affecting circumstances are not expected because this project is reconstruction of existing bridge and road.
	8	Sediment	D	D	Impact to the sediment is not expected because this project is reconstruction of existing bridge and road.
Natural Environment	9	Protected Areas	D	D	No national park and protected area exist in and around the project site.
	10	Ecosystem	B-	D	Construction Stage : Impact to the surrounding ecosystem is assumed and tree cutting is expected. Operation Stage : No impact to ecosystem is expected at the operation stage because this project is reconstruction of existing bridge and road.
	11	Hydrology	C	C	Construction/ Operation Stage : Hydrological impact is expected due to the construction of piers of new bridge in the river and demolition of existing bridge.
	12	Topography & Geology	D	D	Construction Stage : Impact to topography and geology is not expected because large scale earth cut and earth fill are not expected to be implemented.

Cate-gory	#	Environmental and Social Item	Assessment		Reason of Assessment
			Before/Under Construction	Operation	
Social Environment	13	Resettlement	C	D	Construction Stage : Land acquisition and involuntary resettlement are not considered necessary because this project involves the reconstruction of the existing bridge and road, and the project site is owned by government. However, impact might occur depending on the road alignment. Operation Stage : Additional land acquisition and resettlement is not necessary at operation stage.
	14	The Poor	C	B+	Construction Stage : The poor might be included in the Project Affected Persons (PAPs) in case resettlement happen. On the other hand, positive impact to the poor is also expected by the increase of employment opportunity arising from the construction works. Operation Stage : Positive impacts to the poor such as the improvement of access to social service, market and working place are expected because of the improvement of the Project road and bridge.
	15	Ethnic Minority & Indigenous Minority	D	D	Kyrgyz is multiethnic country and ethnic minority exist in project site. But impact to the ethnic minority and indigenous minority is not assumed because this project involves the reconstruction of the existing road and bridge.
	16	Local Economy such as Employment and Livelihood etc.	B+	B+	Construction Stage : The number of tentative employees engaging in the construction works is expected to increase. Operation Stage : Improvement of convenience of road will vitalize economic activities in project area and positive impact to employment opportunity and local economy is expected.
	17	Land Use and Utilization of Local Resources	B-	D	Construction Stage : Land use as construction work office, worker's camp, plant facility and quarries are expected and it might affect to the land use and local resources. Operation Stage : No impact to land use is expected at operation stage because this project is reconstruction of existing road and bridge.
	18	Water Usage	C	C	Construction Stage : Muddy water during construction might affect to environment in case water usage of rivers is observed. Impact to the residents who use river water for irrigation and daily life water is concerned if river water is used for construction work. Operation Stage : When raining, impact due to influx of oil spilled and dust on the road is concerned in case water usage of rivers is observed.
	19	Existing Social Infrastructures and Services	B-	B+	Construction Stage : Negative impact to the traffic condition is expected by moving of construction machinery near the Project site. Relocation of power pole and pylon might be necessary. Operation Stage : Due to the traffic safety measures, safety of the project road is expected to improve. The improvement of traveling performance of project road causes the decrease of traffic volume in community road and convenience of surrounding roads and access to social service is expected to increase.
	20	Social Institutions such as Social Infrastructure and Local Decision-making Institutions	D	D	No impact to social institutions and local decision-making institutions is expected since this project involves the reconstruction of the existing bridge and road.
	21	Misdistribution of Benefit and Damage	D	D	This project will not give unfair damage and benefit to surrounding area because it's the reconstruction of the existing bridge road.
	22	Local Conflict of Interests	D	D	This project will not cause local conflict of interests because it's the reconstruction of the existing bridge and road.
	23	Cultural Heritage	D	D	No cultural heritage does exist around the Project site.

Cate-gory	#	Environmental and Social Item	Assessment		Reason of Assessment
			Before/Under Construction	Operation	
	24	Landscape	B-	B±	Construction Stage : Construction work and tree felling will impair surrounding landscape. Operation Stage : Landscape of project area might be improved because of new bridge, however negative impact caused by tree felling is also expected.
	25	Gender	B-	D	Construction Stage : Wage discrimination between men and women might be observed. Operation Stage : No impact to gender is expected at operation stage because this project involves the reconstruction of the existing road and bridge.
	26	Right of Children	D	D	Passport is necessary for labor contract in Kyrgyz and 16 years or above can work, therefore no negative impact to right of children is expected.
	27	Infectious Diseases such as HIV/AIDS	B-	D	Construction Stage : Infectious diseases such as HIV/AIDS are expected to spread due to the inflow of construction workers into the Project site. Operation Stage : No impact to infectious diseases is expected at operation stage because this project involves the reconstruction of the existing road and bridge.
	28	Working Condition including Occupational Safety	B-	D	Construction Stage : Working condition including occupational safety for construction workers shall be considered to avoid occupational accident. Operation Stage : Negative impact to worker's is not expected at operation stage because this project involves the reconstruction of the existing road and bridge.
Others	29	Accident	B-	B±	Construction Stage : Accidents during construction woks and accidents involving a third person are expected to happen. Operation Sage : The number of accidents is expected to be decreased due to the improvement of the road alignment and introducing safety measures. On the other hand, increase of the number of accident is expected because of the increase of traffic volume and travel speed.
	30	Global Warming	B-	B±	Construction Stage : CO_2 emission from construction machinery is expected to increase, however the impact is expected to be limited. Operation Stage : CO_2 emission is expected to increase due to the increase of traffic volume. On the other hand, CO_2 emission per vehicle is likely to reduce since CO_2 emission goes down due to the proper travel speed, and in the long run, the volume of CO_2 emission is expected to decrease.

Assessment Level
A+/- : Significant positive/negative impact is expected.
B+/- : Some positive/negative impact is expected.
C+/- : Extent of impact is unknown.
D : No impact is expected.

1-3-6 Terms of Reference

The Terms of Reference (TOR) for the environmental and social consideration of the Project is shown in Table 1-3-21 based on the scoping of the Project (Table 1-3-20).

Table 1-3-21 TOR of Environmental and Social Considerations Survey

Survey Item	Investigation Item	Investigation Method
Air Quality	i. Confirmation of air quality standard in Kyrgyz, Russia and WHO ii. Understanding of current air quality iii. Understanding of the future traffic volume based on future traffic demand	i. Investigation into existing documents ii. Implementation of baseline survey along the Project road iii. Forecast of impact based on the traffic demand analysis

Survey Item	Investigation Item	Investigation Method
	iv. Confirmation of the location of school and clinic which are affected easily by air pollution v. Impact during construction	iv. Site investigation and investigation into existing documents v. Investigation into construction details
Water Quality	i. Understanding of current water quality of Urmaral river ii. Confirmation of the water usage of river water iii. Impact during construction	i. Implementation of baseline survey at Urmaral River ii. Site investigation and hearing survey. iii. Investigation into construction details
Wastes	i. Disposal method of construction wastes ii. Status of waste collection around the Project road	i. Investigation into existing documents and hearing survey to related organizations ii. Site investigation and hearing survey
Soil Contamination	i. Provision for oil spill during construction	i. Investigation into construction details
Noise & Vibration	i. Confirmation of noise and vibration standard in Kyrgyz and Russia ii. Understanding of current noise and vibration level iii. Distance from the source origins of noise and vibration to residential area, clinic and school iv. Impact during construction	i. Investigation into existing documents ii. Implementation of baseline survey along the Project road iii. Site investigation and investigation into existing documents iv. Investigation into construction details
Offensive Odor	i. Impact during construction	i. Investigation into construction details
Ecosystem	i. Endangered species in Kyrgyz ii. Impact on flora and fauna	i. Investigation into existing documents and hearing survey to MOTR and local residents ii. Site investigation
Hydrology	i. Understanding of current hydrology condition ii. Confirmation of the extent of impact during construction and operation stage	i. Site investigation and investigation into existing documents ii. Investigation into construction details and river channel
Resettlement	i. Consideration of minimizing involuntary resettlement alternatives ii. Confirmation of the extent of land acquisition and resettlement iii. Assistance for ARAP preparation if necessary iv. Confirmation of RAP/ARAP prepared for IsDB project	i. Comparative study of alternatives ii. Investigation into laws and regulations related to resettlement, site survey to investigate the number and kind of project affected structures, confirmation of land use iii. Assistance of ARAP preparation based on the Kyrgyz laws and regulations, JICA Guidelines and WP OP4.12 iv. Investigation into existing documents and hearing survey to related organizations
The Poor	i. Understanding of the distribution of the poor	i. Site investigation and investigation into existing documents
Land Use and Utilization of Local Resources	i. Understanding of the status of land use and the usage of local resources ii. Confirmation of land necessary for construction (Construction work office, plant facility, quarry etc.)	i. Investigation into existing documents, hearing survey and site investigation ii. Discussion with MOTR and confirmation of plan
Water Usage	i. Understanding of the status of water usage	i. Hearing survey and site investigation
Existing Social Infrastructures and Services	i. Understanding of existing infrastructure and social services	i. Hearing survey and site investigation, investigation into existing documents
Landscape	i. Understanding of the present condition of the flora	i. Site investigation
Gender	i. Understanding of the status of gender	i. Investigation into existing documents, hearing survey to related organizations and contractors

Survey Item	Investigation Item	Investigation Method
Infectious Diseases such as HIV/AIDS	i. Understanding of the status of HIV/AIDS	i. Investigation into existing documents and hearing survey to related organizations
Working Condition including Occupational Safety	i. Understanding of labor safety measures	i. Investigation into existing documents, hearing survey to related organizations, Investigation into construction details
Accident	i. Understanding of the number of accidents ii. Confirmation of safety measures during construction iii. Confirmation of traffic safety measures	i. Investigation into existing documents, hearing survey to related organizations ii. Investigation into the safety measures during construction iii. Investigation into traffic safety measures
Global Warming and Climate Change	i. Confirmation of construction plan ii. Understanding of the volume of future CO_2 emission based on future traffic demand	i. Investigation into construction details ii. Forecast of the impact based on the traffic demand analysis and design speed

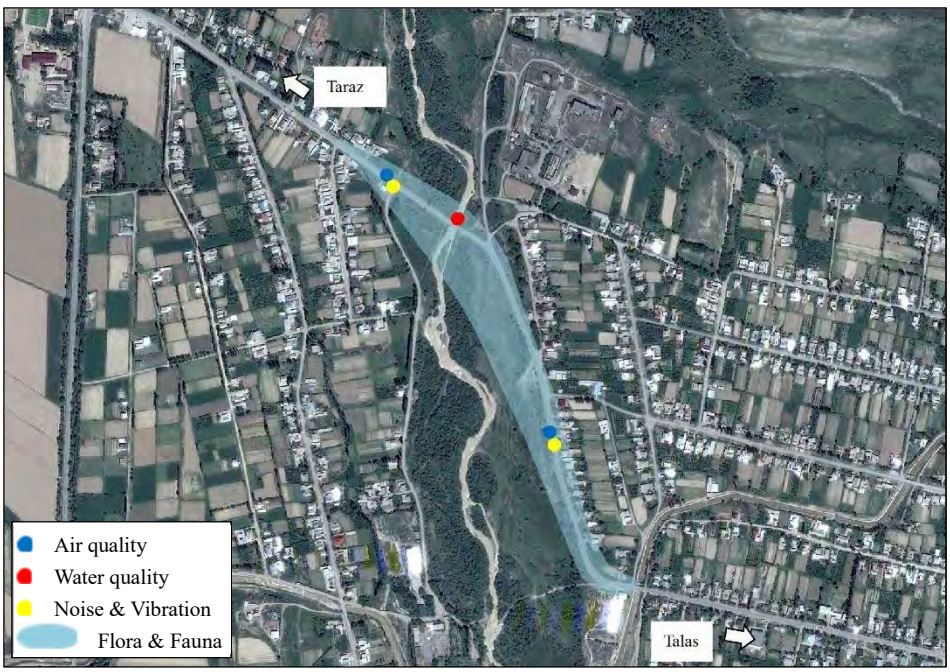
1-3-7 Baseline Survey

As a baseline survey of this project, surveys of air quality, water quality, noise and vibration, flora and fauna were conducted. Table 1-3-22 shows the outline of the baseline survey. The survey points of each survey are shown in Figure 1-3-7. The results are described in Table 1-3-23.

Table 1-3-22 Outline of Baseline Survey

Item	Parameters	Survey Point	Date
Air Quality	TSP, CO, SO_2, NO_2, Pb, Wind Direction, Wind Speed	2 points at Project site	24-25 November 2017
Water Quality	pH, SS, DO, Cadmium, Lead, Arsenic, Mercury, etc	Urmaral river	24 November 2017
Noise & Vibration	Equivalent noise, maximum noise, vibration acceleration	2 points at Project site	24-25 November 2017
Flora & Fauna	-	Project site	November 2017

Source: JICA Study Team



Source: JICA Study Team

Figure 1-3-7 Baseline Survey Points

1-3-8 Result of Environmental and Social Survey

The result of the environmental and social survey is shown in Table 1-3-23 based on the TOR shown in Table 1-3-21.

Table 1-3-23 Result of Environmental and Social Survey

<table>
<tr><th>Survey Item</th><th>Survey results</th></tr>
<tr><td>Air Contamination</td><td>As a result of the baseline survey at two points of project sites, both sites show below environmental standards (average 24 hours). The outline of the survey result is shown below.
Table 1-3-24 Result of Air Quality Survey
<table>
<tr><th>Parameters</th><th>MPC*(mg/m^3)</th><th>Ak Dobo (0+400)</th><th>Kyzyl-Sai (1+160)</th></tr>
<tr><td>SO_2</td><td>0.05</td><td>0.001±0.0003</td><td>0.001±0.0003</td></tr>
<tr><td>NO_2</td><td>0.04</td><td>0.04±0.015</td><td>0.04±0.01</td></tr>
<tr><td>CO</td><td>3.0</td><td>1.1±0.22</td><td>1.6±0.32</td></tr>
<tr><td>TSP</td><td>0.15</td><td><0.1</td><td><0.1</td></tr>
<tr><td>Pb</td><td>0.0003</td><td><0.0001</td><td><0.0001</td></tr>
</table>
* MPC: Maximum Permissible Concentrations
Source: JICA Study Team

There are no schools, medical facilities, etc. where the influence of air pollution is particularly concerned along the project road, but considering the influence on residents' lives, a construction plan and construction method to minimize the influence on the air quality is considered. In addition, it was confirmed that exhaust emission control type of construction vehicle will be used and avoid unnecessary idling.</td></tr>
<tr><td>Water Contamination</td><td>A baseline survey was conducted near Urmaral river bridge. The outline of the survey result is shown below. Except for suspended solids (SS) and mercury, it meets environmental standards. The reason is considered that the water flow of Urmaral river is very fast and the geology of mountainous area in upstream of the river is brittle. At the time of the survey, the water volume was low, but during the flood period in June to August, the sediment collapse seems to cause a considerable increase in the amount of sediment transported.
Table 1-3-25 Result of Water Quality Survey
<table>
<tr><th>Parameters</th><th>MPC*</th><th>Measured Value</th></tr>
<tr><td>pH</td><td>6.5-8.5</td><td>7.9</td></tr>
<tr><td>Suspended Solids (mg/l)</td><td>＜0.75</td><td>1.0</td></tr>
<tr><td>Dissolved Oxygen (mg/l)</td><td>>4</td><td>11.2</td></tr>
<tr><td>Mineral Oil (mg/dm^3)</td><td>＜0.3</td><td><0.02</td></tr>
<tr><td>Cadmium (mg/dm^3)</td><td>＜0.001</td><td><0.0002</td></tr>
<tr><td>Lead (mg/dm^3)</td><td>＜0.01</td><td><0.0002</td></tr>
<tr><td>Arsenic (mg/dm^3)</td><td>＜0.01</td><td><0.01</td></tr>
<tr><td>Mercury (mg/dm^3)</td><td>＜0.0005</td><td><0.003</td></tr>
</table>
* Maximum Permissible Concentrations for drinking and household water

As a result of interview survey on the residents around the project road, it was confirmed that livestock may drink water of Urmaral river, but it is not used other than that. Construction plan / construction method to prevent water pollution and sediment discharge at the time of water increase will be considered and adopted.</td></tr>
<tr><td>Wastes</td><td>Abandoned soil and wastes arising from construction works (such as construction waste and soil) are expected to be generated. Daily waste generation is expected from the contractor’s office and labor camp. It was confirmed that construction waste materials (constructed soil and concrete shells) etc. generated in this project will be reused as much as possible in this project. It was also confirmed that waste materials and waste oil generated from construction machinery that cannot be reused will be properly disposed at approved disposal sites. In the target area of this project, household waste is regularly collected by local governments and transported to the final disposal site.</td></tr>
<tr><td>Soil Contamination</td><td>Oil and concrete mortar spill from the construction machinery and vehicles might affect soil. Leakage usually occurs due to inadequate maintenance of construction machinery. Strict control</td></tr>
</table>

<table>
<tr><th>Survey Item</th><th>Survey results</th></tr>
<tr><td></td><td>for technical maintenance will be performed in order to prevent any spill and as a result contamination of the soil around the project area.</td></tr>
<tr><td>Noise and Vibration</td><td>Noise measurement results showed some excess of noise maximum permissible level on Ak Dobo (PK 0+400), on 25 November 2017 at 3:00 (78 dB) and 6:00 (92 dB), and Kyzyl Sai (PK 1+160), on 25 November at 2:00 (89 dB) and 8:00 (94 dB). The recorded excess of MPL of noise can be regarded as temporary and short-term. This can be explained by the cargo traffic specifically when truckers prefer to cross the Kyrgyz-Kazakh border at night time, or early in the morning.
Measuring of vibration indicated that there is no meaningful excess of permissible vibrations levels. The outline of the survey result is shown below.
Table 1-3-26 Result of Noise & Vibration Survey
<table>
<tr><th></th><th>MPL</th><th>Ak Dobo (0+400)</th><th>Kyzyl-Sai (1+160)</th></tr>
<tr><td>Noise Level (dB)</td><td>75</td><td>Day (8-22) 52-68
Night (22-8) 76-92</td><td>Day (8-22) 45-72
Night (22-8) 74-94</td></tr>
<tr><td>Vibration Level (dB)</td><td>108</td><td>Day (8-22) 71-98
Night (22-8) 72-79</td><td>Day (8-22) 75-101
Night (22-8) 74-94</td></tr>
</table>
Note: The numerical value is the minimum and maximum value of the measurement date.</td></tr>
<tr><td>Offensive odors</td><td>Daily wastes management is to be organized in such a manner to prevent offensive odors occurrence. Contractor has to establish agreement with Bakai-Ata village administration for waste management.</td></tr>
<tr><td>Ecosystem</td><td>1. Fauna: According to the Survey results, there is no endangered live species in the Project area. Animals observed during survey are as following:
• Mammals: mouse, hedgehog, coyotes, foxes
• Birds: pigeons, sparrows, Rooks.
• Reptiles and amphibians: water snake, frogs.
Fish species are represented only with brown trout and Issyk Kul marinkas, several kilometers upstream the Urmaral river, but no fish were observed around project site.
2. Flora: Valuable and highly valuable wood species (walnut and juniper) are not detected in the project area. Around 300 trees and shrubs along the road and river bank are necessary to be cut or replant, but serious impact to ecosystem is not expected since these trees are widespread species all over the country. These trees are close to busy roads and between the settlements, so they do not serve as habitat for birds.</td></tr>
<tr><td>Hydrology</td><td>1. Impact by new bridge construction: Concrete casting of bridge piles is planned in river bed. It is necessary to prepare temporary islands in the river during construction, thus narrowing the cross section of the river is expected. Round shape pile will be applied to correspond to change of river flow.
2. Impact by demolition of existing bridge: Accumulation of driftwood will be avoided by reducing the number of piers in the river. There is a possibility of a river channel transition at the time of flooding.</td></tr>
<tr><td>Resettlement</td><td>Four alternatives including the zero option were compared and the optimum plan was adopted. There are many residential and several commercial facilities along the project road, but the road alignment was examined with a policy to avoid the influence on these structures as much as possible. As a result, the land required for the implementation of this project is only the public land and land acquisition does not occur. There are no residents living in the site, so there is no involuntary resettlement. It also does not affect other private property.</td></tr>
<tr><td>The Poor</td><td>No resettlement is expected, therefore negative impact to the poor is not expected. Positive impact is expected by the increase of employment opportunity arising from the construction works.</td></tr>
<tr><td>Land Use and Utilization of Local Resources</td><td>1. For construction needs it is recommended to utilize Open pit #1 which is located in south-western direction, 8.5 km from the bridge with approximate capacity of 300.000m^3 and Open pit #2 located in eastern direction approximately 3.5 km from the bridge (volume about 324.000m^3). Local authorities have permission of use OP#1; it is necessary to obtain permission of use OP#2.
2. It is planned that bonded warehousing of construction materials to be performed in DEU#47 (under jurisdiction of MOTR), Kyzyl Sai village, approximately 1 km away from project site. Nowadays, secured area of DEU#47 is utilized as a parking for road construction machineries. Total area of DEU#47 is about 1ha
3. Plants construction sites. Concrete plant might be installed a short distance away from</td></tr>
</table>

<table>
<tr><th>Survey Item</th><th>Survey results</th></tr>
<tr><td></td><td>DEU#47 (distance is about 0.5km) at a place used to be utilized for bitumen storage. Total area is about 1ha.</td></tr>
<tr><td>Water Usage</td><td>According to the interview data, local inhabitants never utilize Urmaral river water for their needs. Sometimes cattle might use it for drinking.</td></tr>
<tr><td>Existing Social Infrastructures and Services</td><td>Taraz-Talas motor road is important transport route for the local people from the point of economic and social life views. Sharp curves before bridge and bridge imminent condition causes a high risk of accidents. As a result, traffic jams and road capacity decrease.
The Project will ensure cargo transportation safety, allow for easier and safer traffic in general, stimulate cross-border economic activity and will make this transport corridor more attractive. Improved road infrastructure and the road section will be conductive to safer traffic both for drivers and local people who use this bridge in their daily needs It is planned that existing (old) bridge will be utilized during the construction period of the project. Once the new bridge is constructed, the existing bridge will be demounted to construct the protection dike.
Speed limit around construction site will be lowered for the period of construction work implementation. Moving of construction machinery near the Project site will also affect to the traffic condition during construction.
Removal and relocation of sign boards installed along the roadside such as traffic signs and kilometer posts, and telephone poles are necessary before the commencement of the project.</td></tr>
<tr><td>Landscape</td><td>Construction work will temporary impair surrounding landscape. Tree felling along the road and river bank is necessary and it will also affect to the landscape of the site. On the other hand, new bridge might be a new landmark of this area.</td></tr>
<tr><td>Gender</td><td>According to the statistical data there is no gender issue in Kyrgyz Republic for the is no court proceedings recorded; there is no inequality in between males and female either. However, in the country, especially in suburban areas where there is a lack of labor, stealing the girls for wedding is still pending. There is a huge difference in between wage of male and female (women get less than 70% of men’s salary). Construction works give the opportunity for finding job quickly. However, there might be a difference in wage for women-workers.</td></tr>
<tr><td>Infectious Diseases such as HIV/AIDS</td><td>According to the Ministry of Healthcare, the number of HIV infected increases annually. Officially registered number of HIV-infected in 2011-2015 is 3,222.
Table 1-3-27 The Number and Ratio of HIV/AIDS infected by Region (2011-2015)
<table><tr><th>Region/City</th><th>Number (person)</th><th>Ratio</th></tr><tr><td>Osh</td><td>797</td><td>24.7%</td></tr><tr><td>City of Osh</td><td>274</td><td>8.5%</td></tr><tr><td>Jalal-Abad</td><td>373</td><td>11.6%</td></tr><tr><td>Batken</td><td>106</td><td>3.3%</td></tr><tr><td>Naryn</td><td>86</td><td>2.7%</td></tr><tr><td>Chui</td><td>925</td><td>28.7%</td></tr><tr><td>Yssyk-Kul</td><td>111</td><td>3.4%</td></tr><tr><td>Talas</td><td>63</td><td>2.0%</td></tr><tr><td>Bishkek</td><td>487</td><td>15.1%</td></tr><tr><td>Total</td><td>3,222</td><td>100%</td></tr></table>Source: Republic AIDS center, Ministry of Healthcare, 2016

At this stage of the Project it is planned to hire 100% of workers of local population which, means low risk of disease dissemination. To prevent this, Contractor will be responsible for workers’ awareness rising by conducting regular instruction on safe behavior.</td></tr>
<tr><td>Working Condition including Occupational Safety</td><td>Contractor is fully responsible to ensuring proper working conditions and occupational safety according to the legislation of Kyrgyz. With installation of adequate safety equipment on the Project site, the Contractor’s Safety Engineer will ensure daily safety briefings for workers, will oversee that every worker is provided and is using safety gear (hard hats, gloves, goggles, safety boots) while on the shift.
There is a labor law “Road Norms and Rules” related to construction. Regarding to the construction safety procedures in Kyrgyz Republic, MOTR holds a meeting with a contractor and sub-contractors and issues minutes of the meeting with their signatures. On the other hand, on the consultant service side, the consultant will review the safety control plan made by the contractor and obtain approval of the plan from the project owner MOTR.</td></tr>
</table>

Survey Item	Survey results
Accidents	For the last 10 months of 2017, 695 people died in car accidents in Kyrgyz, and 771 people died in 2016. Total number of recorded car accidents from January to November 2017 is 5,197 and 7,839 people got injured. 33.8% of the accidents occurred due to over speeding; entering an oncoming lane and overdriving violation – 14.4%. 20% of fatal accidents occurred due to maneuvering rules violation; 8.6% - due to alcohol intoxication. According to the interviews with the traffic police and DEU 47, 5 fatal accidents occurred in the past two years near the Urmaral River bridge, and 15 other accidents occurred over the past three years. There are no records on car and industrial accidents occurred during the construction process in Kyrgyz. In order to provide safety during Project implementation, all of the workers to follow construction safety regulations, wear personal Protective item (PPI). Flagman on both sides of the bridge during construction work is obligatory.
Global Warming	Currently it is impossible to evaluate the volume of greenhouse gas emissions (CO_2) for the Project documentation is not prepared yet. All necessary calculations will be performed during Project Detail design.
Public Hearings	First and second public hearings were conducted on 3 October 2017 and 21 April 2018 in Kyzyl Sai and Ak Dobo villages, Ak Dobo village administration of Bakai-Ata district, Talas region. There were no negative comments from the participants. Local inhabitants positively accepted idea of Reconstruction Project preparation and expressed their hope for its early implementation.

1-3-9 Impact Assessment

The impact assessment based on the survey result in Table 1-3-21 is shown in Table 1-3-28.

Table 1-3-28 Impact Assessment based on the Result of Survey

Cate-gory	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Before/Under Construction	Operation	Before/Under Construction	Operation	
Pollution Measures	1	Air Quality	B-	B±	B-	B±	Construction Stage : Tentatively air quality is expected to deteriorate because of the emission gas arising from construction machinery and vehicles. Operation Stage : Due to the increase of traffic volume, emission gas arising from vehicles is expected to affect air quality. On the other hand, impact of dust will be mitigated because of the improvement of road surface.
	2	Water Quality	B-	B-	B-	B-	Construction Stage : Water quality of Urmaral river is expected to deteriorate due to muddy water during earth work. Also, discharged water from construction machinery and worker's camp might contaminate water. Operation Stage : When raining, there is the concern that oil spilled on the road and dust will flow into the rivers.
	3	Wastes	B-	D	B-	D	Construction Stage : Abandoned soil and wastes arising from construction works are expected to be generated. Operation Stage : Waste generation affecting circumstances are not expected because this project involves the reconstruction of the existing bridge and road.
	4	Soil Contamination	B-	D	B-	D	Construction Stage : Oil and concrete mortor spill from the construction machinery and vehicles might affect soil. Operation Stage : Soil Contamination

Cate-gory	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Before/Under Construction	Operation	Before/Under Construction	Operation	
							affecting circumstances are not expected because this project involves the reconstruction of the existing bridge and road.
	5	Noise & Vibration	B-	B-	B-	B-	Construction Stage : Noise and vibration arising from the operation of construction machinery and vehicles is expected. Operation Stage : There are houses along the Project road. Due to the increase of traffic volume, noise level is assumed to deteriorate.
	6	Subsidence	D	D	N/A	N/A	No work triggering subsidence is expected because this project involves the reconstruction of the existing bridge and road.
	7	Offensive Odor	B-	D	B-	D	Construction Stage : Offensive odor generated from emission gas of construction machinery and vehicles, and daily waste is expected. Operation Stage : Offensive odor generation affecting circumstances are not expected because this project involves the reconstruction of the existing bridge and road.
	8	Sediment	D	D	N/A	N/A	Impact to the sediment is not expected because this project involves the reconstruction of the existing bridge and road..
Natural Environment	9	Protected Areas	D	D	N/A	N/A	No national park and protected area exist in and around the project site.
	10	Ecosystem	B-	D	B-	D	Construction Stage : Serious impact to the surrounding ecosystem is not expected since no endangered species and valuable species observed at project site. But around 300 trees along the road and river bank are necessary to be cut. Operation Stage : No impact to ecosystem is expected at the operation stage because this project involves the reconstruction of the existing bridge and road.
	11	Hydrology	C	C	B-	B-	Construction Stage : Temporary islands for construction of bridge piles will narrow the cross section of the river. Operation Stage : River channel transition is expected due to the demolition of existing bridge at the time of flooding, but serious impact is not expected since river channel transition is already assumed in the project plan. New bridge will not conduce debris and driftwood accumulation.
	12	Topography & Geology	D	D	N/A	N/A	Construction Stage : Impact to topography and geology is not expected because large scale earth cut and earth fill are not expected to be implemented.
Social Environment	13	Resettlement	C	D	D	D	Construction Stage : Private land acquisition and involuntary resettlement are not necessary. Operation Stage : Additional land acquisition and resettlement is not necessary at operation stage.
	14	The Poor	C	B+	B+	B+	Construction Stage : No resettlement is expected, therefore negative impact to the poor is not expected. Positive impact to the poor is

Cate-gory	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Before/Under Construction	Operation	Before/Under Construction	Operation	
							expected by the increase of employment opportunity arising from the construction works. Operation Stage : Positive impacts to the poor such as the improvement of access to social service, market and working place are expected because of the improvement of the Project road and bridge.
	15	Ethnic Minority & Indigenous Minority	D	D	N/A	N/A	Kyrgyz is multiethnic country and ethnic minority exist in project site. But impact to the ethnic minority and indigenous minority is not assumed because this project involves the reconstruction of the existing bridge and road.
	16	Local Economy such as Employment and Livelihood etc.	B+	B+	B+	B+	Construction Stage : The number of tentative employees engaging in the construction works is expected to increase. Operation Stage : Improvement of convenience of road will vitalize economic activities in project area and positive impact to employment opportunity and local economy is expected.
	17	Land Use and Utilization of Local Resources	B-	D	B-	D	Construction Stage : Land use as construction work office, worker's camp, plant facility and quarries are expected and it might affect to the land use and local resources. Operation Stage : No impact to land use is expected at operation stage because this project involves the reconstruction of the existing bridge and road.
	18	Water Usage	C	C	D	D	No impact to water usage is expected since local inhabitants never utilize Urmaral river water for their needs.
	19	Existing Social Infrastructures and Services	B-	B+	B-	B+	Construction Stage : Negative impact to the traffic condition is expected by moving of construction machinery and speed limit near the Project site. Relocation of power pole is necessary. Operation Stage : Due to the improvement of road alignment and traffic safety measures, safety of the project road is expected to improve.
	20	Social Institutions such as Social Infrastructure and Local Decision-making Institutions	D	D	N/A	N/A	No impact to social institutions and local decision-making institutions is expected since this project involves the reconstruction of the existing bridge and road.
	21	Misdistribution of Benefit and Damage	D	D	N/A	N/A	This project will not give unfair damage and benefit to surrounding area because it's the reconstruction of the existing bridge road.
	22	Local Conflict of Interests	D	D	N/A	N/A	This project will not cause local conflict of interests because it's the reconstruction of the existing bridge and road.
	23	Cultural Heritage	D	D	N/A	N/A	No cultural heritage exists around the Project site.

Cate-gory	#	Environmental and Social Item	Assessment at the Scoping		Assessment base on the Result of Survey		Reason of Assessment
			Before/Under Construction	Operation	Before/Under Construction	Operation	
	24	Landscape	B-	B±	B-	B±	Construction Stage : Construction work and tree felling will impair surrounding landscape. Operation Stage : Landscape of project area might be improved because of new bridge, however negative impact caused by tree felling is also expected.
	25	Gender	B-	D	B-	D	Construction Stage : Wage discrimination between men and women might be observed. Operation Stage : No impact to gender is expected at operation stage because this project involves the reconstruction of the existing bridge and road.
	26	Right of Children	D	D	N/A	N/A	Passport is necessary for labor contract in Kyrgyz and 16 years or above can work, therefore no negative impact to right of children is expected.
	27	Infectious Diseases such as HIV/AIDS	B-	D	B-	D	Construction Stage : Infectious diseases such as HIV/AIDS might spread due to the inflow of construction workers into the Project site. Operation Stage : No impact to infectious diseases is expected at operation stage because this project involves the reconstruction of the existing bridge and road.
	28	Working Condition including Occupational Safety	B-	D	B-	D	Construction Stage : Working condition including occupational safety for construction workers shall be considered to avoid occupational accident. Operation Stage : Negative impact to workers is not expected at operation stage because this project involves the reconstruction of the existing bridge and road.
Others	29	Accident	B-	B±	B-	B+	Construction Stage : Accidents during construction woks and accidents involving a third person are expected to happen. Operation Stage : The number of accidents is expected to be decreased due to the improvement of the road alignment and introducing safety measures.
	30	Global Warming	B-	B±	B-	B+	Construction Stage : CO_2 emission from construction machinery is expected to increase, however the impact is expected to be limited. Operation Stage : CO_2 emission is expected to increase due to the increase of traffic volume. On the other hand, CO_2 emission per vehicle is likely to reduce since CO_2 emission goes down due to the proper travel speed, and in the long run, the volume of CO_2 emission is expected to decrease.

Assessment Level A+/- : Significant positive/negative impact is expected.
B+/- : Some positive/negative impact is expected.
C+/- : Extent of impact is unknown.
D : No impact is expected.

N/A : No assessment conducted since assessed as D at scoping

1-3-10 Mitigation Measures and Cost for Mitigation Measures

As a result of the impact assessment, a significant negative impact is not expected. The expected mitigation measures necessary for the implementation of the Project are shown in Table 1-3-29 Environmental Management Preliminary Plan (EMP), based on the environmental and social items assessed at B- in Table 1-3-28. MOTR, supervising Consultant and Contractor are responsible for EMP implementation. Before starting Project implementation EMP to be revised by Consultant and Contractor. Thereupon approval of MOTR and Talas TREPD shall be obtained.

Supervising Consultant and Contractor will control all of the activities, disclose issues and give recommendations on how to improve situation, prepare monthly, quarterly and annual environmental reports. MOTR will review the reports and instruct additional measures if necessary. These activities on environmental protection are common for the construction works, therefore all the related expenses except sampling are included into the construction cost.

Table 1-3-29 Environmental Management Preliminary Plan (EMP)

	Item	Impact	Measure	Implementing Agency	Responsible Agency	Monitoring and Timing
Construction Stage						
1	Air Quality	Air pollution by dust and exhaust gases from operating equipment	• Appropriate construction machinery is used and maintained regularly. Unnecessary idling is avoided. • Water spraying is done regularly to avoid raising sand dust. • In case backfilling materials and construction materials are stocked temporally in the stock yards or the construction site, these materials are covered by sheets to avoid scattering. • Regular monitoring is carried out. In case the values get worse extremely compared to baseline survey's values and environmental standard, the reason shall be found out and necessary measures shall be taken. • Line ministries and organizations are recommended to strengthen restrictions on ill-serviced vehicles.	Contractor Consultant MOTR	MOTR	Sampling / Quarterly. Dust control / daily.
2	Water Quality	Water contamination due to construction work	• Appropriate construction machinery is used and maintained regularly. • Waste water arising from construction works is discharged after treatment in sand basin and not discharged into the river directly. • Construction machinery is not washed in the rivers. • Regular monitoring surveys are carried out. In case the values get worse extremely compared to baseline survey's values and environmental standard, the reason shall be found out and necessary measures shall be taken.	Contractor Consultant MOTR	MOTR	Sampling /Quarterly Discharge control/ daily
3	Wastes	Construction waste and human wastes	• Wastes are recycled and reused as much as possible. • Wastes unable to be recycled and reused are disposed to authorized facilities. • Prohibition to spoil and to dump wastes into the river.	Contractor Consultant	MOTR	Waste control/ daily

	Item	Impact	Measure	Implementing Agency	Responsible Agency	Monitoring and Timing
4	Soil Contamination	Oil and concrete mortar leakage during construction work	Adequate technical maintenance of the machinery. Emergency Plan of Action preparation.	Contractor Consultant	MOTR	Leakage control/ daily
5	Noise & Vibration	Noise and vibration during construction machinery exploitation	• Appropriate construction machinery is used and maintained regularly. • Low-noise construction machinery is utilized. • Construction works are done within designated working hours. • In case of night work, the permission of is obtained and the notice of the work is notified to local residents in advance. • Anti-noise screens are utilized if needed. • Regular monitoring surveys are carried out. In case the values get worse extremely compared to baseline survey's values and environmental standard, the reason shall be found out and necessary measures shall be taken. • Line ministries and organizations are recommended to strengthen restrictions on ill-serviced vehicles.	Contractor Consultant MOTR	MOTR	Noise and vibration monitoring / Quarterly Working hour control/ daily
7	Offensive Odor	Offensive odors due to exhaust gas and human wastes.	• Appropriate construction machinery is used and maintained regularly. Unnecessary idling is avoided. • Line ministries and organizations are recommended to strengthen restrictions on ill-serviced vehicles • Daily wastes management is to be organized appropriately with village administration.	Contractor Consultant	MOTR	Waste contorl/ daily
10	Ecosystem	Cutting of trees	• Trees which are not affecting construction work are not cut to the extent possible. • Existing trees are replanted as much as possible. • Trees cutting plan development demands Talas TREPD and Bakai-Ata village administration approval.	Local Administration Contractor Consultant	MOTR	Review of tree cutting plan/ Before construction Tree condition/ monthly
11	Hydrology	Construction works in river bed: excavation, bridge piles concrete casting, river bed alignment.	• River bed construction works plan is developed. • Construction management shall be performed considering water flow, such as installation plan for temporary objects not hindering the water flow as much as possible. • After Project detailed plan of works developed additional measures for impact reduction might be needed.	Contractor Consultant	MOTR	Visual observation/ daily
17	Land Use and Utilization of Local Resources	Land for gravel pit will be utilized.	Contractor will develop gravel pit utilization plan including quarry schedule and quantity according to construction plan for the period of project implementation.	Contractor Consultant	MOTR	Land utilization control / monthly

	Item	Impact	Measure	Implementing Agency	Responsible Agency	Monitoring and Timing
19	Existing Social Infrastructures and Services	Temporary detour occupies a section of existing road.	• Approval with Traffic police is obtained. • Road signs and information boards is installed properly.	Contractor Consultant	MOTR	Claims and complains on new operating conditions registration and timely response / as needed
24	Landscape	Cutting of trees	• Trees which are not affecting construction work are not cut to the extent possible. • Existing trees are replanted as much as possible. • Greening plan is considered for river dike.	Local Administration Contractor Consultant	MOTR	Visual observation/ monthly
25	Gender issues	Wage difference of males and females	• The contract with the contractor prohibits the wage difference by gender. • Contractor's employees account book is monitored.	Contractor Consultant MOTR	MOTR	According to the payment / 1 or 2 times a month
27	Infectious Diseases such as HIV/AIDS	Possible contact with HIV positive person	• Stringent prohibition of drug consumption • Advocacy work implementation • Establish communication with medical personnel of local hospital to implement measures for HIV/AIDS prevention and control	Contractor Consultant	MOTR	Implementation schedule, advocacy work, daily schedule / monthly
28	Working Condition including Occupational Safety	Labors incidents and injures	• Construction safety regulations provision • Installation of adequate safety equipment • Utilization of uniform, safety boots, helmets, protective glasses, gloves. • First aid provision system is established.	Contractor Consultant	MOTR	Briefing / weekly
29	Accidents	Incidents during construction works	• Construction safety regulations provision • Safety educations are provided to construction workers. The contract with the contractor stipulates the implementation of the safety educations. • Construction workers put on safety equipment such as helmet and safety shoes. • Sidewalks separated from carriage ways are installed. • Sign boards and road markings with a high regard for safety are placed. • Information such as construction plans are disclosed to the public.	Contractor Consultant	MOTR	Constantly
30	Global Warming	CO_2 emission	• Appropriate construction machinery is used and maintained regularly. Unnecessary idling is avoided.	Contractor Consultant	MOTR	Constantly
		Operation Stage				
1	Air Quality	Air pollution by exhaust gases from traffic	• Regular monitoring is carried out. In case the values get worse extremely compared to baseline survey's values and environmental standard, the reason shall be found out and necessary measures shall be taken. • Line ministries and organizations are recommended to strengthen restrictions on ill-serviced vehicles.	MOTR	MOTR	Sampling Every six months

	Item	Impact	Measure	Implementing Agency	Responsible Agency	Monitoring and Timing
2	Water Quality	Water contamination due to spilled oil and dust on the road when raining	• Regular monitoring is carried out. In case the values get worse extremely compared to baseline survey's values and environmental standard, the reason shall be found out and necessary measures shall be taken.	MOTR	MOTR	Sampling / Every six months
5	Noise & Vibration	Noise and vibration from traffic	• Regular monitoring is carried out. In case the values get worse extremely compared to baseline survey's values and environmental standard, the reason shall be found out and necessary measures shall be taken. • Line ministries and organizations are recommended to strengthen restrictions on ill-serviced vehicles. • In case pot holes and damages on the Project road are found, they are repaired immediately.	MOTR	MOTR	Sampling / Every six months
11	Hydrology	River channel transition	• Regular monitoring is carried out. In case any serious problem is observed, the reason shall be found out and necessary measures shall be taken. • If driftwood is accumulated, it should be removed immediately.	MOTR	MOTR	Constantly
24	Landscape	Condition of trees and greening plan	• Condition of replanted trees and greening plan of river dike are monitored regularly.	Local Administration MOTR	MOTR	Constantly

1-3-11 Monitoring Plan

The monitoring plan of the Project in construction stage and first two years of operation stage is as follows. It will be reviewed and modified at the time of Detailed Design (D/D) if necessary. MOTR shall compile the results of monitoring survey and report to SAEPF / JICA every quarter during construction and every half year in operation stage.

Table 1-3-30 Environmental Monitoring Plan (EMoP)

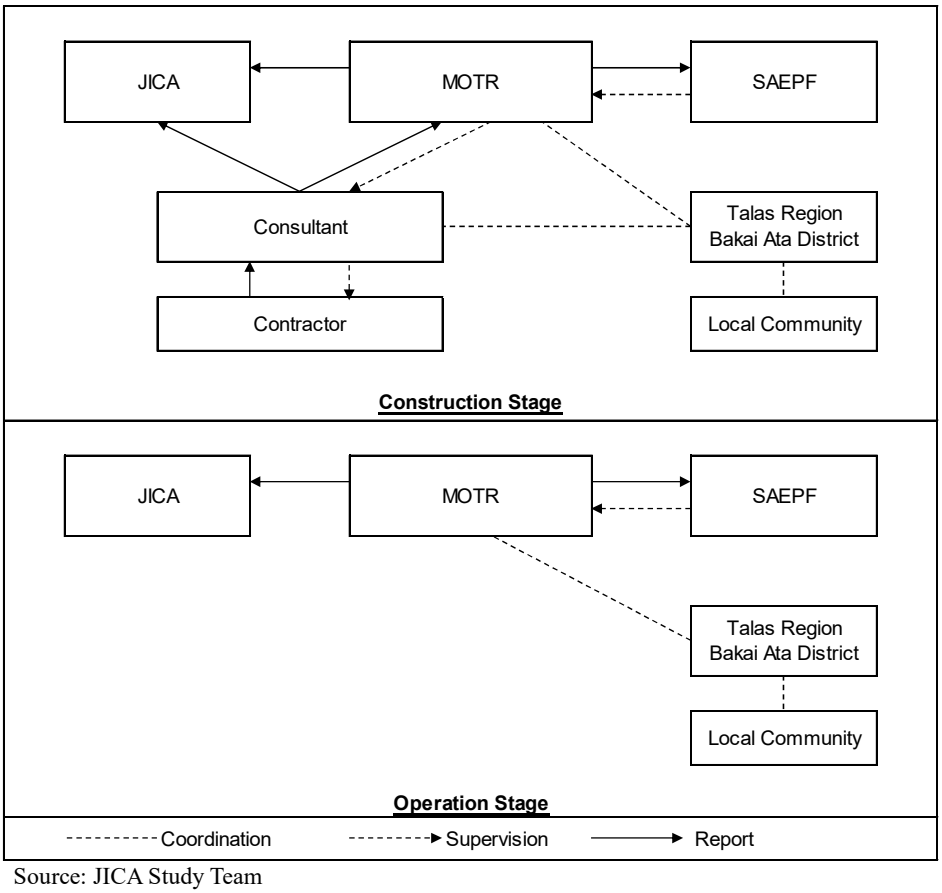
Item	Parameter	Survey Point (same as each baseline survey)	Frequency (Upper: Construction Stage/ 2.5 years) (Lower: Operation Stage/ 2 years)	Implementing/ Responsible agency	Cost (Upper: Construction Stage/ 2.5 years) (Lower: Operation Stage/ 2 years)
Air Quality	NO_2, SO_2, CO, TSP, Pb	Ak Dobo (0+400) Kyzyl-Sai (1+160)	Construction stage: Quarterly Operation stage: Biannually	MOTR	1,000$x10 =10,000$ 1,000$x 4 = 4,000$
	Dust	In and around construction site	Construction stage: Daily (Visual observation)	Consultant/ MOTR	Included in construction cost
Water Quality	pH, SS, DO, Mineral Oil, Cadmium, Pb, Arsenic, Mercury	Urmaral River	Construction stage: Quarterly Operation stage: Biannually	MOTR	1,250$ x10=12,500$ 1,250$ x 4 = 5,000$
	Discharge control	In and around construction site	Construction stage: Daily (Visual observation)	Consultant/ MOTR	Included in construction cost
Wastes	Construction waste	In and around construction site	Construction stage: Daily (Visual observation and meeting with contractor)	Consultant/ MOTR	Included in construction cost

Item	Parameter	Survey Point (same as each baseline survey)	Frequency (Upper: Construction Stage/ 2.5 years) (Lower: Operation Stage/ 2 years)	Implementing/ Responsible agency	Cost (Upper: Construction Stage/ 2.5 years) (Lower: Operation Stage/ 2 years)
Soil Contamination	Oil and concrete mortar leakage	In and around construction site	Construction stage: Daily (Visual observation and review of inspection record)	Consultant/ MOTR	Included in construction cost
Noise & Vibration	Noise & Vibration Level	Ak Dobo (0+400) Kyzyl-Sai (1+160)	Construction stage: Quarterly Operation stage: Biannually	MOTR	1,000$ x10=10,000$ 1,000$ x 4 = 4,000$
	Working hour	In and around construction site	Construction stage: Daily (Review of working record)	Consultant/ MOTR	Included in construction cost
Offensive Odor	Daily wastes	In and around construction site, worker's camp	Construction stage: Daily (Visual observation)	Consultant/ MOTR	Included in construction cost
Ecosystem	Tree cutting plan	-	Before construction: Once or as needed	Consultant/ MOTR	Included in construction cost
	Tree condition	In and around construction site	Construction stage: Monthly (Visual observation and meeting with local administration)		
Hydrology	Water flow	Urmaral River	Construction stage: Daily (Visual observation and review of work plan)	Consultant/ MOTR	Included in construction cost
	River channel transition		Operation stage: Monthly (Visual observation)	MOTR	Included in maintenance cost
Land Use and Utilization of Local Resources	Land utilization	Gravel pit and quarry	Construction stage: Monthly (Visual observation and review of working record)	Consultant/ MOTR	Included in construction cost
Existing Social Infrastructures and Services	Impact to existing road by temporary detour (Complaints handling)	In and around construction site	Construction stage: As needed	Consultant/ MOTR	Included in construction cost
Landscape	Tree cutting plan	-	Before construction: Once or as needed	Consultant/ MOTR	Included in construction cost
	Condition of trees and greening plan	In and around construction site	Construction stage: Monthly (Visual observation and meeting with local administration)		
			Operation stage: Monthly (Visual observation and meeting with local administration)	MOTR	Included in maintenance cost
Gender issues	Monitoring of employees account book	-	Construction stage: According to the payment (1 or 2 times a month)	Consultant/ MOTR	Included in construction cost
Infectious Diseases such as HIV/AIDS	Advocacy work implementation	-	Construction stage: Monthly (Review of schedule and implementation record)	Consultant/ MOTR	Included in construction cost
Working Condition including Occupational Safety	Briefing (safety education) implementation	-	Construction stage: Weekly (Review of implementation record)	Consultant/ MOTR	Included in construction cost
	Accident report (industrial accident)	In and around construction site	Construction stage: As needed		

Item	Parameter	Survey Point (same as each baseline survey)	Frequency (Upper: Construction Stage/ 2.5 years) (Lower: Operation Stage/ 2 years)	Implementing/ Responsible agency	Cost (Upper: Construction Stage/ 2.5 years) (Lower: Operation Stage/ 2 years)
Accidents	Accident report (traffic and third party accident)	In and around construction site	Construction stage: As needed	Consultant/ MOTR	Included in construction cost
Global Warming	Regular maintenance of construction machinery and idling stop	In and around construction site	Construction stage: Daily (Visual observation and review of inspection record)	Consultant/ MOTR	Included in construction cost
Total					32,500$ 13,000$

1-3-12 Implementation System of EMP and EmoP

The implementation structure of EMP and EMoP during construction and operation stage are shown in Figure 1-3-8.



Source: JICA Study Team

Figure 1-3-8 Implementation Structure of EMP and EMoP

1-3-13 Public Hearing

Prior to the start of the survey on environmental and social considerations, the first public hearing was held in October 2017 at Ak-Dobo and Kizil-Sai Village in order to explain the outline of the Project and the survey on environmental and social considerations. There is no opposition from residents and support for the Project is confirmed since sidewalk of existing bridge is narrow and dangerous, bridge itself is dilapidated, and many accidents happen due to sharp curve. The second public hearing was hold in April 2018 after the approval of the EIA report in order to explain the details of the Project and the EIA survey results.

Table 1-3-31 First Public Hearing

Item	Details
Date and Venue	11:30-13:00, 3 October 2017 Kyzyl-Say village, Ak Dobo village administration, Bakai Ata district 17:00-18:00, 3 October 2017 Ak Dobo village, Ak Dobo village administration, Bakai Ata district
Agenda	1. Explanation on outline of the project 2. Explanation on survey of environmental and social considerations 3. Question and answer session
Participants	Head of Ak Dobo village administration, Chief engineer of Regional Department №3 in Talas region (MOTR), Head of DEU №47 (MOTR), Regional Environmental Conservation, Local residents, JICA study team, Local consultants
Number of Participants	Kyzyl-Say village: Male 29, Female 7,Total 36 Ak Dobo village: Male 7, Female 47, Total 54

Question	Answer
When does bridge construction begin?	Project design and survey works have been already started. Sanitary regulations and standards of environmental management are to be studied. Environment related recommendations will be submitted. Construction process will begin in 2019.
What kind of bridge do Japanese plan to build? Is it grant or loan project?	Bridge construction will be implemented under Grant Aid from the Government of Japan. Bridge structure corresponds to every construction standards and requirements with provided lights on sidewalks. Bridge details: 3 spans, total length 90m , 1km including approach road, width of carriageway 14 m.
What will be with the pond near the bridge?	According to the results of hydro geologist's exams it will be reported whether water is usable or not. So far there are no results.
Who is going to evaluate scale of trees cutting? Cost estimation? Is compensation will be addressed to the local administration budget?	Survey work has just started. It is necessary to determine who owns project site land. Boundaries are to be confirmed with State Land Agency.
What is designed lifetime of the bridge?	The bridge is designed assuming 40-50 years lifetime.
Are flora and fauna endangered species to be surveyed in the bridge reconstruction project area?	Flora and fauna condition will be surveyed. If there are any species out of Red data book, corresponding protective measures to be taken.
Is road closure will take in effect during the bridge construction?	New bridge construction will be implemented next to existing bridge. Therefore, road users will be able to cross the river using existing bridge.
Is irrigation channel to be reconstructed?	There will be no reconstruction of irrigation channel, for irrigation channel is not a part of the Project.
Is it possible to save existing bridge after completion of new bridge construction?	Existing bridge to remove or to leave as it is – will be decided by MOTR.
There is a high number of traffic accidents at sharp curve of the road. Is any improvement of road alignment included in the scope work of the Project?	Sharp curve of the road will be aligned to improve road traffic flow and to make it safe. Carriageway will be widened at curve section. New traffic signs, lights and speed limit signs will be installed.
Is it planned to involve local qualified specialists and labors for construction process?	If it's possible.
Current road repair work affects on bridge construction or not?	There will be no problems as for the bridge construction work confirmed with relative state agencies.

Source: JICA Study Team

Photo 1-3-2 First Public Hearing at Kyzyl-Say Village

Photo 1-3-3 First Public Hearing at Ak Dobo Village

Table 1-3-32 Second Public Hearing

Item	Details
Date and Venue	14:00-14:50, 21 April 2018 Kyzyl-Say village, Ak Dobo village administration, Bakai Ata district 15:00-15:55, 21 April 2018 Ak Dobo village, Ak Dobo village administration, Bakai Ata district
Agenda	1. Explanation on bridge details information 2. Explanation on the approval of preliminary EIA report by SAEPF 3. Question and answer session
Participants	Head of Ak Dobo village administration, Head of the administration of Bakai Ata district, Chief engineer of Regional Department №3 in Talas region (MOTR), Head of DEU №47 (MOTR), Local residents, JICA study team, Local consultants
Number of Participants	Kyzyl-Say village: Male 21, Female 4, Total 25 Ak Dobo village: Male 8, Female 11, Total 19

Question	Answer
When Bridge construction will start?	Construction will start in May 2019 and will be finished in November 2021.
Is it possible to involve the local population in the construction of a bridge?	The contractor will hire local residents, and residents should have appropriate experience.
What is the length and width of the new bridge?	The length of the new bridge is around 90 meters and the length of approach roads is 1,100 meters. The width of the new bridge is 14.8 meters; 1.5 meters are allotted to the sidewalks on both sides of the bridge.
How Japanese government provides the assistance for bridge reconstruction?	The Japanese Government provides gratuitous assistance on a grant basis.
What height of the new bridge in relation to the old bridge?	The new bridge will be 2.5-3 meters higher than the old one, this will improve visibility of the road from the bridge side. The sidewalk will provide safety for pedestrians crossing the bridge.

Source: JICA Study Team

Photo 1-3-4 Second Public Hearing at Kyzyl-Say Village

Photo 1-3-5 Second Public Hearing at Ak Dobo Village

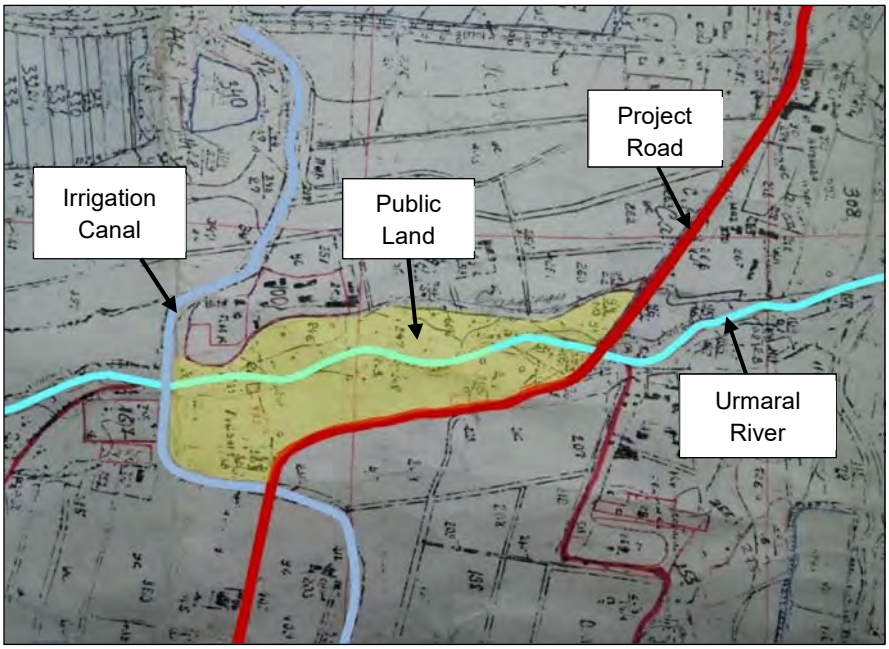
1-3-14 Land Acquisition and Resettlement

(1) Necessity of Land Acquisition and Resettlement

ROW width is 32 m by the Law on Road because the Project road is classified as category II. However, in order to avoid and minimize land acquisition and/ resettlement, it is confirmed that it will be a policy to secure only the necessary land width for reconstruction of the bridge and improvement of road alignment.

1) Land Acquisition and Involuntary Resettlement

There are many residential and several commercial facilities along the project road, but the road alignment was examined with a policy to avoid the influence on these structures as much as possible. As a result, the land required for the implementation of this project is only the public land and land acquisition does not occur. There are no residents living in the site, so involuntary resettlement is also not required. Since the site necessary for this Project is the property of the Ak-Dobo village administration, it will be necessary to transform the registration from the public land to the state-owned land to use as road ROW.



Source: State Registration Service, Bakai Ata District

Figure 1-3-9 Cadastral Map of Project Site

2) Other Impacts and Considerations for Residents

The use of riverbed and irrigation canal are confirmed as items that might affect the lives of residents, and measures shall be considered to avoid or mitigate the impact according to the degree of influence.

i) Use of riverbed

Nearby residents sometimes use riverbed of Urmaral river, which is public land, as feeding and drinking place for their livestock for private use. However, the pasture of livestock for animal husbandry locates in the mountains about 4~5 km away from the Project site and Suusamyr Valley, which is around 100 km southeast from Talas city, is used as pasture land in the summer. Thus, serious impact for their livelihood is not expected.

ii) Irrigation Canal

Irrigation canal which collects natural drainage and spring water flows through the riverbed and crosses under the road, then becomes an irrigation pond. It seems to be used as reservoir since there are water gates, but proper maintenance is not conducted and not specially utilized. Approximately 10 households around 500m away from the project site use leaked water from the pond as irrigation water for trees and vegetable garden. Village administration manages this irrigation canal and cleaning work are sometimes conducted, however there are no future maintenance or usage plan. Leaked water from irrigation canal forms a pond beside the bridge but this pond is also not utilized.

Photo 1-3-6 Feeding Place of Riverbed

Photo 1-3-7 Irrigation Canal

(2) Legal Framework on Land Acquisition and Resettlement

Laws and legislations concerning to the land acquisition and involuntary resettlement and the outlines of those are shown in Table 1-3-33.

Table 1-3-33 Major Legislations for the Land Acquisition and Resettlement

Legislation	No.	Year Passed	Outlines
Constitution of Kyrgyz Republic	-	2010	The Article 12 provides that: diversity of ownership forms and equal legal protection to ownerships; various types of ownership; and acquisition of property for public purposes with fair and prior payment of the compensation.
Land Code	45	1999	The code provides that land can be acquired for state and purposes based on an agreement between the authorized body and landowner or land user, and compensation should reflect the market value of the right to the land and losses; land owners/users can be allocated replacement land with the same value.
Civil Code	15	1996	The code provides types and costs of losses that must be compensated in the case of land acquisition and involuntary resettlement.

Legislation	No.	Year Passed	Outlines
Law on Grievances	67	2007	The law provides that the grievance from the Kyrgyz Republic citizens should be registered, given due consideration, and adjusted in an equitable, timely and accountable manner.
Law on Roads	72	1998	The law provides that roads of common use can be only in state ownership and cannot be sold or held in private ownership. The following activities are prohibited on the right-of-way of common use roads: organizing trading outlets along the roads; and buildings, kiosks, pavilions and similar structures.
Temporary rules for the valuators and valuation companies	537	2003	The valuation of the assets is carried out on the basis of these government resolutions and other provisions of national legislation.
Valuation standards for the valuators	217	2006	

Source: Final Report of Data Collection Survey on Osh City Road Transportation in the Kyrgyz Republic, Land Acquisition and Resettlement Plan for Kyrgyz Republic Power Sector Improvement Project Prepared by JSC "National Electric Grid of Kyrgyzstan" for the Asian Development Bank

(3) Necessity of Land Acquisition and Resettlement

As mentioned above, land acquisition and resettlement will not occur.

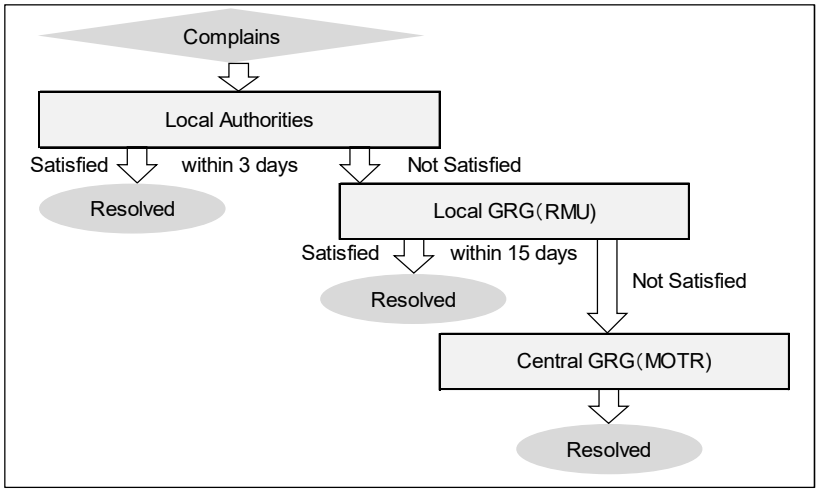
(4) Measures for Compensation and Assistance

Village administration will explain the use of riverbed to residents who are using it as feeding and drinking place for livestock before construction and plan to provide alternative sites. The irrigation canal flowing in riverbed is planned to ensure by installing culvert at the bottom of the embankment of approach road so as not to block water flow.

(5) Grievance Redress Mechanism

For the period of Project implementation MOTR shall establish the Grievance Redress Group (GRG) to deal with various Project-related issues. The role and responsibility of GRG is to receive complains, assess their validity, probable consequences and timely resolution of problems.

Complain statements shall be first submitted to local authorities and provided this complain remains without motion for three days, then this complain shall be submitted to the GRG at the local level. At this level the submitted complain shall be discussed with the account of opinion of Road Maintenance Unit (RMU) and affected local population. Provided this complain is not resolved within 15 days then it shall be submitted to the GRG at central level (MOTR), which has to come up with its final decision.



Source: JICA Study Team

Figure 1-3-10 Grievance Redress Mechanism

(6) Implementation Structure

MOTR and local administrations are responsible for land transformation procedure, tree cutting and replanting, removal and relocation of affected facilities, and provision of alternative feeding and drinking place for livestock

(7) Implementing Schedule

After finalization of required land and affected trees, necessary procedures will be implemented before tender of contractor.

Table 1-3-34 Implementation Schedule

	2017			2018												2019						
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7
Preliminary EIA																						
Submission of EIA Report to SAEPF																						
EIA Review and Approval by SAEPF																						
Public Hearing																						
Land Transformation Procedure																						
Tree Cutting and Replanting,																						
Removal and Relocation of Affected Facilities																						
Provision of Alternative Feeding and Drinking Place for Livestock																						
Tender																						
Commencement of Construction																						

Source: JICA Study Team

(8) Budget and Source

GOK and local administrations will bear the cost for land transformation procedure, tree cutting and replanting, removal and relocation of affected facilities

1-3-15 Others

(1) Draft Monitoring Form

Draft monitoring form is attached in Appendices.

(2) Environmental Check List

Environmental check list is attached in Appendices.

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

(1) Overall Goal and Project Objective

The National Development Plan of the Kyrgyz Republic includes "National Sustainable Development Strategy 2013-2017" which listed the "Development of Strategic Industries of the Economy" as one of the priority area. The major development goals of the transportation and road sector are shown in Table 2-1-1. Especially rehabilitation of international transportation corridors (5 roads) is prioritized in the above goals.

Table 2-1-1 6 Major Development Goals of NSDS

(1)	Rehabilitation of five motorways that represent international transport corridors (Road Sector)
(2)	Preservation and improvement of the network of domestic hard-surface roads (Road Sector)
(3)	Construction of bypass roads in the urban area (Road Sector)
(4)	Completion of FS Study for major international crossing railway
(5)	Creation of an air transport hub
(6)	Introduction of e-governance system and transition of digital TV and radio-broadcasting

NSDS places the importance on the transportation and road sector as a prioritized area to develop economy and industry, and to transform the landlocked country which has limitation to access to the ports to the strategic point country of the transportation.

Overall Goal: Landlocked country, Kyrgyz is converted to be a key country of traffic and the economic activities are accelerated due to the stability and smoothness of internal traffic.

Project Objective: Safety and stability of the traffic of Talas-Taraz road which connects between Kyrgyz and Kazakhstan and is the international and arterial road, is put into practice.

Outcome: Urmaral river bridge which is located at the point 82km on the international and arterial road connected between Kyrgyz and Kazakhstan (Talas-Taraz road) is reconstructed and its approach road is improved.

(2) Outline of the Project

This Project consists in the improvement of the Urmaral Bridge on one of International roads (Talas- Taraz Road) and to put safety and stability of the traffic into practice in order to obtain above mentioned overall goal. As the result of this achievement, the economic activities are accelerated with the stability and smoothness of internal traffic. Therefore, this Project consists in the reconstruction of the Urmaral Bridge on Talas- Taraz Road and the improvement of its approach road. Both of which were requested from Republic of Kyrgiz. The Project scope of Japanese assistance are as follows;

- Reconstruction of the Urmaral River Bridge on Talas- Taraz Road.
- Construction of Revetment Adjacent to the Urmaral River Bridge.
- Approach road improvement of approximatelly 1.1km from 82k700 to 81k300 including the improvement of two small radius curves and excluding the bridge crossed irrigation channel.
- Traffic safety countermeasures such as the installation of the large reflectors shaped arrow, road signs, road markings and street lights.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design policy

(1) Road Traffic Condition

The results of the traffic survey (2011) of the five major roads conducted by ADB M/P survey are shown in the figure below. The traffic volume of the project target area is 2,900 vehicles a day, which is the second highest in Kyrgyz (the highest is 4,700 vehicles a day along Bishkek-Naryn-Torugurt Road). This means that the Project road can be positioned as an important international road of the inter-regional transportation network that connects Kazakhstan and Kyrgyz.

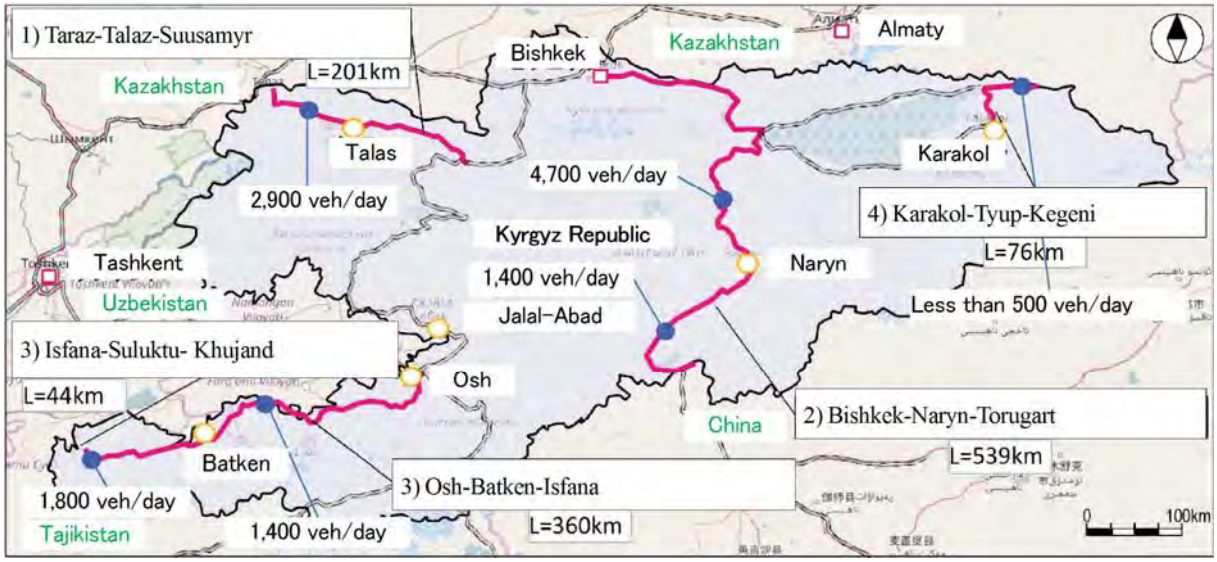


Figure 2-2-1 5 Major International Transportation Corridors

The traffic survey was conducted at related locations along Talas-Taraz road. The outline and results of the survey are shown in Figure 2-2-2 and Table 2-2-1.

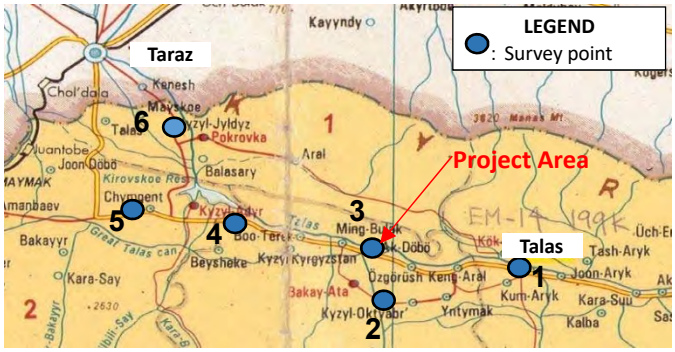
Survey Location	Implementation Day
	First field Survey July 16, 2017 (Sun) July 19, 2017 (Wed) Second Field Survey September 16, 2017 (Saturday) September 19, 2017 (Tue) Vehicle classification Mobile: 9 classifications (vehicle + motorcycle) Non-mobile: 3 classifications (bicycle, pedestrian)

Figure 2-2-2 Outline of Traffic Survey (24h)

Table 2-2-1 Result of Traffic Survey

Date		I:Light vehicles		II: Medium vehicles		Total (A)	III: Heavy vehicles				Total (B)	G.Total
		Sedan/Wagon	Pick-up/4WD	Van/Mini bus	Mini truck		Standard & Large bus	2-axle truck	3-axle truck	Articulated truck		(A+B)
July 2017	Weekday	3,498	8	509	50	4,065	8	77	50	115	250	4,315
	Weekend	3,091	0	414	70	3,575	17	57	44	120	238	3,813
Setember 2017	Weekday	3,639	135	287	369	4,430	4	70	46	164	284	4,714
	Weekend	3,751	18	817	209	4,795	5	99	113	163	380	5,175

The daily traffic volume near the target bridge (survey point no. 3) was measured in July and September 2017. In July, the traffic volume was found to range between 3,800 veh/day to 4,300 veh/ day, and the ratio of large vehicles was from 5.8% to 6.2%. Meanwhile, in September, the traffic volume was observed to range from 4,700 veh/day to 5,200 veh/day, and the ratio of large vehicles was from 6.0% to 7.3%. In addition, the daily traffic volume of large vehicles near the border (survey point no. 6) was found to range from 110 veh/day to 180 veh/day in July, and 110 veh/day to 180 veh/day in September.

The target road, Talas-Taraz road, is an important international road, and the traffic volume in 2030 after 10 years' operation is 6,074 veh/day. Road classification is decided considering this traffic volume. Road elements such as lane width, shoulder are integrated with that of IsDB section.

(2) Transition of River Channel of Urmaral River and Scope of the Project

Urmaral River is a tributary of Talas River that instantaneously flows for around 70 km from the top of Tian Shan mountains with an altitude of 4,000 m to an altitude of 1,000 m, and then confluences to Talas River with an average river bed slope of less than 1/100 as a steep stream.

The flow path in the river channel formed by riverbank scouring during small and medium floods meanders and changes its shape as time goes on, but the river formed by a large flood (equivalent to 100-year return period of river discharge) shows a linear shape.

At the time of construction, the existing bridge was planned to cross over the river channel meandering to the right side at a right angle.

A river channel with a steep stream has a strong tendency to have a straighter river flow compared to the usual meandering river channel.

During the flooding in 2016, the concrete revetment, which was installed on the left bank upper side of the existing bridge to divert the floodwaters to right bank, was scored and broken. Consequently, the floodwaters flowed straight and leached onto the approach road behind the bridge on the left bank, causing road embankment collapse.

In planning of the new bridge, the change of the future river flow transition and possible floods should be considered. At the same time, it is important to avoid the flow resistance of the river, which would arise from the natural self-correction of the river flow transition.

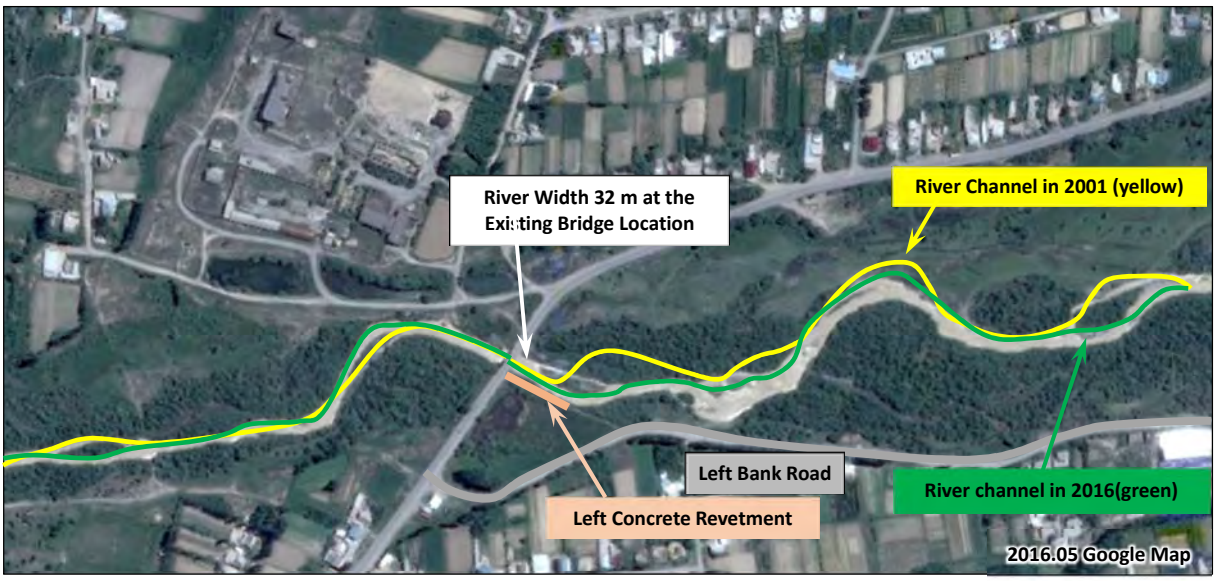


Figure 2-2-3 River Channel Transition

For this reason, when flooding occurs in the future, the river is assumed to flow straight with a high velocity in the direction of the blue arrow in Figure 2-2-4. The new bridge will be planned along with a revetment plan to control this flow.

The abutment of the new bridge on the left bank is planned to be installed to prevent the future river line from resisting the planned left revetment. Although the abutment of the new bridge on the right bank is planned to be installed corresponding to the existing right bank, the right revetment should control the transition of the river channel from the existing river channel to the future river channel in the direction of the blue arrow in Figure 2-2-4.

The existing right bank of downstream of the river meanders to the left bank, so scouring outside of the meandering on the left bank is a concern. It is expected that the water colliding front that causes scouring moves as flooding occurs.

In addition, there is a residential area, and the river is close to a road to settlement downstream of the river. From the viewpoint of disaster prevention, it is necessary that a range of revetment improvements is put in place between the planned bridge and the meandering part of the river.

From the above, the plan of the new bridge is made while assuming the transition of the river channel and planning minimum revetment for putting safely into practice. This project is conducted comprehensively without separating any parts.

Furthermore, the left bank side downstream of the river from the bridge was not a usual river channel through which river water flows, and there are many plants that are rooted stably on the land. Although scouring progresses gradually, this area is relatively strong against scouring. Given that it will take a long time to improve the revetment on the left bank downstream of the river, the improvement of downstream revetment is excluded from this grant aid project. The scope of improvement of revetment on both government is discussed and it shows in Figure 2-2-4. The road route in this figure is plan C described in Chapter 2-2-2.

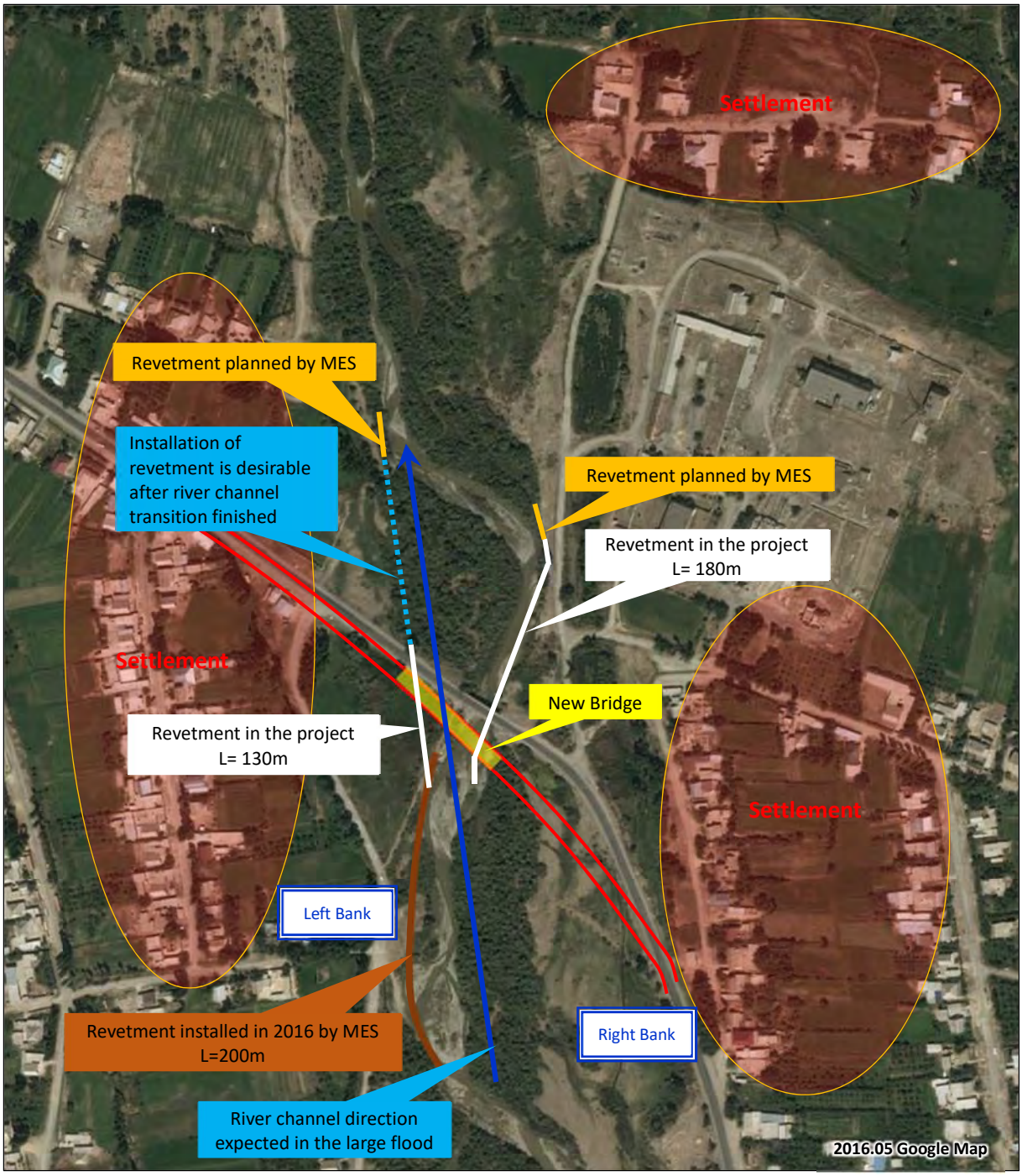


Figure 2-2-4 The Issues on the Project Area

(3) Existing Condition of the Bridge and the Road

The length of the existing bridge is 36.2 m. There is a high risk of bridge collapse and road malfunction due to the increase of snowmelt water caused by recent abnormal climate attributed to climate change, damage from driftwoods, scouring behind the bridge and the dike.

In June 2016, the road was temporarily closed because of damage such as scouring behind the abutment, which affected neighboring residents and caused the road to lose its function as an international road. The damage was caused by pile bent piers of which spans is short and they led to driftwood and an increase river water level , as well as failure to ensure the necessary river width.

The road alignment of the road near the bridge has two curves, with small curve radii of 100 m and

60 m. This is a section prone to traffic accidents – 15 traffic accidents occurred in the past three years, of which two or three of passenger of vehicles per year were fatal. Therefore, it is necessary to improve both the road and the bridge.

(4) Construction Circumstance in the Site

There is a little experience on bridge construction in Kyrgyz and no construction companies in Talas State. A company located around Bishkek is considered as a candidate sub-contract construction company. An asphalt plant with a productivity rate of 35t/hr was provided by JICA project "The Project for Improvement of Workshops for Road Maintenance Equipment" and is now operational. Procurement of asphalt pavement from this plant can be expected.

(5) Operation and Maintenance

As for bridge maintenance, "The Project for Capacity Development for Maintenance Management of Bridges and Tunnels" is currently implementing relevant activities including creating a database and a bridge inspection manual, and conducting bridge inspection training. Knowledge acquisition for bridge maintenance is still ongoing, so a bridge type with less maintenance shall be selected for this project. Aggregates for asphalt concrete and concrete are available, considering the aspects of quantity and quality.

(6) Obstacle Facilities

There is a high-voltage electricity line tower at the starting point of the planned road and a house at the end of the planned road. It would take a long time to relocate the high-voltage electricity line tower and the house. Therefore, the project is planning to set these obstacles as control points.

From the above, rather than forcibly controlling the river flow with artificial structures, river planning will be done such that river channels are formed naturally. The bridge plan and road plan will be made considering this river plan. The bridge, the road, and the river are planned to be improved integrally.

(7) Design Standard

The design standard is basically adopted with the SNiP standard (Russian Federation Construction Standard), Japanese Road Structure Ordinance etc. are adopted supplementary. Pavement design is conducted by using AASHTO standard. Bridge design is conducted compering between active load of specifications for highway bridges in Japan and НГ80 of SNiP.

<Road Design Standard>

Geometric Design

Design of Highways SNiP KP 32-01-2004, 2004
Road Structure Ordinance2015, Japan Road Association

Pavement Design

Guide for Design of Pavement Structures 1993, AASHTO
Guideline for Pavement Design and Construction 2006, Japan Road Association

Drainage System

Guidance of Drainage System on Road Earth Work 1987, Japan Road Association

<Bridge Design Standard>

Design of Bridges and pipes SNiP 2.05.03-84
Specifications for highway bridges 2012, Japan Road Association
River management facilities Ordinance 2000, Japan River Association

2-2-2 Basic Plan

(1) Design Condition

1) Road Class

The target year of the project is on 2030, which is 10 years after the start of operation.

Traffic surveys that were conducted during the field survey served as bases for forecasting future traffic demand. Large vehicle ratio is set as same as that of existing. The results of future traffic demand forecast are shown in Table 2-2-2.

Table 2-2-2 Future Traffic Volume (Veh/day)

Year	Sedan/ Wagon	Pick-up/ 4WD	Van/ Mini bus	Mini truck	Total (A)	Standard & Large bus	2-axle truck	3-axle truck	Articulated	Total (B)	Grand Total (A+B)
2017	2,796	33	406	140	3,375	8	61	52	113	234	3,609
2020	3,146	39	458	159	3,802	11	70	61	128	270	4,072
2025	3,830	49	560	196	4,635	16	88	76	159	339	4,974
2030	4,663	63	685	241	5,652	21	109	96	196	422	6,074

The future traffic volume of Talas-Taraz Road in the year 2030 is 6,074 veh/day. This road is an international road connecting Talas and Taraz in Kazakhstan, and it is classified as category II. A lane width of 3.5 m is adopted for the project to become integrated with the IsDB section.

The future traffic volume in 2040,20 years after operation is 8,025 Veh/day and it result in over the category II. But the road capacity is enough to accommodate this traffic volume, because the traffic capacity of general two-way road is from 6,000 to 12,000 veh/day.

2) Design Speed

There is limited space for road and bridge construction in the project area because there is a need to avoid the river. Moreover, the restriction of speed for residential areas in Kyrgyz is 60 km/h, so the design speed is adopted as 60km/h.

(2) Examination of Bridge Location and Road Route

Generally, in river planning, the river cross section is designed as a cross section that is adequate for the design river discharge. The grade of this river is steep at 1/100. Given that the flow velocity for steep rivers is quite rapid and the river channel widely moves to the left and right, it is necessary to secure not only the cross-sectional area but also the river width in consideration of river channel movement for the safety of river embankment and the like.

In particular, the river channel greatly changes upstream of the current bridge and tends to change its flow during flooding to the left bank due to its straightness, but because the existing bridge is a control point, the channel is forced to move to the right bank instead. For this reason, the upright concrete revetment, which had been installed on the left bank due to the straightness of the river flow, collapsed during the flooding in June 2016. Moreover, the abutment on the right bank, which was downstream from the reflected flow, also collapsed during that time.

Therefore in this survey, using the disaster situation in 2016, river channel transition and discharge data in the past, and existing riverbed grade, flood damage in 2016 was analyzed, and the bridge location was subsequently examined. The river channel transition was analyzed using Google Earth aerial photos taken in 2001, 2013 and May 2016 before the June 2016 flooding, as well as drone photos taken in this survey after the flooding.

1) Bridge Location

The transition of river channels depend on each characteristic. Therefore, setting out of the transition range of the river is decided considering past river channel location on each part of the river.

Alternative road routes are shown in below. Bridge length of each route is set considering this transition range of the river.

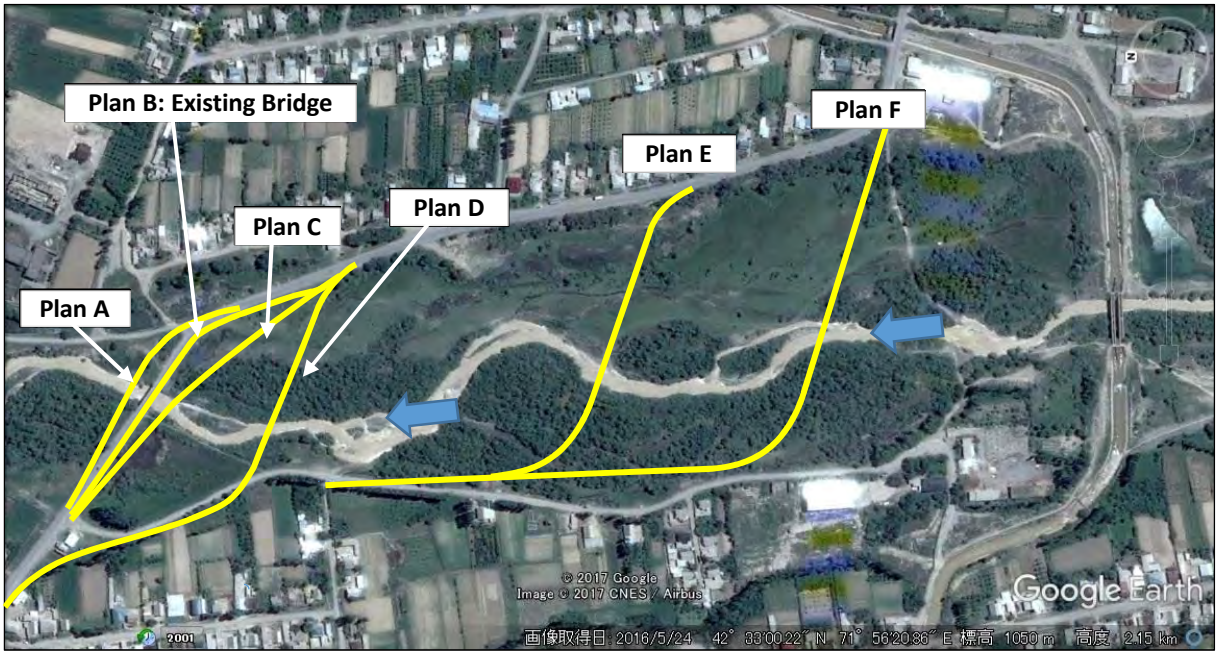


Figure 2-2-5 Alternative Routes

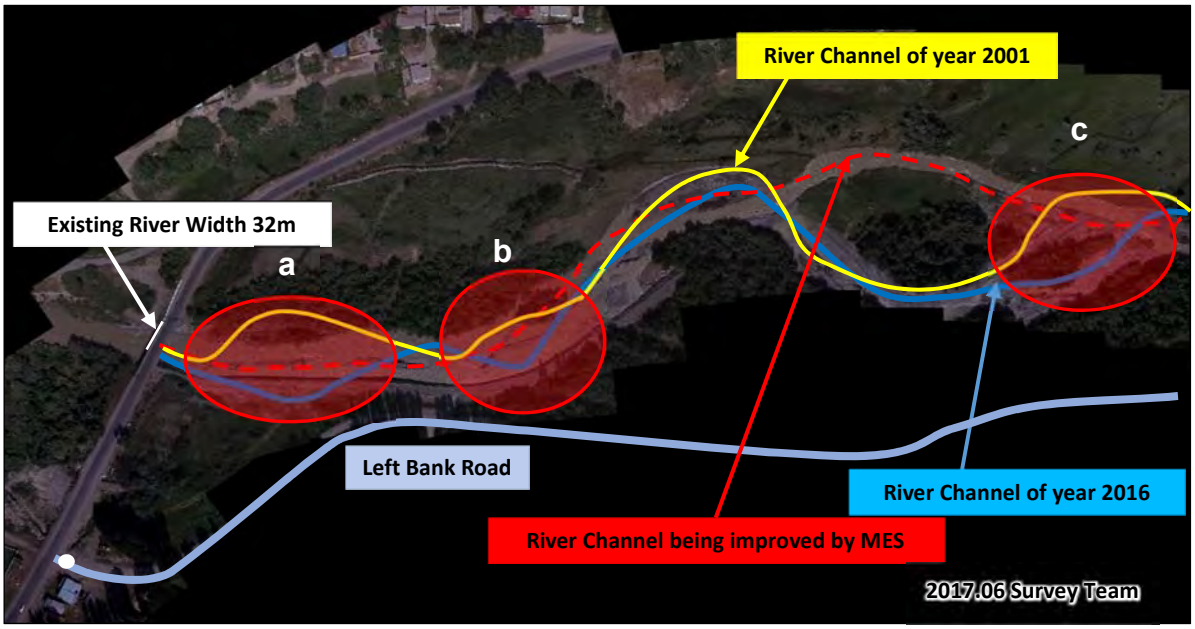


Figure 2-2-6 River Channel Transition

The section of the river between the irrigation channel bridge which is located upstream of the existing bridge and the existing Urmaral river bridge has transited widely.

These are the sections, where the river channel transited compare to other points, marking with red circles shown in above figure for 15 years from year 2001 to 2016.

i) Route A, B, and C

Considering the straightness of river flow of steep rivers during flooding, the river channel is highly likely to flow close to the red line in the figure below after the current bridge is removed. On the other hand, the river channel tends to meander during small or medium flooding, so it is likely that the existing flow line will be kept. The only way to predict how river channel fluctuates in the future is by predicting from the past fluctuations of the river channel. The width indicated in yellow in the figure below represents the predicted range of the river channel in the future.

Reconstruction of the bridge with the shortest bridge length at the crossing points of the red line in the figure below can be considered after improving the river channel upstream of the bridge such that the river channel is moved along the red line. However, because the river channel line during large flooding usually does not coincide with that during small and medium flooding, it is desirable to design the river channel while considering river channel movement not only during large floods but also small and medium floods.

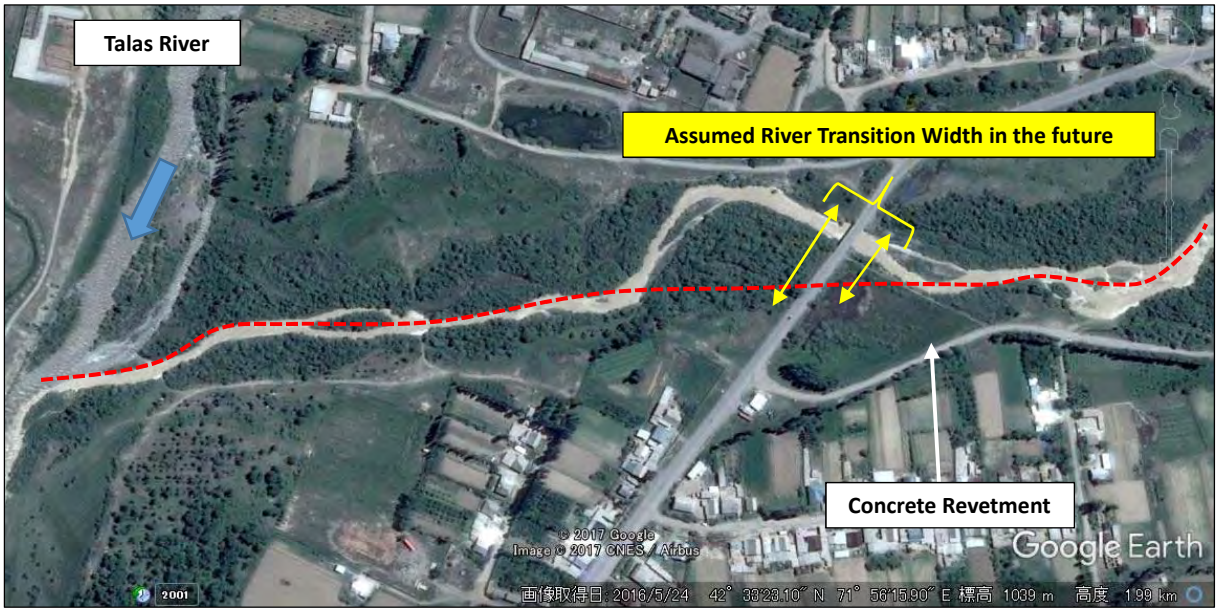


Figure 2-2-7 Urmaral River Channel (Google Earth May 2016)

ii) Plan D, E and F

The river channel line in the interval presented in Plan D, E and F has not fluctuated so much for the past 16 years.

This interval is more suitable for the construction site of the new bridge from the viewpoint of river channel fluctuation than the other intervals.

2) Setting Bridge Length of alternative Routes

i) In case that the new bridge based on plan A, B and C is designed, the transition of the river channel must be considered. If the existing bridge is removed after the construction of the new bridge, the river channel will not change in the short-term, but it will change gradually to the left side due to straightness and assumed to approach towards the red line below. Although the river

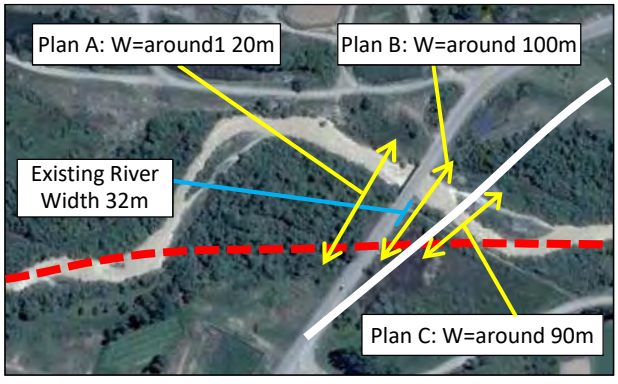


Figure 2-2-8 Setting Bridge Length of Each Route

width is 32 m at the existing bridge point, the following widths between both abutments are proposed instead to take into consideration the fluctuation of the river channel.

Plan A about 120 m

Plan B about 100 m

Plan C about 90 m

ii) Plan D and E are located at the area where the river channel does not change so much. Although the existing river width is about 30-35 m, the distance between both abutments is proposed to secure a width of about 50 m, taking into consideration that the width of the crossing bridge for the irrigation canal is 48.7 m.

iii) Plan F is located at the area immediately downstream of the crossing bridge for the irrigation canal. The width of river channel fluctuation is about 60 m. The distance between both of abutments is proposed to secure about 70 m by adding an allowance of 10 m to the fluctuation width of 60 m.

3) Route Examination

Alternative road routes are examined considering the location of the planned bridge. The access road of the planned route plays the roles of a community road and an international road connecting to Kazakhstan, and thus enough traffic capacity should be provided. The following planning policy were applied to examine the alternative routes.

【Planning Policy】

- Improvement of Traffic Safety
  Based on the occurrence of the traffic accident on the existing road, the alignment/plan that can improve in 2 places; a sharp curve (R = 60 m) at the start point and a sharp curve (R = 100 m) near the bridge.
- Optimum utilization of existing facilities
  Plan to use the existing road as much as possible, and consider economic efficiency.
- Avoiding interferences to electric towers and poles
  The high voltage electricity towers and electricity poles are the control points of the plan and avoid intersection with high-voltage cables as much as possible.
- Orientation of river flow direction and bridge axis at the bridge site, consideration to intersect bridge axis with perpendicular to the flow direction of the river.

Based on the above planning policy, 6 routes A to F were selected. The outline of the alternative routes is shown in Table 2-2-3.

Table 2-2-3 Outline of Alternative Routes

A	Route A crosses over the river at the point of the immediate downstream from the existing bridge. This route improves the sharp curve (R= 60) of the start point to R=160 (V=60km/h minimum curve radius R=150 or more) and cross to the downstream side avoiding the high voltage pole.
B	Route B is replacement of the existing bridge. This route improves the sharp curve (R=60) of the start point to R=160 and improves the sharp curve (R=100) near the existing bridge to R=150. The other section is the same plan as the existing road.
C	Route C crosses over the river at the point of the immediate upstream from the existing bridge. This route improves the sharp curve(R=60) of the start point to R=160 and improves road plan by keeping the separation from the existing bridge as far as possible. (R=500 and R=600)
D	Route D crosses over the river at the point 60m far upstream from the existing bridge. In this route, the bridge position of Route C will be shifted to a position where fluctuation of river channel was small and planned with S curve of R=150.

E	Route E crosses over the river at the point 300m far upstream from the existing bridge. This route proposes to on the left bank side so as to link almost linearly at a position where fluctuation of river channel is small and planned with S curve of R=150.
F	Route D crosses over the river at the point 600m far upstream from the existing bridge. This route improves the sharp curve of the start point to a straight line, and links with a straight line to a position where fluctuation of river channel is small, and grinds around the existing road on the left bank side.

Among these Plans, Plan D, E and F were excluded of reason that shown in the Table 2-2-4. Comparison among plans A, B and C was further considered.

Plan A, B and C are shown in Figure 2-2-9. Comparison table is shown in Table 2-2-5.

Table 2-2-4 Problem of Plan D to E

Plan D	Plan E	Plan F
・R＝150m of S curve ・Curve radius is small ・A lot of curves	・Curve radius is small ・A lot of curves ・Affect high voltage line	・Affect high voltage line and tower
⇒Poor running performance and safety	⇒Poor running performance and safety High cost and delay of project	⇒ High cost and Difficult to implement the project

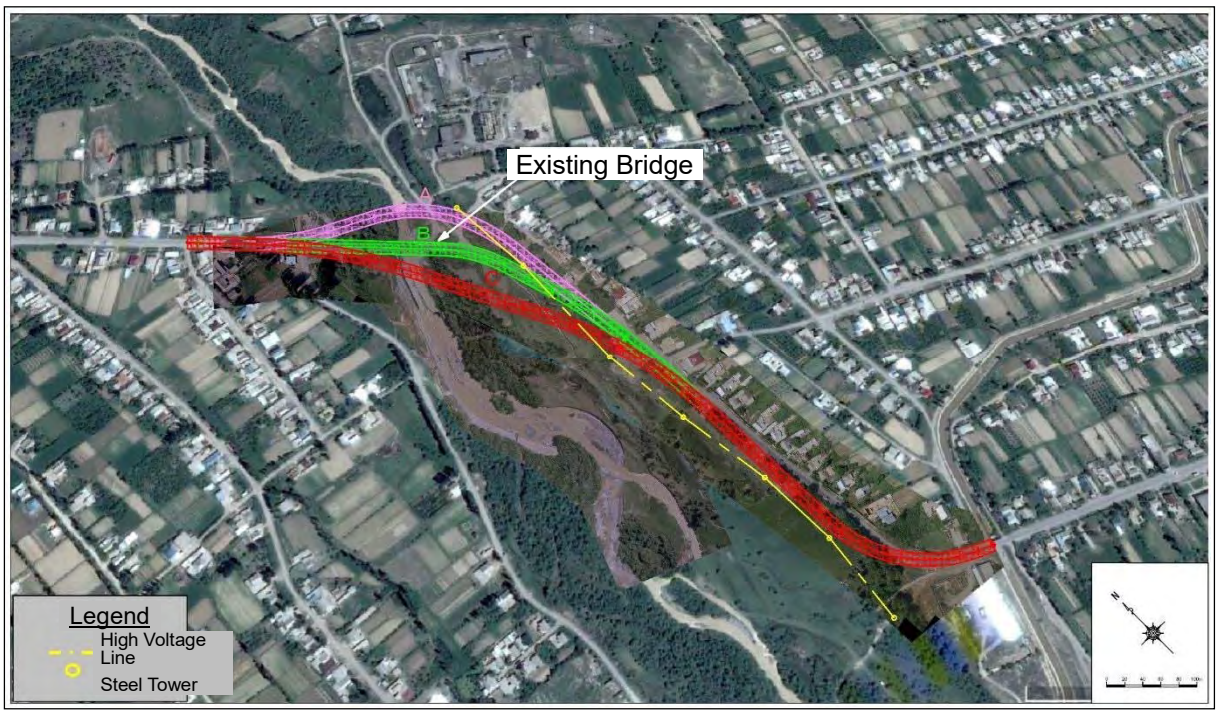


Figure 2-2-9 Selected Alternative Routes

Table 2-2-5 Comparison Table of Alternative Routes

Items	Route A	Route B	Route C
Stream conditions at river crossing point	There is a high possibility of the river channel transition in the future Fair △	There is a possibility of the river channel transition in the future Good ○	There is a possibility of the river channel transition in the future Very Good ◎
Measures against flood	Install a crossing pipe under the approach road on Taraz side Good ○	Install a crossing pipe under the approach road on Taraz side Good ○	Install a crossing pipe under the approach road on Taraz side Good ○
Alignment	・Number of curves : 5 (R=300,150,210,1000,150) It is not suitable for other requests because the number of curves is the largest and the curve radius is small Fair △	・Number of curves : 4 (R=150,500,1000,150) It is existing alignment, and the first curve is modified, but it is not enough for other requests because the number of curves is large Good ○	・Number of curves : 3 (R=1000,650,150) It is suitable for other requests because the number of curves is the small and the curve radius is large Very Good ◎
Length	・Bridge 125m ・Road 1115m ・Total 1,240m Fair △	・Bridge 105m ・Road 1115m ・Total 1,220m Good ○	・Bridge 90.5m ・Road 1,112m ・Total 1,203m Very Good ◎
Construction	・Existing bridge can be used during construction ・Bridge length is long at 125 m, it takes time to construct Fair △	・Detour route (temporary bridge) is necessary to replace existing bridge Fair △	・Existing bridge can be used during construction Very Good ◎
Additional measures to be taken by GOK	Removal of existing bridges and approach roads is required Good ○	There is no burden by Kyrgyzstan to replace existing bridge Very Good ◎	Removal of existing bridges and approach roads is required Good ○
Construction Cost	1.2 Fair △	1.1 Good ○	1.0 Very Good ◎
Evaluation	Construction cost is the highest compared to other plan, stream condition is also unstable in the future, so study team dose not recommend route-A	Construction cost is the high compared to other plan, stream condition is also unstable in the future, so study team dose not recommend route-B	Stream condition is relatively stable in the future, Alignment is suitable for other requests, so study team dose recommend route-C

Based on the above comparative study, the route C is recommended and shown in Figure 2-2-10.

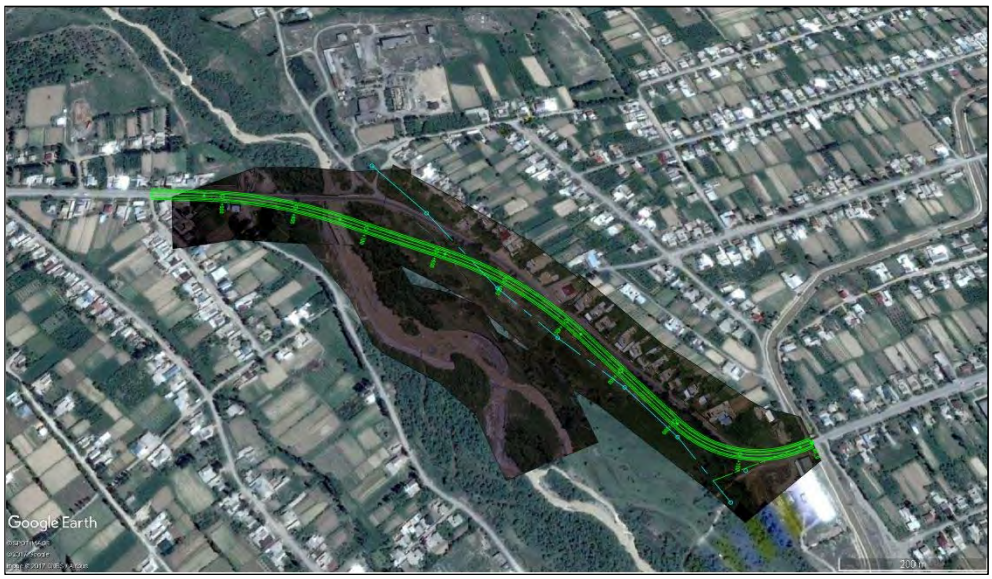


Figure 2-2-10 Final Selected Route

(3) River Plan

In deciding the extent of the river channel that the bridge has to cross, it is necessary to calculate the 100-year return period of river discharge by using the yearly maximum discharge from 1927 to 2015 on the Urmaral River meteorological station of MES.

The water level at the crossing point with the bridge was calculated with varied flow calculation using the existing river cross section which was obtained from the topological survey.

1) Planned River Water Discharge

Comparing the analysis result of the 100-year occurrence probability flow rate in the past, the discharge used for repaired revetment design of MES, and the largest river discharge in the past, the planned river water discharge is set out to be 110 m^3/s.

- Result of 100-year return period of river discharge: 93 m^3/s
- Discharge used for the repaired revetment design of MES (100-year occurrence probability flow rate): 94.6 m^3/s
- Largest river discharge in the past: 102 m^3/s

2) Varied Flow Calculation

The cross sections for varied flow calculation is created based on the river topographical survey results.

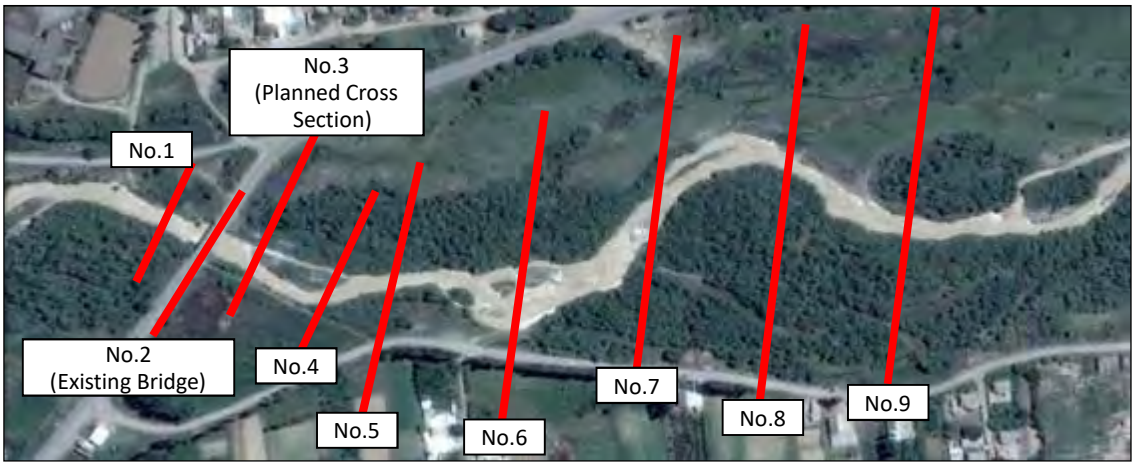


Figure 2-2-11 Cross Section for Varied Flow Calculation

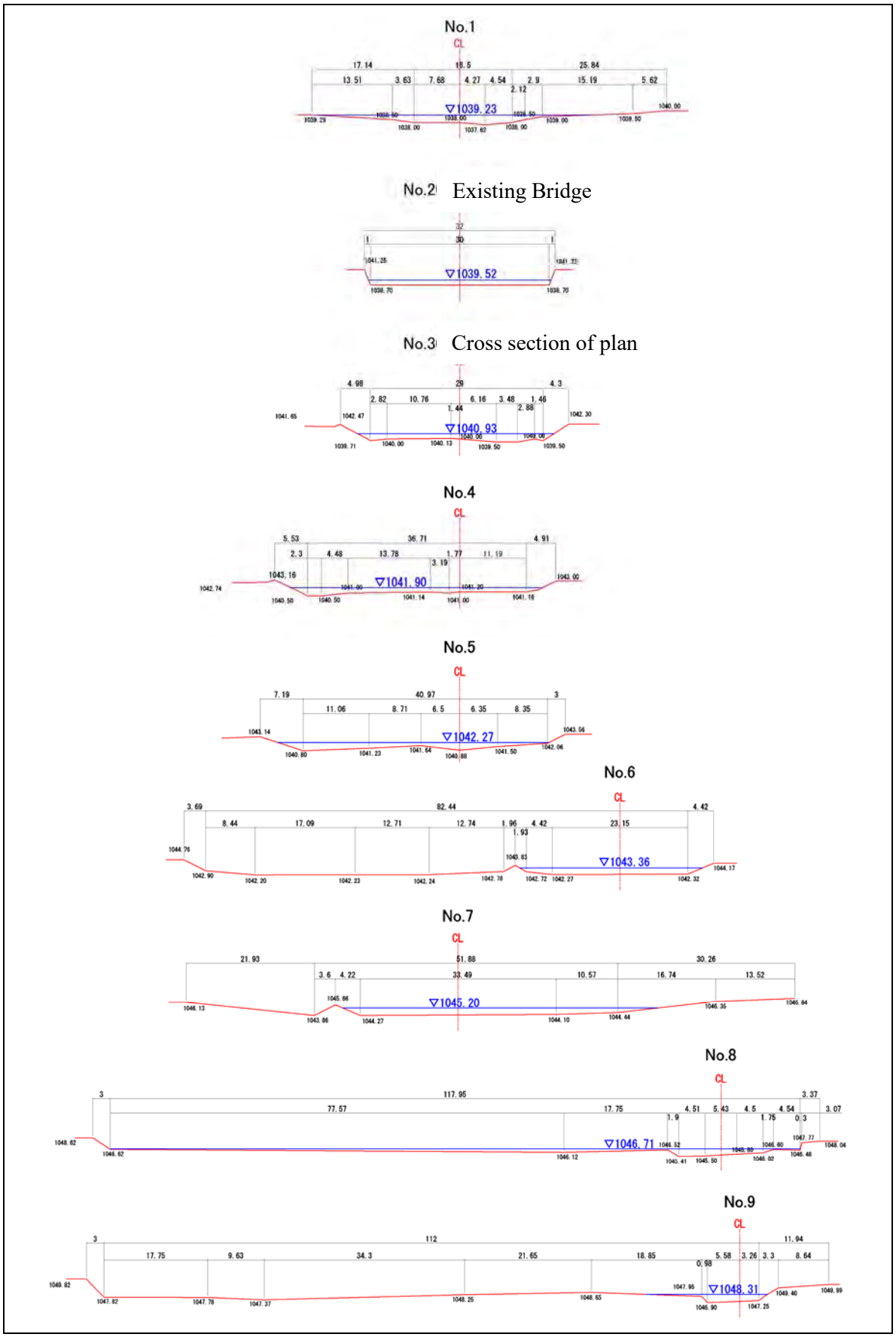


Figure 2-2-12 Cross Sections for Varied Flow Calculation

3) Roughness Coefficient of Urmaral River

Reverse analysis was conducted to calculate the roughness coefficient assuming the case wherein maximum discharge flows in the existing cross section. The conditions of the analysis are shown below.

i) Slope of River Bed: i=0.0135 (≒1/74)
ii) Water Discharge: 102 m^3/s (the largest in the past)

Through reverse analysis, the roughness coefficient is calculated as 0.035, which corresponds to a common value for general rivers.

Table 2-2-6 (Reference) Manning Roughness Coefficient of Natural Rivers

Shape and Condition of River	Roughness Coefficient
Alignment and cross section is regular, deep water	0.025-0.033
Riverbed with gravel, grassy shore	**0.030-0.040**
Meandering, futility	0.33-0.045
Meandering, small water depth	0.040-0.055
Many aquatic plants	0.50-0.080

(Source: Technical Criteria for River Works)

4) Varied Flow Calculation Result

Varied flow calculation is conducted under the following conditions: design discharge= 110m^3/s, roughness coefficient=0.035, the slope of river bed i=0.0135 (≒1/74), and setting cross sections. The result of the calculation is as follows. Since the river bed gradient is constant (i = 0.0135), varied flow calculation is conducted, so the varied flow water level is changing.

Table 2-2-7 Varied Flow Calculation Result

Station	Distance (m)	Discharge Q (m^3/s)	Varied Flow Water Level		Average Flow Rate (m/s)
			Flow Type	Water Level (m)	
No.1	-70.000	110	Supercritical flow	1.614	3.186
No.2(Existing Bridge)	-40.000	110	Supercritical flow	0.815	4.453
No.3(Planned point)	0.000	110	Supercritical flow	1.430	3.247
No.4	65.000	110	Supercritical flow	1.401	3.121
No.5	80.000	110	Subcritical flow	1.391	2.864
No.6	180.000	110	Subcritical flow	1.086	1.447
No.6	180.000	110	Supercritical flow	0.671	2.619
No.7	300.000	110	Supercritical flow	1.095	2.627
No.8	400.000	110	Supercritical flow	1.296	2.169
No.9	500.000	110	Subcritical flow	1.405	2.311

5) Estimated High Water Level (HWL)

The altitude of the river bed at the planned crossing point of the bridge (No.3) is 1039.50 m, and the high water surface of varied flow is 1040.93 m. Therefore, the water depth at this point is 1.43 m. The planned water depth is set out to be 1.50 m at the crossing point with the planned bridge. The planned high water level (HWL) at the planned cross section is shown below.

Elevation of River Bed: 1039.50 m

Design High Water Level: 1041.00 m

Planning Water Depth：1.50 m

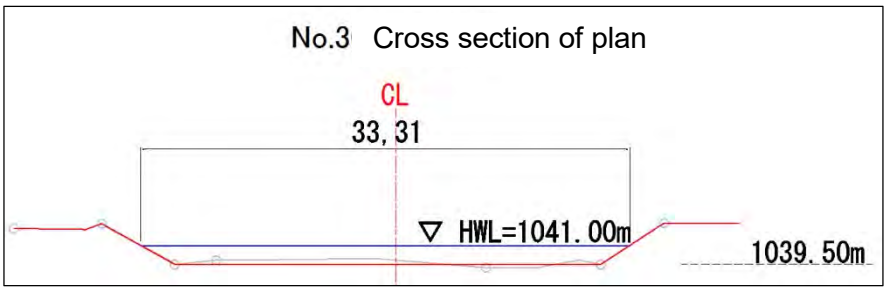


Figure 2-2-13 Planned Water Depth

6) Revetment

Revetment was planned considering river channel transition shown in chapter 2-2-2.

Left side revetment was planned along the future river way to go straight, because there is a high possibility that a river will goes straight when big flooding.

Right side revetment was planned to current position of water impact, because river will meanders left and right when small and medium flooding.

The river bed of the new left bank is set at the level of existing river bed.

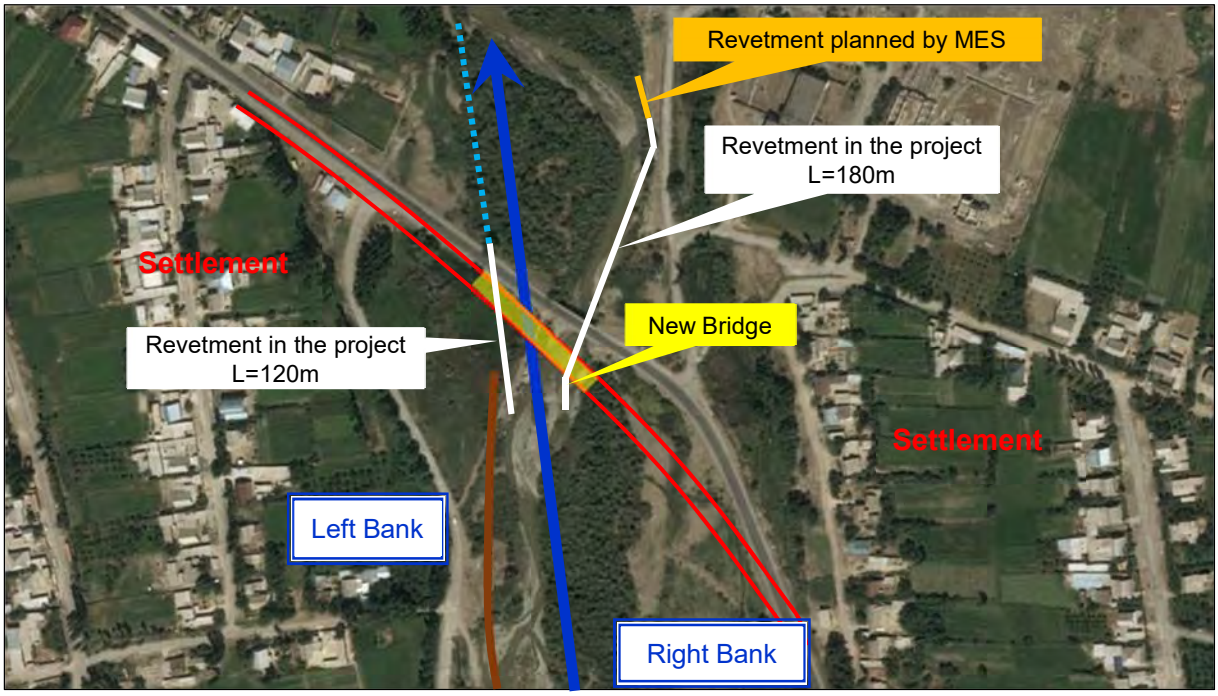


Figure 2-2-14 Project Area of Revetment

Stacking gabion, gabion, and mortal stone pitching were compared as adequate revetment types.

As a result of the comparison, gabion is selected and adopted considering its merits outlined below.

- Well-developed masonry revetment installed by MES
- No skilled workers or product factories are required
- Economical

Table 2-2-8 Comparison of Revetment

Construction method	Stacking Gabion	Gabion	Setting up stones method
			
Characteristic	● The multistage type is a construction method applied to a steep slope section with a gradient of 1:1.0 or less. It is a construction method used to protect riverbanks lower than the landside area.	● It is a construction method used for temporary revetments and transition areas to existing river banks. It is important to take countermeasures for these transition areas as well.	● When the slope gradient is lower than 1:1.5 and a rapid-flow river can not be slowed down, a construction method that uses natural stone is used.
Design flow rate	1 m/s ~5 m/s	1 m/s ~5 m/s	More than 4 m/s
Environmental characteristics	● There is no particular problem regarding to aspects such as vegetation on the slope's surface or at the water's edge, the aquatic habitat, and landscape considerations.	● There is no particular problem regarding to aspects such as vegetation on the slope's surface or at the water's edge, the aquatic habitat, and landscape considerations.	● Consideration needs to be given to vegetation on the slope's surface and at the water's edge, as well as, the habitat for aquatic life.
Workability	● Materials for revetment works are readily available. ● No special construction method is required therefore construction is easy.	● Materials for revetment works are readily available. ● No special construction method is required therefore construction is easy.	● Materials for revetment works are readily available. ● No special construction method is required therefore construction is easy.
Construction Cost	1.00	1.00	1.88
Response to this case	● Because of the ease of material availability and the low difficulty of construction, it is easy to deal with this case.	● Because of the ease of material availability and the low difficulty of construction, it is easy to deal with this case.	● Although its use is possible, this river is below the target design flow velocity.
Evaluation	● The survey team recommends this construction method from the viewpoint of the slope gradient, river design flow velocity, and environment.	● It is suitable for a section with a moderate gradient and is somewhat unsuitable for the slope gradient of this case.	● It is difficult to consider this as a construction method to adopt actively from the environmental point of view such as water circulation and restoration of vegetation.

【Height of Revetment and Embedment】

The height of the revetment is set to 2.8 m, corresponding to the installed revetment by MES. Referring to the steep stream technical guideline in Japan, it is necessary for the embedment of the revetment to be 1.0 m as a minimum. However, its minimum is set at 1.5 m considering enough depth for scouring. Therefore, the embedment is set to be 1.5 m from the bottom of the existing river bed, and the embedment depth from planned river bed is 2.2 m.

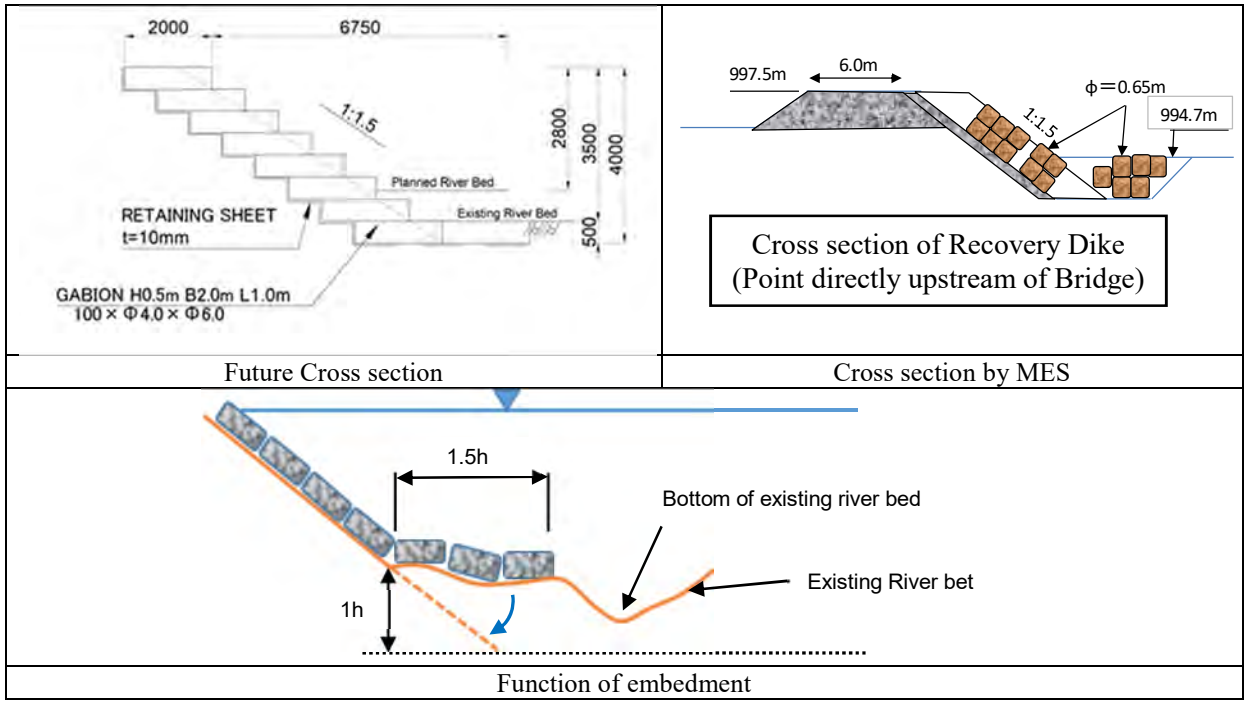


Figure 2-2-15 Cross Section of Revetment

【Crest Width】

Referring to the relationship between planned river water discharge and crest width in the table below, the crest width of the revetment is set as 3.0 m corresponding to the planned river water discharge of110 m^3/s.

Table 2-2-9 Planned River Water Discharge and Crest Width

Planned river water discharge		Crest width (m)
	less than 500	3
500 or more	less than 2,000	4
2,000 or more	less than 5,000	5
5,000 or more	less than 1,0000	6
10,000 or more		7

【Others】

Expected life spans of gabions are approximately 30 years with corrosion allowance of steel mash cage. A gabion is flexible structure, and will adopt unexpected transition of the river more or less. However, they shall be maintained and updated adequately depending on the situation.

(4) Road and Pavement Design

1) Geometry

i) Geometry Standard

As shown in Table 2-2-10, SNiP standard is basically adopted as the Geometry Standard, with some reference to the values of AASHTO and Road Structure Ordinance.

Table 2-2-10 Geometry Standard

Items		Standard Value	Adopt
Design Speed (km/h)		60	60
Minimum Horizontal Curve Radius (m)		150	150
Steepest Slope Gradient (%)		7.0	4.5
Minimum Vertical Curve Radius	Crest (m)	2,500	2,800
	Sag (m)	1,500	1,700
Maximum Super-elevation (%)		6.0	6.0
Normal Cross fall (%)		2.0	2.0
Limit Super Elevation Rate (%)		10.5	7.16

ii) Composition of Road Width

The composition of road width is decided considering integration with the values in SNiP and the IsDB project.

Carriageway: The carriageway widths of category II of SNiP are 3.75 m and 3.5 m, while that of the IsDB Project is 3.5 m; therefore, 3.5 m is adopted as carriageway width.

Shoulder: The shoulder width of bridge sections in the IsDB project is 2.0 m, so this value is adopted. On the embankment section, a shoulder protection width of 0.5 m is added to this value, so the total width is 2.5 m.

Sidewalk: A sidewalk width of 1.5 m is adopted based on Japan Road Structure Ordinance considering the standard width for two people passing at the same time in opposite directions.

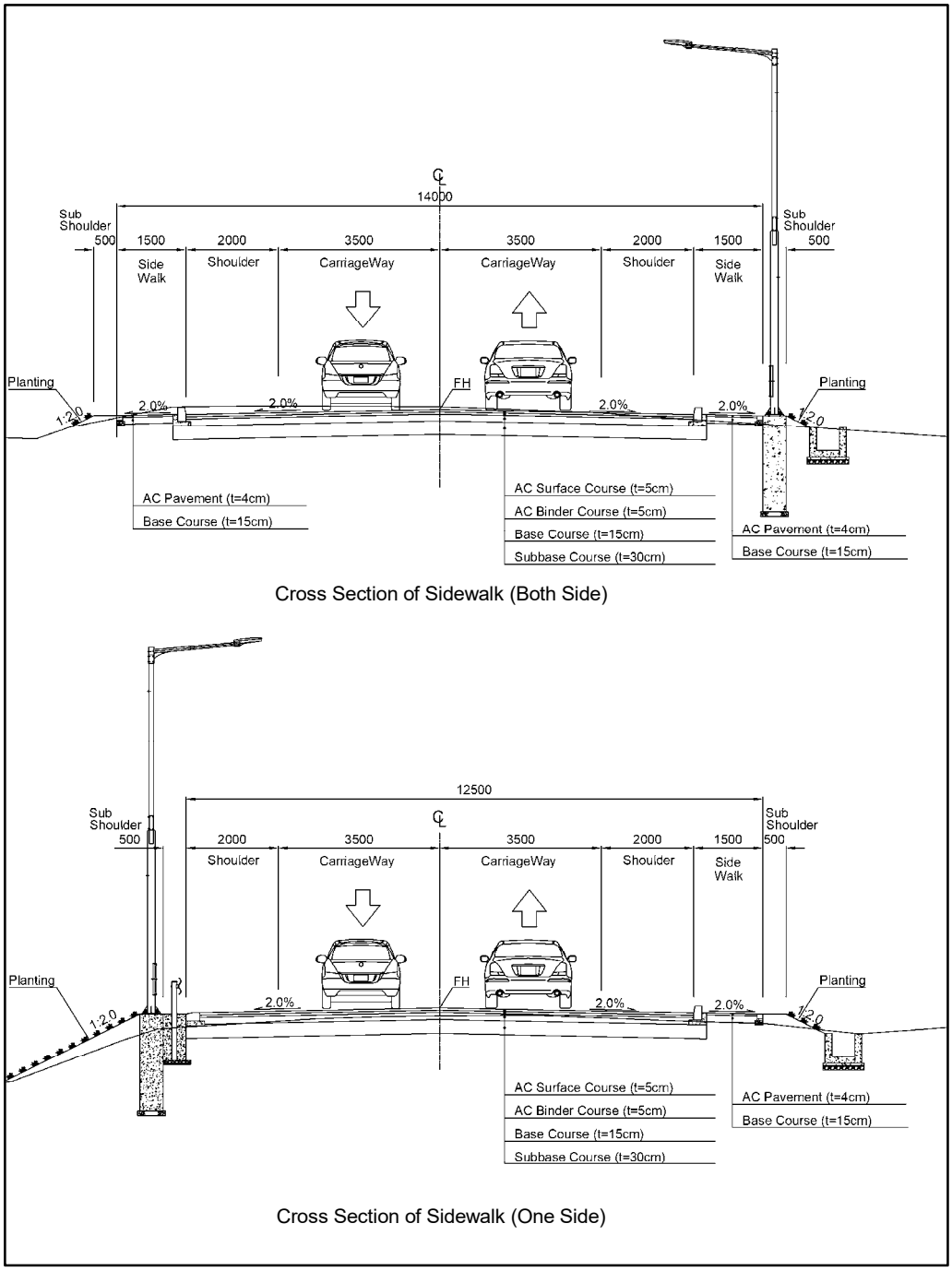


Figure 2-2-16 Typical Cross Section

iii) Sidewalk

The scope of the sidewalk is outlined below.

Sta.0+0～0+500　one side

Sta.0+500～1+200　both sides

The existing bridge has 0.7-m wide sidewalks on both sides. In the project, sidewalk width is set to 1.5 m so that two people walking in opposite directions can pass at the same time. Installation of sidewalk on both sides is planned just as in the existing condition.

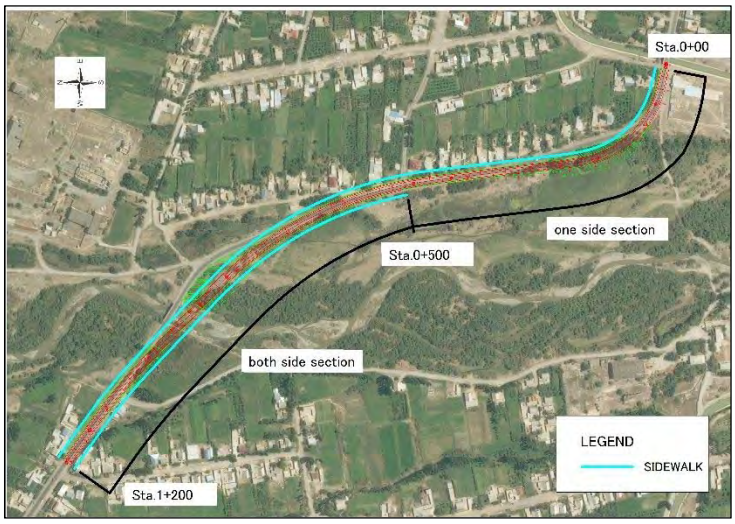


Figure 2-2-17　Location Map of Sidewalk

To have continuity between the bridge section and embankment section, the scope of sidewalk on both sides of the road are from Sta.0+500 at the middle intersection of the project to Sta.1+200 at the intersection of the end point of the project.

There are some houses on the left side of the section from Sta.0+0 to Sta.0+500. Therefore, a sidewalk will be installed only on the left side.

2) Profile

In order to avoid height differences between existing and planned roads, it was recommended to match to the height of the existing road as much as possible, and to raise the profile to keep the clearance for the future river flow (H=H.W.L + margin height + Piers beam + Girder thickness).

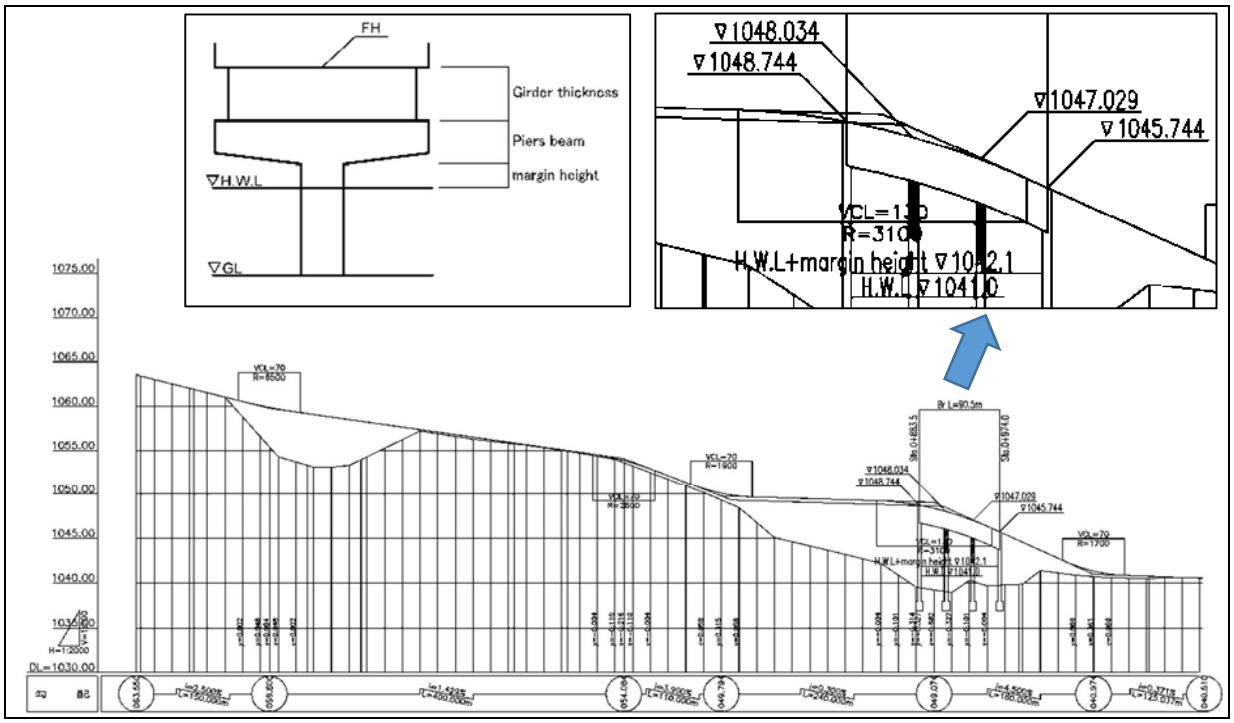


Figure 2-2-18　Profile

3) Pavement Design

i) Method of Design

Pavement design is conducted using AASHTO pavement design.

ii) Result of CBR Test

Result of CBR test for existing road bed is shown in Figure2-2-19. All of the CBR of the existing road bed and the road bed material for planned road from expected borrow pits are indicated with more than 20%. This is the reason why the soil of the existing road bed have cobble stone. The CBR of planned road bed is expected to be used 6.0% which is the general value.

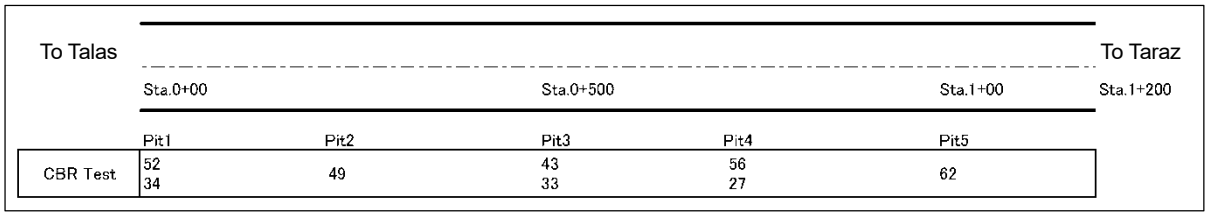


Figure 2-2-19 Result of CBR Test for Existing Road Bed

iii) Design Period and Materials

The design period is set for 10 years from 2021 to 2030 after operation. Pavement materials for roadbed, subbase, base course and surface course available at the site will be used.

Surface course and binder course: asphalt concrete

Base course: crushed stone for mechanical stabilization (CBR>80)

Subbase course: crusher-run (CBR>30)

Roadbed: soil from borrow pit and excavated soil(CBR>6)

iv) Axle Load Equivalent Factor (ALEF)

The axle load equivalent factor (ALEF) is calculated from the data obtained from the nearest weigh station.

Table 2-2-11 Axle Load Equivalent Factor

Vehicle Type	2 or 3 axles	4 or more axles
ALEF	2.378	4.286

v) Equivalent Single Axle Load (ESAL)

The equivalent single axle load (ESAL) is calculated by multiplying traffic volume of each vehicle type and the corresponding ALEF.

Table 2-2-12 Equivalent Single Axle Load (ESAL)

Category			Growth rate (%)	Future traffic volume: Sedan	Pick-up	Mini bus	Mini truck	Truck	Trailer	Total ESAL per day	Total ESAL per year
Equivalent single axial load by vehicle type				0.010	0.100	0.100	0.100	2.378	4.286		
2021	1	Year of starts		3,272	41	477	166	149	134	1,030	375,865
2022	2		4.0	3,403	43	497	173	156	140	1,076	392,863
2023	3		4.0	3,540	45	517	180	164	146	1,125	410,752
2024	4		4.0	3,682	47	538	188	172	152	1,175	428,732
2025	5		4.0	3,830	49	560	196	180	159	1,228	448,335
2026	6		4.0	3,984	51	583	204	189	166	1,285	468,864
2027	7		4.0	4,144	54	607	213	198	173	1,341	489,524
2028	8		4.0	4,310	57	632	222	207	180	1,398	510,243
2029	9		4.0	4,483	60	658	231	216	188	1,459	532,588
2030	10		4.0	4,663	63	685	241	226	196	1,523	555,900
2direction 2lane ESAL				39,311	510	5,754	2,014	1,857	1,634	12,640	4,613,666

Correction factor (1Lane , direction rate 50%)

2,306,833 (adopt)

vi) Structural Number (SN)

Structural number (SN) is calculated from ESAL using the equation below to accommodate loads above equivalent single axle load.

$$\log10(W_{18}) = Z_R \times S_0 + 9.36 \times \log_{10}(SN+1) - 0.20 + \frac{\log_{10}〔\triangle PSI/(4.2\text{-}1.5)〕}{0.40 + 1094/(SN+1)^{5.19}} + 2.32 \times \log_{10}(MR) - 8.07$$

W_{18} = predicted number of 18-kip (=8.16t) equivalent single axle load applications,
Z_R = standard normal deviate, (ZR=-1.037)
S_o = combined standard error of the traffic prediction and performance prediction,
MR = resilient modulus (psi)＝CBR×1500
ΔPSI = difference between the initial design serviceability index, p0, and the design terminal serviceability index, p1 (ΔPSI=1.7)
SN = structural number (SN=3.6)

Table 2-2-13 Condition of Pavement Design

Design Duration	10years (from year 2020 to year 2030)
ESAL	2.306×10^6
CBR of Roadbed	6%
Required SN	3.60

vii) Pavement Composition

The necessary structural number (SN) is calculated from planned pavement using the equation below.

The minimum thickness of asphalt concrete based on SNiP standards is from 6 to 7 cm for one layer, while that of Japanese standard and AASHTO is 5 cm for one layer. Pavement work and quality control will be conducted by a Japanese contractor. Therefore, the minimum thickness of asphalt concrete is set as 5 cm.

$$SN = a_1 D_1 + a_2 D_2 M_2 + a_3 D_3 M_3$$

a_1, a_2, a_3 = ith layer coefficient,
D_1, D_2, D_3 = ith layer thickness (inches), and
M_2, M_3 =ith layer drainage coefficient

Table 2-2-14 Asphalt Pavement Composition

	α	M	hickness	SN
Surface course (Dense particle size asphalt concrete)	0.440	-	5 cm	0.87
Binder course (Course particle size asphalt concrete)	0.440	-	5 cm	0.87
Base course (CBR 80%)	0.135	0.9	15 cm	0.72
Subbase course (CBR 30%)	0.108	0.9	30 cm	1.14
Total			55 cm	3.60

Pavement composition from AASHTO equation, IsDB section, and Japanese TA method are compared to check validity.

Table 2-2-15 Comparison of Pavement Composition (IsDB Section and TA Method)

	Adopted Value	Reference	
	AASHTO ESAL=2.3×10^6	IsDB Phase III	T_A Method Large Vehicle Traffic Volume 100-250 veh/day (T_A=21)
Surface course (cm)	5	5.0	5.0
Binder course (cm)	5	7.0	5.0
Base course (cm)	15	10.0	15.0
Subbase course (cm)	30	15.0	25.0

For the sidewalk pavement, a surface course of 5 cm and a base course of 15 cm are used to be consistent with the IsDB project.

【Necessity of Anti-Frost Layer】

There are three elements that cause frost on the pavement: (1) lower temperature, (2) fine grain soil, and (3) existence of high underground water and possibility of high moisture content soil. Frost on the pavement occurs when the three conditions above are met.

viii) Temperature: freezing index is more than 500°C・days

The freezing index is calculated based on meteorological data, which is 513.6 °C・days.

ix) Geology: Soil Containing Fine Particles

According to the research paper "Study on Design of Asphalt Pavement in Cold Climate" (1981, Civil Engineering Research Institute for Cold Regions), soil that contains a lot of fine grains (10% or more passing the 0.075-mm sieve and of 3% or more passing the 0.02-mm sieve) is easily affected from frost. Based on the results of the soil survey, it was found that the roadbed soil on the site has a significant amount of anti-frost soil (cobblestone sandy soil) and the 0.07-mm sieve passage amount is only 1.0 to 5.9%.

x) Water Content: the Groundwater Level is High or the Soil Water Content Ratio is High

According to above research paper, the water content of easily-frosted soil is considered to be 20%. Based on the soil survey results, the groundwater level in the area is low, and the water content ratio is from 3 to 11%.

From above, the freezing index is more than 500°C・days, but the roadbed is made up of anti-frost soil, has lower water content and a low groundwater level. Therefore, the possibility of frost on the pavement is considered to be low. Furthermore, the pavement of IsDB project

has no anti-frost layer, and the progress of weakening of roadbed bearing is considered to be slow because of the damage condition of the existing road pavement. Therefore, an anti-frost layer will not be installed.

【Necessity of Antifreeze Pavement】

Dense particle size asphalt concrete was adopted as the surface course in the IsDB project, but the special measurement for antifreeze of pavement was not conducted. This is because the height of the pile of snow is considered to be low, and the season of average temperature, which is below freezing, is around 2 months. Dense particle size asphalt concrete has few voids and less invasion of water, so freezing is unlikely to occur and influence on freezing pavement is considered to be small.

However, in this project, dense grain asphalt is adopted, but by adding more filler than usual, the number of voids in the asphalt is reduced, and freezing of the pavement is prevented. The weight mixing ratio F / A of the filler is about 1.7.

4) Traffic Safety Facility

i) Current Situation of Traffic Accidents

The fatal traffic accident data in the site is shown in Table 2-2-16.

Figure 2-2-20 Location Map for Traffic Accident

Table 2-2-16 Fatal Traffic Accidents

Date	Time	Place	Types of Accident
2017.2.25	19:20	Near 83 km Post	Crash due to changing direction
2017.1.9	10:30	Near 83 km Post	Straying onto the opposite lane
2016.3.29	20:30	Near 83.2 km Post	Drunk driving
2016.1.2	15:00	Near 83.7 km Post	Crash due to overtaking
2016.2.27	21:00	Near 82 km Post	Unknown

Based on the police report about traffic accidents, the most frequent location of fatal traffic accidents in the site is the area near the 83 km post on Talas-Taraz Road. The type of traffic accident is a crash caused by straying onto the opposite lane on the curve section. It is considered that the causes of the traffic accidents are difficulty in recognizing the curve, poor visibility of the curve, and over-speeding. As shown in Figure 2-2-21, it is difficult for drivers traveling from Talas to Taraz to recognize the curve.

Shape Curve at the Starting Point
(Direction from Talas to Taraz)

Shape Curve at the Starting Point
(Direction from Taraz to Talas)

Figure 2-2-21 Existing Condition of the Curve

The profile of the existing road indicated a downhill slope of 2.5%. This is not a steep grade, but vehicles tend to over-speed slightly.

Figure 2-2-22 Existing Road Condition near the 83 km Post

The road alignment near the post 83 km will be improved from curve radius 60 m to 150 m, which is the minimum curve radius on the design speed 60 km/h and the desirable curve radius on the design speed 50 km/h. This curve improves trafficability and traffic safety as compared to the existing road condition. However, this curve section is a black spot, so it is necessary to install the traffic safety facilities to make it easier to recognize the curve from afar and to reduce running speed.

ii) List of Traffic Safety Facilities

Common traffic safety facilities on general sections are shown below.

Table 2-2-17 Common Traffic Safety Facility on General Section

Road Safety Countermeasures	Description
Speed suppression	Make drivers feel that the road width is narrow and the driving speed faster than it actually is, and suppress speed. Give drivers information using road signs or information boards that give caution and lead to lower driving speeds.
Visual guidance	Driving performance is improved by visual guidance such as lane marking or delineator.
Prevention of lane departure	Prevent vehicles from departing outside the lane with the installation of guardrail or concrete barrier
Prevention of vehicle entry	Prevent vehicles from entering disruptively with the installation of guard post or guardrail
Shock mitigation	Shock mitigation of vehicles that depart their lane to outside the road
Night visibility	Improve visibility at night by installing lighting

Table 2-2-18 Traffic Safety Measures and Applicability for the Project

Items		Visual guidance	Speed suppression	Prevention of lane departure	Prevention of vehicle entry	Shock mitigation	Night visibility	Applicability	Remarks
Road Marking	Dot line	○	○					◎	
	Feather		○					○	
Rumble strips				○				◎	Concave Type: Effectiveness of the rumble strips was confirmed in cold areas such as USA and Hokkaido.
Hump			○					×	Inappropriate for a high-class road
Color pavement		○						△	Difficult to be maintained by MOTR
Traffic button		○						△	Obstacle for snow removal work
Traffic pole		○						△	Obstacle for grazing animals

Items		Visual guidance	Speed suppression	Prevention of lane departure	Prevention of vehicle entry	Shock mitigation	Night visibility	Applicability	Remarks
Visual guidance	Delineator	○						○	
	Feather shape reflector	○						◎	High visibility from afar compared to a delineator
Warning display board	Road sign type		○					○	
	Information board type		○					◎	High effectivity with facilitating sensor
Guardrail				○				◎	
Railing or Fence of fall prevention for vehicles and people					○	○		◎	
Cushion dram						○		○	
Crash Cushion						○		○	
Streetlight							○	◎	

◎:Very Good, ○:Good, △: Poor

iii) Traffic Safety Facility Plan

From the viewpoint of reducing fatal traffic accidents, traffic safety facility is planned while making speed suppression the first priority. Visual guidance on a curve section is expected to play the same role as speed suppression does. It means that recognition of a curve makes a driver reduce his speed, so effectively it is speed suppression.

【Speed Suppression: Caution Information Board】

As a non-structural measure, drivers will be cautioned by using a road digital information board indicating variable messages such as “caution of curve” or “caution of speed.” However, in case the said message needs to be shown every time, the effect of this device is limited and expected to function just like a road sign.

A road digital information board is facilitated by a sensor that catches a vehicle when it comes before the curve section and gives information to the driver timely, so the effect of this device is high. This device will be installed at the section between 50 m before the curve and the curve section itself in each direction.

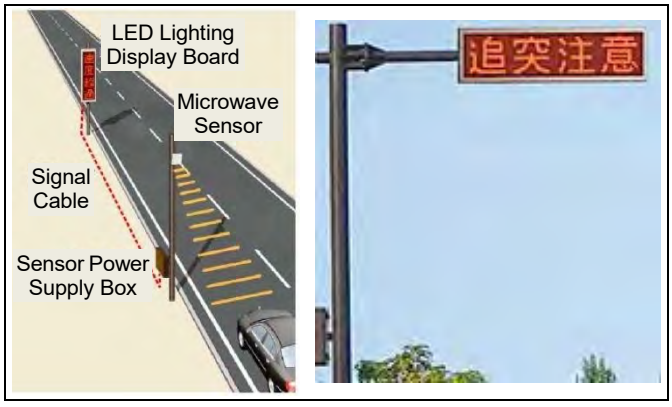


Figure 2-2-23 Caution Information Board

Table 2-2-19 Examples of Indication

Japanese	English	Kyrgyz
スピード落とせ	Slow Down	жайла
急カーブ	Sharp Curve	резкая кривая

【Visual Guidance】

As a structural measure, the installation of road dot marking is expected to suppress speed inside the outer line on the section between 20 m before the curve and the curve section itself. It would make drivers feel that the carriageway width has become narrow so they would reduce their driving speed. This road marking will be installed between 20 m before the curve radius is 150 m (where there is a clothoid element section) and curve section itself in each direction.

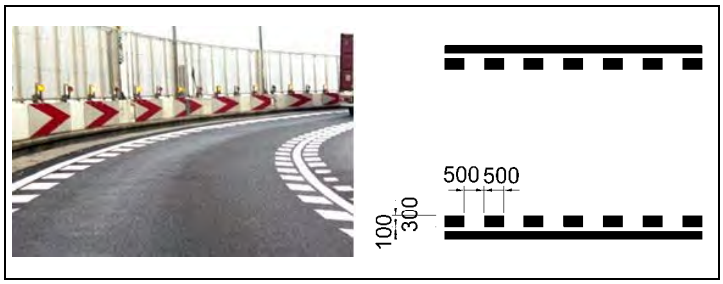


Figure 2-2-24 Road Dot Marking

【Prevention of Lane Departure: Rumble strips】

As a hard measure, install rumble strips in the shoulder and center line of curve section on road surface. When the vehicle departure from the lane, sound and vibration are generated when the tire passes over the rumble strips. It is expected that the driver will be awakened and paid attention.

The installation range is a curve section of R=150 and R=570, and it will be installed inside the curve of center line and outside the road shoulder edge lines.

Figure 2-2-25 Rumble Strips

【Visual Guidance】

Since the curve section is located on the embankment section, a guardrail is installed to prevent drivers from departing the lane and falling from the road. Moreover, a deflector-indicating arrow is planned to be installed to allow the curve to be recognized from afar and at night. It is also expected to work as a speed suppressor. Moreover, the effectiveness of the road dot marking becomes lower at night, but that of the reflector-indicating arrow does not. The deflectors will be installed on the curve section and the section with guardrails.

Figure 2-2-26　Visual Guidance and Prevention of Lane Departure for Curve Section

【Others】

Near the beginning point of the project site, where the curve starts, the road width becomes narrow due to the interaction with the existing road. There is a bridge for crossing irrigation channel and a shop. The guard rails shall be installed at this point to prevent the vehicles from lane departure. In front of the shop, guard posts will be installed to prevent lane departure and provide visual guidance. Guard posts shall be installed in front of Street light poles, road signs, etc., where sidewalk and installation of guard rail are not planned.

Guard Post

Figure 2-2-27　Other Traffic Safety Facilities

The traffic safety facilities layout is shown on the next page.

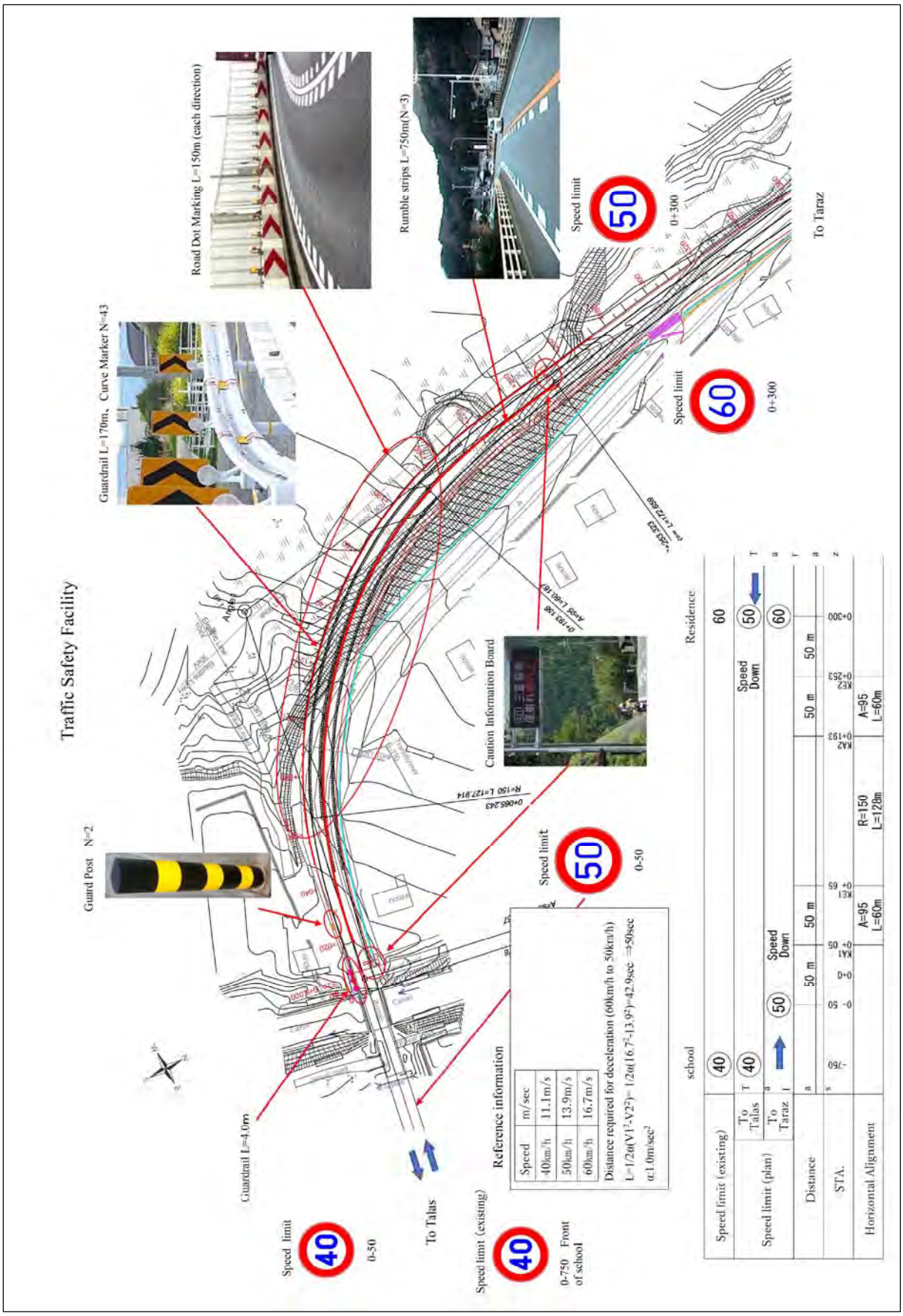


Figure 2-2-28 Layout of Traffic Safety Facilities

5) Guardrail

On the section of turning curve without pedestrian way, where the height difference between the planned road and existing land is more than 2 m, guardrails will be installed in order to prevent vehicles from departing from the lane and falling from the road. On the section with pedestrian way, where the height difference between the planned road and existing land is more than 2 m, guardrails will be installed in order to prevent the falling from the road. Also, in the bridge section and its mounting part, the post columns will be set up to prevent vehicles from departing from the lane and fallout prevention.

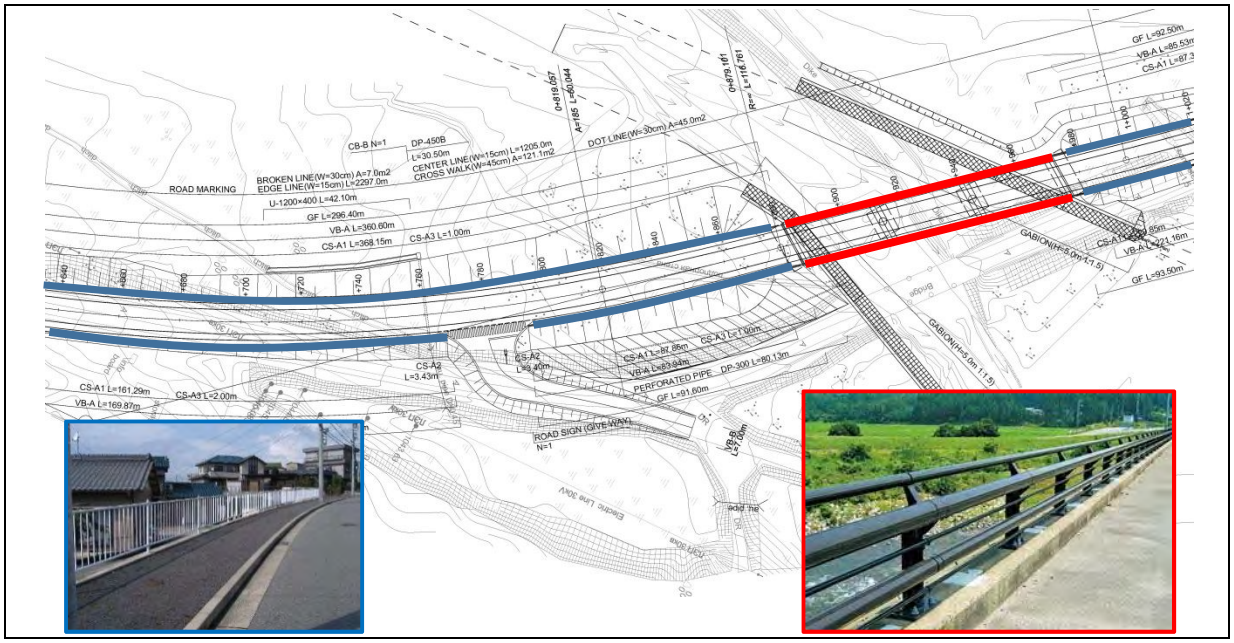


Figure 2-2-29 Allocation of Guardrails at the Bridge Section

6) Street Light

For traffic safety at night, street lights will be installed on the embankment section and the bridge section.

【Type of Light】

As a result of the comparison of light types in the table below, LED Type is adopted. The cost of a LED lamp has recently become cheaper than before, and its life expectancy is longer than others, so the life cycle cost is the cheapest among all alternatives.

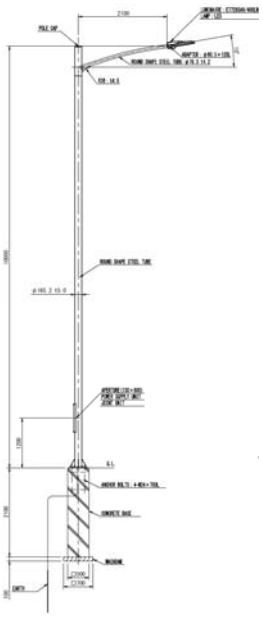
Table 2-2-20 Comparison of Street Lights

	LED Lamp (120W)	High Pressure Sodium Lamp (180W)	HID Lamp (400W)
Photo			
Life of Lamp	60,000 hours (15 years)	24,000 hours (6 years)	40,000 hours (10 years)
Lamp Cost	Higher	Cheaper	Cheaper
Maintenance	No need	Lamp needs to be replaced for around 10 years.	Lamp needs to be replaced for around 5 years.
Electricity Cost	Cheapest	Cheaper	Expensive
Life Cycle Cost	Cheapest	Cheaper	Expensive
Total Evaluation	Very Good	Good	Fair

【Height of Light】

There are street lights near the site, which are around 10-m high.

The total road width of the target road is 15 m, and the area that needs to be lit is narrow, so the light height is adopted as 15 m.



【Light Arrangement】

The total road width is not wide, so the adequate light arrangement is staggered.

【Power Supply】

The electricity cost is borne by MOTR. Necessary procedure for the introduction of electricity is conducted by MOTR as well.

7) Drainage System

Due to the adoption of a flat-type sidewalk, half of the road surface water is planned to flow into the river directly. The other half is planned to be caught by a ditch installed along the road and opposite to the river. The ditch would gather water in one place, cross under the road, and flow into the river.

Part of existing irrigation channel affected by the planned road is considered to be replaced and connected up to downstream crossing pipe culvert. Moreover, there is spring water coming from the downstream pond at station 0+820, and this water is planned to flow into the river by installing a perforated pipe and crushed stone.

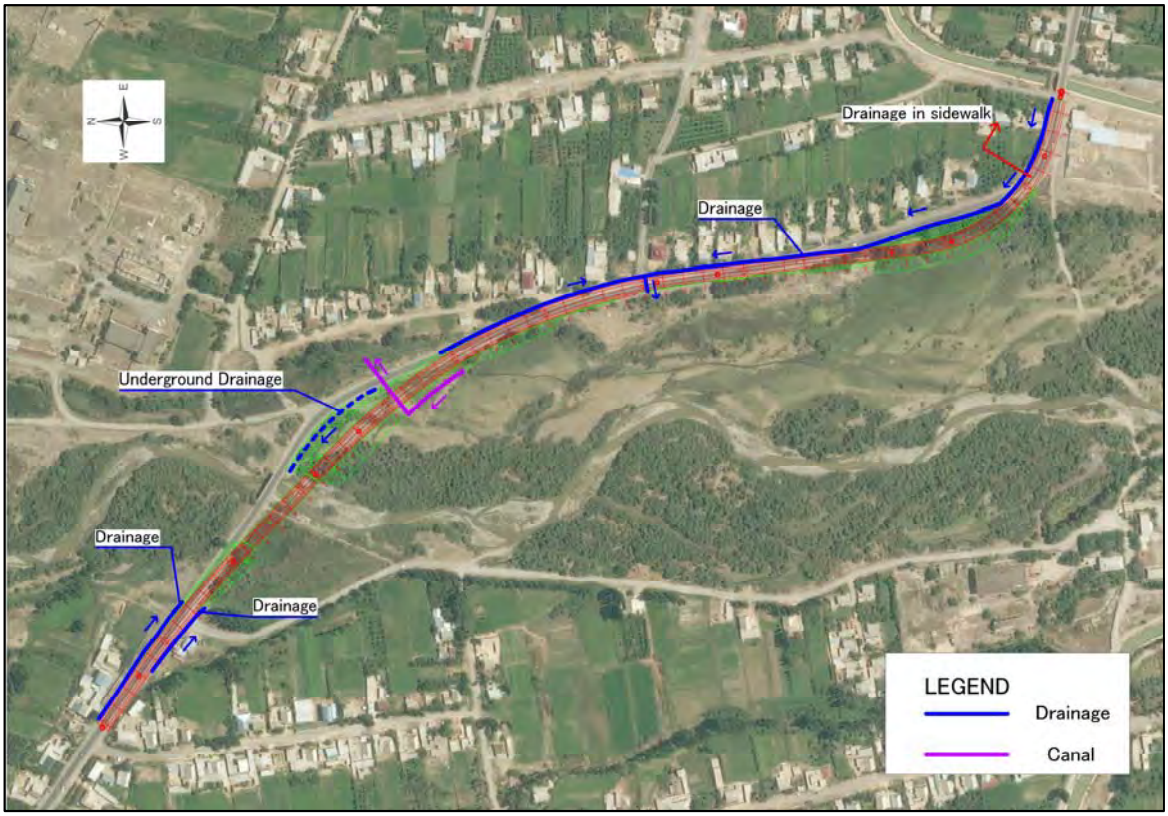


Figure 2-2-30 Drainage System

【Drainage condition】

Rainfall intensity used for the calculation of rainwater discharge is 60 mm/hr, referring to the standard rainfall intensity of Hokkaido (10-minute rainfall intensity of 3-year reoccurrence), where annual rainfall is 1100 m, and have the similar weather climate. The drainage capacity was determined by obtaining the average flow velocity through Manning formula and set a dimension capable of discharging water.

The results of the drainage calculation are shown below.

Table 2-2-21 Result of Drainage Calculation

Area	Rainwater runoff m3/s	Drainage	Drainage gradient %	Water passage area m2	Average flow velocity m/s	Displacement m3/s	80% depth of water m3/s	Judgment
Sta.0+8～0+150	0.033	U-300	2.5	0.090	2.271	0.204	0.164	OK
Sta.0+150～0+253	0.071	U-300	1.429	0.090	1.717	0.155	0.124	OK
Sta.0+253～0+425	0.094	U-300	1.429	0.090	1.717	0.155	0.124	OK
Sta.0+425～0+550	0.095	U-300	1.429	0.090	1.717	0.155	0.124	OK
Sta.0+550～0+580	0.097	U-300	3.9	0.090	2.836	0.255	0.204	OK
PIPE	0.097	ϕ450	2.512	0.122	2.513	0.307	0.245	OK
Sta.1+70～1+205	0.004	U-300	0.5	0.090	1.016	0.091	0.073	OK
Sta.1+60～1+130	0.016	U-300	0.5	0.090	1.016	0.091	0.073	OK

(5) Bridge Design

1) Design Conditions

i) Road Conditions

The cross section of the bridge is shown in Figure 2-2-31.

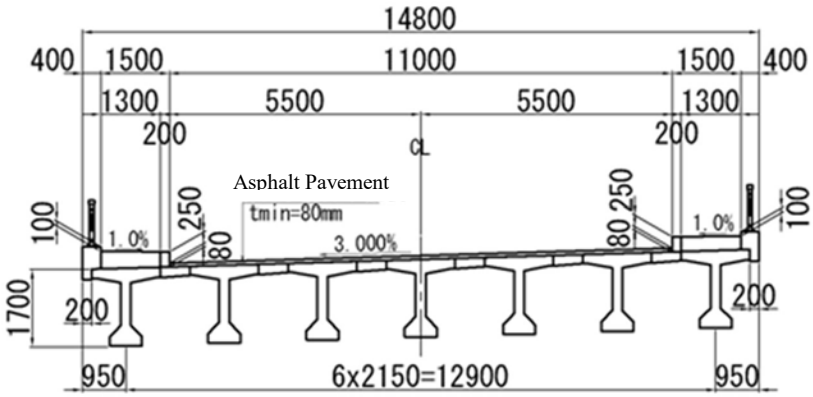


Figure 2-2-31 Cross Section of the Bridge

ii) River Conditions

- Freeboard

The freeboard, which is applied from the design discharge, is 0.6 m according to Table 2-2-22. The design discharge is estimated to be 110 m^3/s.

Table 2-2-22 Relations of Minimum Freeboard and Design Discharge

Item	1	2	3	4	5	6
Design Discharge (m^3/s)	Less than 200	200~less than 500	500~less than 2000	2000~less than 5000	5000~less than 10000	More than or equal 10000
Freeboard (m)	0.6	0.8	1.0	1.2	1.5	2.0

Source: Government Ordinance for Structural Standards for River Administration Facilities

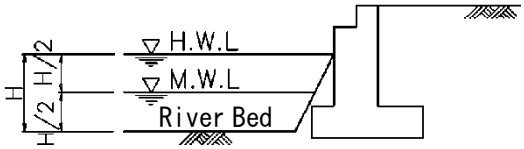
On the other hand, a lot of sand, stones, and driftwoods have been brought from the upstream side during snowmelt floods due to the approximately 1/100 profile of the river. Moreover, a considerable amount of sand and stones have accumulated around the bridge due to finishing the steep river profile surrounding area of the bridge. Such a situation occurs in "Sabo River," which is defined as a river with a river profile of 1/100 or more river profile river in the Sabo Technical Standards of Japan.

The Sabo Technical Standards of Japan requires a 0.5-m margin from a design freeboard level to secure a freeboard after sand and stone accumulation, as well as to secure a passing clearance of driftwoods under the superstructure.

Therefore, the height from the design water level to under the superstructure is set as 0.5 m + 0.6 m = 1.1 m.

iii) Design Water Level

The design water level for designing the substructure has to comply with Bridge Design Handbook of MILT in Japan as shown in Figure 2-2-32. MWL is applied in seismic conditions, while HWL is applied in the other conditions.



Source: Bridge Design Handbook of MILT in Japan

Figure 2-2-32 Design Water Level

iv) Geotechnical Condition

A geotechnical survey was conducted. The items of the geotechnical survey are shown in Table 2-2-23.

Table 2-2-23 Summary of Geological Survey

Items	Units	Quantities	Note
Machine Boring	Nos.	5	Planning points of Substructures: 4 Planning area of Embankment: 1
Standard Penetration Test	Nos.	85	
Physical Test	Set	19	Consolidation, Water Content Ratio, Liquid/Plasticity Limits, Particle Size Distribution
CBR Test	Nos.	5	

The pile foundation is selected since the depth of bearing layer is 7~10 m as follow considerations.

- The soils distributed in this area are classified by the observation and the laboratory test. This area is structured by 3 layers, from top to bottom: topsoil, silty sand and gravel, and sand with gravel. The geological longitudinal profile is shown in Figure 2-2-33.
- First layer: Topsoil. Silty soil. Depth from the ground surface is approximately 2 m.
- Second layer: Silty soil and gravel. Thickness is approximately 10 m. This layer is not considered as a good bearing layer since almost all N values are over 50 (caused by the existence of gravel), while some N values are under 10.
- Third layer: Sandy soil with gravel. Depth from the ground surface is 7~10m. The bearing layer.

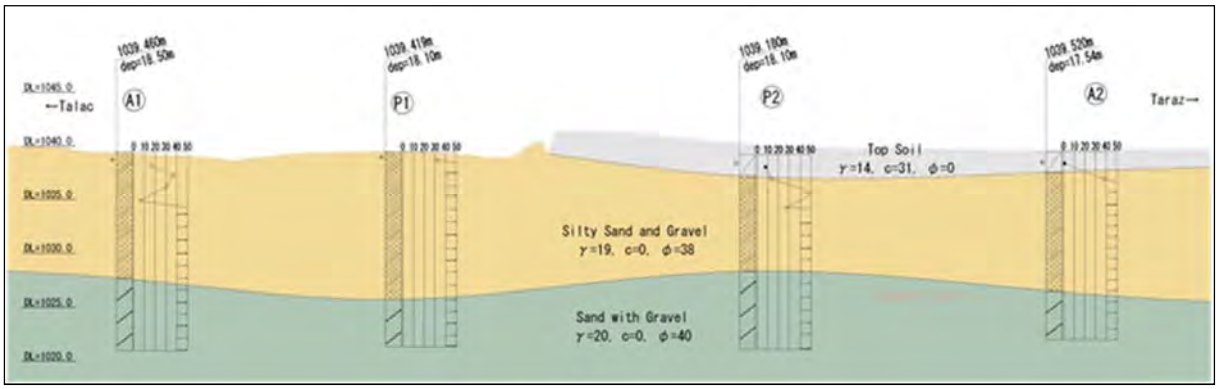


Figure 2-2-33 Geological Longitudinal Profile

v) Seismic Condition

According to SNiP, seismic conditions in Kyrgyz are as follows;

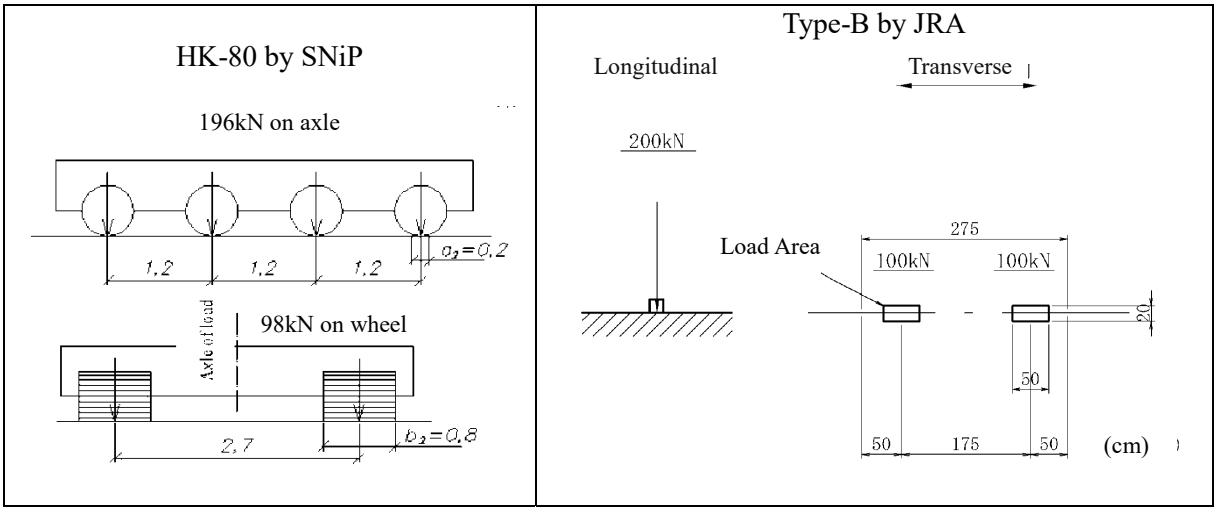
- The Peak Ground Acceleration (PGA) of almost all earthquakes were less than 50 gal; an earthquake with over 100 gal occurred only once (2nd of November 1946, 132 gal) in the past 100 years

- Talas is in an area with a design earthquake scale under magnitude 6.5, and there were no records of over 100 gal in case of magnitude 6 scale.

Therefore, the horizontal acceleration coefficient is adopted 0.1 as 100 gal.

vi) Live Load

Type-B is applied as design live load based on the result of a comparison study between HK-80 of SNiP and Type-B of JRA. The sectional force of girders by Type-B is bigger than by HK-80. Diagrams of live load are shown in Figure 2-2-34.



Source: SNiP and JRA

Figure 2-2-34 Design Live Load Diagrams

vii) Other Loads

Other loads of bridge design are shown in Table 2-2-24.

Table 2-2-24 Other Loads

Effect of Temperature Change	15°C (Range of Temperature Change)
Snow Load	1.0kN/m^2

viii) Materials Specification

Specification of concrete is shown in Table 2-2-25, Specification of reinforcing steel bar is shown in Table 2-2-26.

Table 2-2-25 Specification of Concrete

Classification	Compressive Strength (N/mm^2)
Plain Concrete	18
Reinforced Concrete	24
Column/Beam of Pier, Crossbeam of Superstructure	30
Cast in Placed Concrete Pile	30 *1
Girder	30

*1: Design strength is 24 N/mm^2

Source: JRA

Table 2-2-26 Specification of Reinforcing Steel Bar

Classification	Strength (N/mm^2)
SD345	Yield Point=345-440, Tensile Strength=490

Source: JRA

2) Bridge Length

i) Setting of Abutment

The bridge length is controlled by the position of abutments, which is controlled by the improvement plan of the dike as shown in Figure 2-2-35. Abutments are set back 30 cm or more from the shoulder of the planned revetment. Therefore, the position of A1 abutment is STA.883.5, that of A2 abutment is STA.974.0, and the bridge length is 90.5 m as shown in Figure 2-2-36.

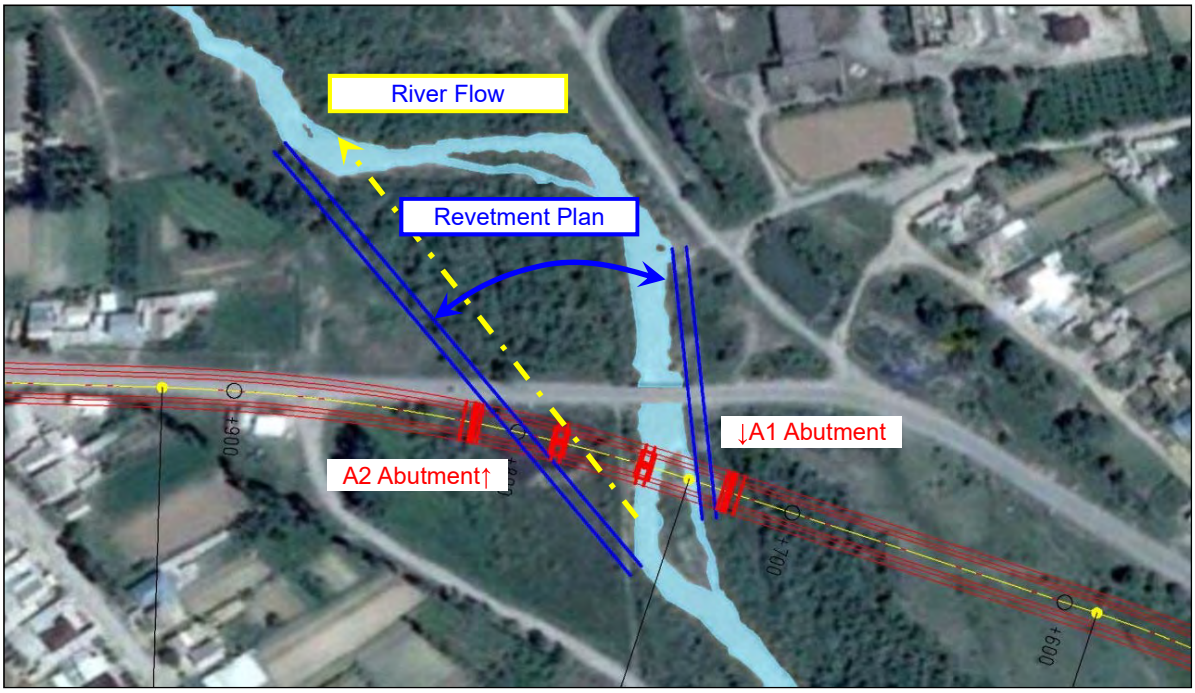


Figure 2-2-35 Improvement Plan of Dike

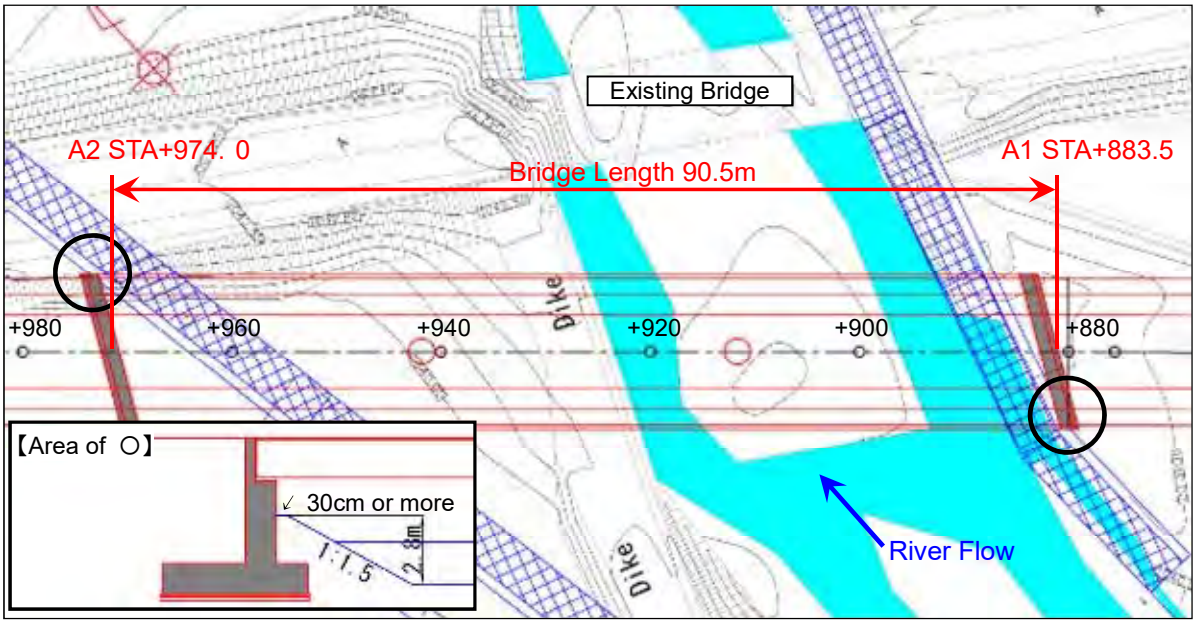


Figure 2-2-36 Location of Abutments and Bridge Length

ii) Minimum Span Length

The minimum span length, which is the distance between substructures, is set based on the "Government Ordinance for Structural Standard for River Administration Facilities" of Japan (hereinafter referred as "Structural Standard for River").

The existing bridge has been damaged by snowmelt floods, but the area along the dike do not have any damages because of the following conditions,

- The flood discharge 110 m^3/s is small,
- The river width at the existing bridge is 14.7 m, and
- The flood water level from the river bed is approximately 1.5 m, and the level of the river bed is lower than the level of the area along the dike.
- Therefore, the impact of snowmelt flood on the area along the dike is low, and the minimum span length is considered in Table 2-2-27.

Table 2-2-27 Minimum Span Length of Low Flood Impact Rivers

Design Discharge (m3/s)	Less than 500	Less than 500	500 or more Less than 2000
River Width (m)	Less than 30	30 or more	—
Minimum Span Length (m)	12.5	15	20

Source: Government Ordinance for Structural Standard for River Administration Facilities

On the other hand, the new bridge is planned at a 40 degrees angle with the river, and the minimum span length should be ensured at 90 degrees angle with the river. Therefore, the span length of the bridge should be more than 23.3 m (=15 m / sin 40 degrees) as shown in Figure 2-2-38.

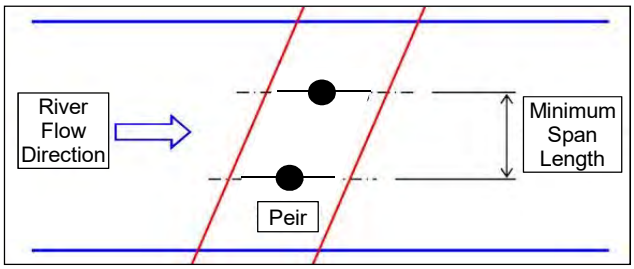


Figure 2-2- 37 Span Length in Oblique Bridge

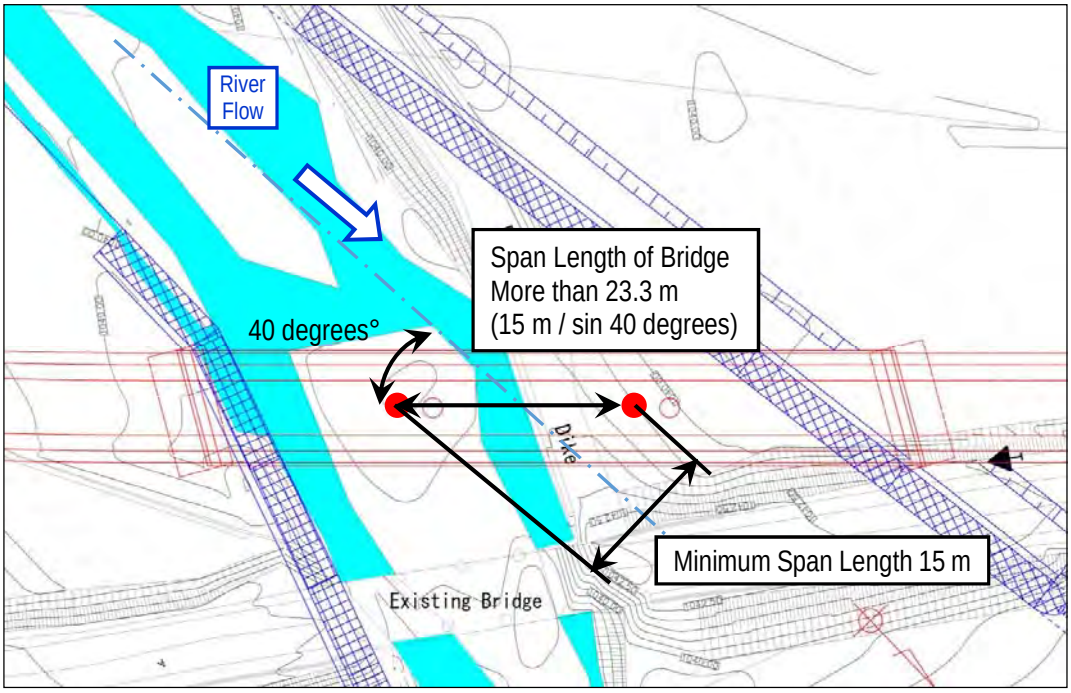


Figure 2-2-38 Span Length of Bridge

3) Superstructure

i) First Comparative Study of Superstructure Types

The first comparative study of superstructure types was carried out based on span arrangements since superstructures have a standard span length for each one.

Alternative plans of span arrangement of the bridge length which is more than 90.5m are as follows;

- 1-Span : 90.5 m,
- 2-Spans : 2 @ 45.25 m = 90.5 m,
- 3-Spans : 3 @ 30.17 m = 90.5 m, and
- 4-Spans : 4 @ 22.63 m = 90.5 m (This arrangement plan is omitted since the span length is less than the minimum span length of bridge 23.3 m).

The first comparative study of superstructure types is shown in Table 2-2-28.

Table 2-2-28 First Comparative Study of Superstructure Types

Span Arrange-ment	Type of Superstructure	Constructability	Impact on River Flow	Maintenance Aspect	Cost (Ratio)	Evaluation
1 Span	Steel Arch/Truss 	- Crane erection with the installation of a stage/bent in the river is needed.	- No installation of piers in the river.	- Periodical Re-paint by Kyrgyz is necessary.	2.78	Negative
2 Spans	Steel Plate Girder 	- Crane erection with the installation of stage/bent in the river is needed.	- One pier is installed in the center of the river.	- Periodical Re-paint by Kyrgyz is necessary.	1.25	Negative
	PC Box Girder 	- Fixed Support is installed whole of river width.	- One pier is installed in the center of the river.	- Long life materials are used (PC).	1.33	Negative
3 Spans	Steel Plate Girder	- Crane erection with the installation of stage/bent in the river is needed.	- Piers are not installed in the center of the river.	- Periodical Re-paint by Kyrgyz is necessary.	Approximately 1.0	Positive
	PC Component Girder	- Erection girder method without installation of stage/bent in the river is applied.	- Piers are not installed in the center of the river.	- Long life materials are used (PC).	Approximately 1.0	Positive
	PCT Girder	- Erection girder method without installation of stage/bent in the river is applied. - Girder profile is lower than other 3-Span types	- Piers are not installed in the center of the river.	- Long life materials are used (PC).	Approximately 1.0	Positive

The three superstructure types with 3-span arrangement were selected for the second comparative study of superstructure types due to the following reasons;

- The cost of construction and maintenance 1-Span plan is most expensive,
- The impact on river flow of 2-span plans, which provide one pier in the center of the river, is not good,
- The girder height of the 2-span plans needs longer approach roads than other span plans, and
- The cost of construction and maintenance of 3-Span plans is cheaper than other plans.

Therefore, the second comparative study of superstructure types will consider the following alternatives:

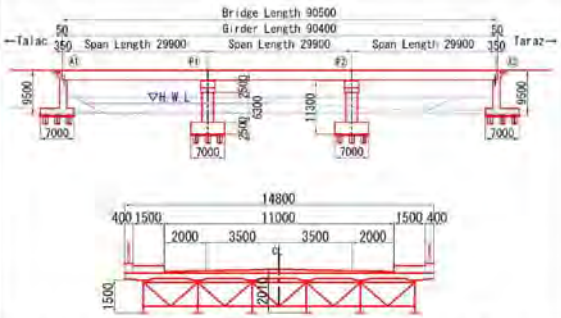
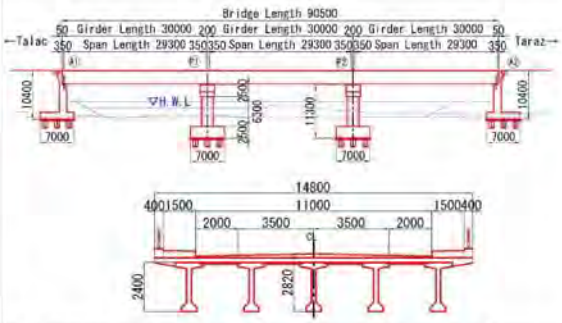
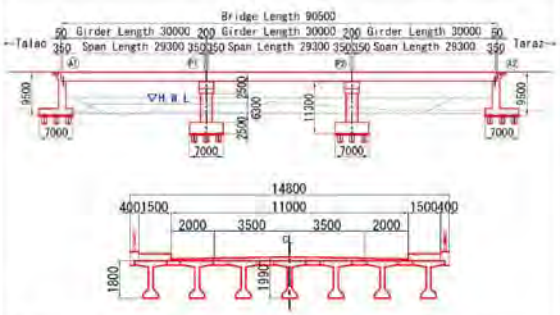
Alternative 1 : 3-Span Continuous Steel Plate Girder Bridge
Alternative 2 : 3-Span Continuous PC Component Girder Bridge
Alternative 3 : 3-Span Continuous PC T-Shape Girder Bridge

ii) Second Comparative Study of Superstructure Types

The second comparative study based on three alternative superstructure types is carried out on Table 2-2-29. The “3-Span Continuous PC T-Shape Girder Bridge” is selected for the following reasons:

- Cheapest superstructure type among all types,
- Maintenance cost is cheap, and
- Girder erection works can be carried out without provision of stage/bent in the river.

Table 2-2-29 Comparison of Bridge Types (Secondary Selection)

	Alternative-1 3 Spans Continuous Steel Plate Girder Bridge		Alternative-2 3 Spans Continuous PC Component Girder Bridge		Alternative-3 3 Spans Continuous PC T-Shape Girder Bridge	
Side View Cross Section						
Road and Traffic	- Girder height is low. Profile of the road can be planned with a gradual slope. Therefore, pedestrians walk easily, and length of the slope become shorter.	Positive	- Girder height is high. Since the profile gradient of the road is steeper than other alternatives, pedestrians do not walk easily.	Negative	- Girder height is low. Profile of the road can be planned with a gradual slope. Therefore, pedestrians walk easily, and length of the slope become shorter.	Positive
Structural Feature	- The structural scale of Substructure/foundation is smaller due to light weight superstructure.	Positive	- The profile from bottom of girder to road surface is highest than other alternatives and the heightening length of the approach will be longest.	Negative	- Profile from bottom of girder to road surface is lowest than other alternatives and lthe heightening length of the approach will be shortest.	Positive
Erection Methodology	- The crane erection is applied and this method requires the installation of stage/bent in the river.	Negative	- The erection girder method without the utilization of the river area is applied.	Positive	- The erection girder method without the utilization of the river area is applied.	Positive
Construction Period	Approximately 13 Months	Negative	Approximately 11 Months	Neutral	Approximately 11 Months	Neutral
Maintenance Aspect	- Periodical Re-paints by Kyrgyz is necessary.	Negative	- The utilization of prestressed concrete makes high durability structures.	Positive	- Routin maintenance work is necessary. But the structure is relatively simple and the visual investigation is easy. -The utilization of prestressed concrete makes high durability	Positive
Cost (Ratio)	1.050	Negative	1.018	Neutral	1.000	Positive
Evaluation					Recommend	

4) Substructure

i) Embedding Depth

The embedding depth of substructures is planned based on "Structural Standard for River" as shown in Figure 2-2-39.

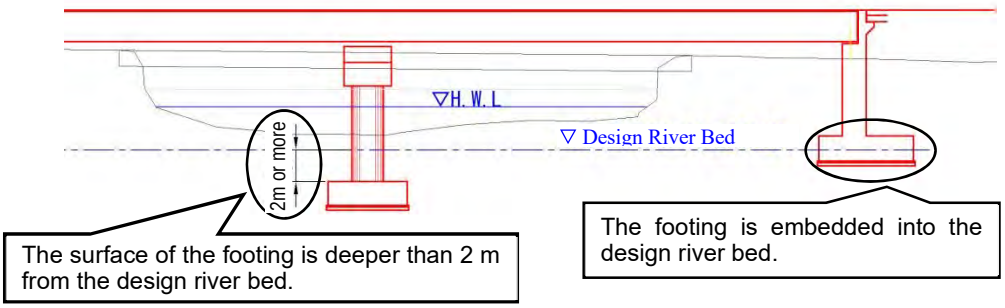
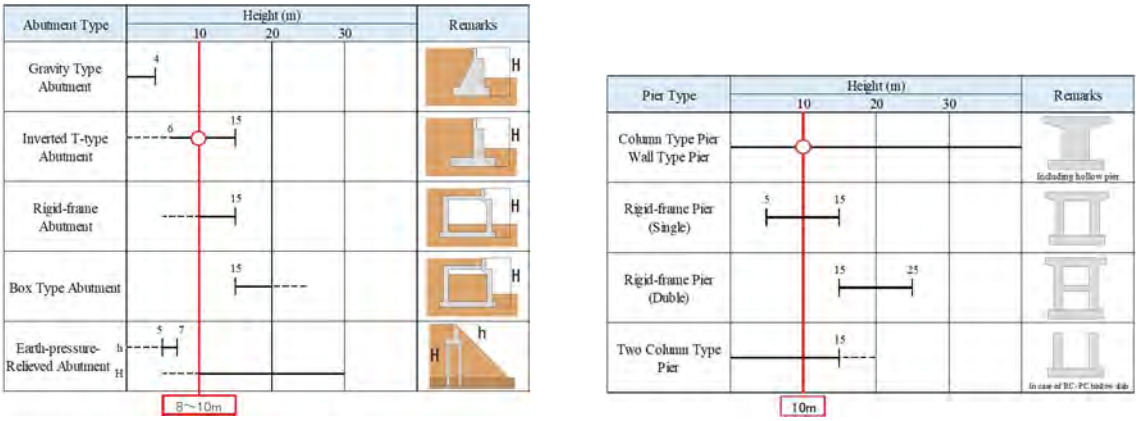


Figure 2-2-39 Embedding Depth of Substructures

ii) Type of Substructure

According to Figure 2-2-40, "Inverted T-Type" was selected as the structural type of abutments, while "Column/Wall Type" was selected as the structural type of piers are selected given that 8~10-m high abutments and approximately 10-m high piers are planned.



Source: Planning manual, MLIT, JAPAN

Figure 2-2-40 Applicable Height of Substructures

5) Examination of Pier Type

i) Adoption of Column Pier

The column pier is adopted for the following reasons;

- The skew of longitudinal directions of the bridge and the river flow is approximately 40 degrees,
- The minimum skew angle of typical superstructures is approximately 75 degrees. The column pier, which connects the girder support beam at 75 degrees, can be adopted for typical superstructures,
- There are different directions of river flow from low to high discharge due to the difference in directions of the low water channel and the dike, and
- The utilization of the column pier prepares for the transition to a low water channel.

ii) Diameter of Pier Column

The diameter of pier column is studied based on the structure analysis. The items of

consideration are as follows;

- The structural stability should be ensured,
- The column pier's reinforcement steel bar and PC cable of the girders support beam can be arranged in the installation area in the girders support beam,
- The inhabitation rate based on "Structural Standard for River" is 7% or less, and
- The procurement of concrete and reinforcement steel bar is feasible.

The results of the study as shown in Table 2-2-30. A diameter of 3.0 m is recommended.

Table 2-2-30 Study of Diameter of Pier Column

Case	Diameter of Column	Inhibition Rate	Strength of Concrete	Diameter of Reinforcement Steel Bar	Evaluation
1	2.5 m	5.5% < 7%	30 N/mm^2	D 51	- D51 reinforcement steel bar will be imported from Japan. - 30 N/mm^2 concrete is not standard for substructures.
2	3.0 m	6.6% < 7%	24 N/mm^2	D32	- Recommended - D32 reinforcement steel bar can be procured in Kyrgyz. - 24 N/mm^2 concrete is standard for substructures.

iii) Structure Type of Girder Support Beam of Pier

A prestressed concrete structure is applied for the girder support beam of the pier because the span of the beam is more than 6 m.

In the case of the reinforced concrete structure shown in Figure 2-2-41, an approximately 14-m high pier is needed, and an increase of construction is expected due to the undesirable influences listed as follows;

- The road profile rises by approximately 2.5 m, and the heightened road is longer,
- All heights of substructures and numbers of piles are increased, and
- The diameter of the pier column is increased.

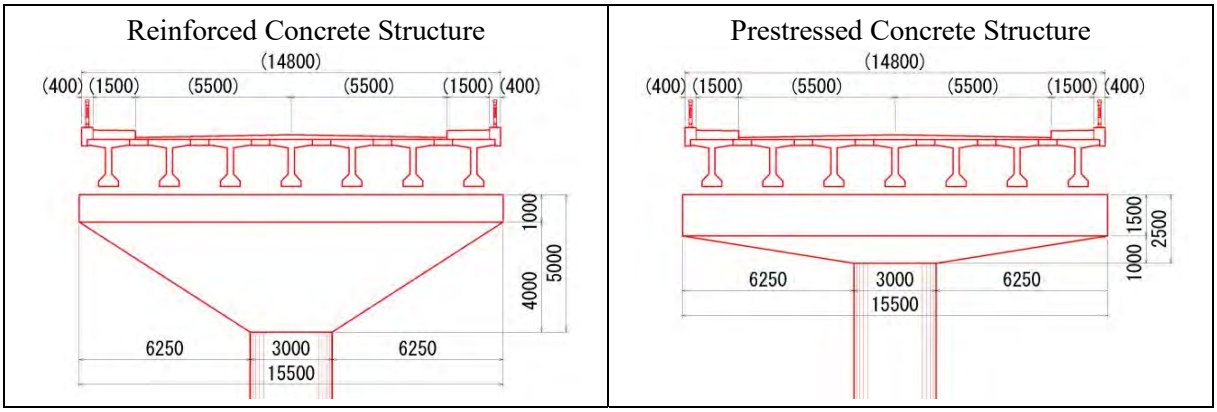


Figure 2-2-41 Structure Type of Girder Support Beam

6) Pile Foundation

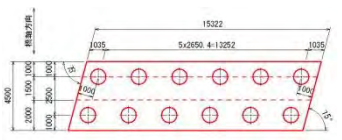
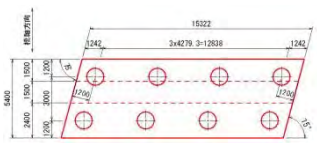
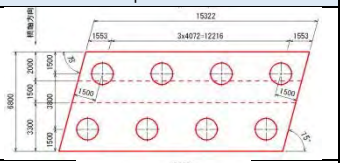
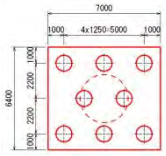
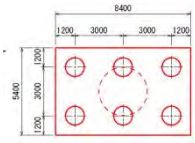
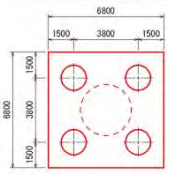
The cast in place concrete pile with rotary all casing is selected due to the following reasons;

- There are gravels with diameters of 10 cm or more from the ground surface to the bearing layer,

- Piles are made from local materials (concrete and reinforcing steel bar), and
- The bearing layer is confirmed by visual observation of the discharged soil.

The 1.2-m diameter pile is selected based on cost as shown in Table 2-2-31.

Table 2-2-31 Cost of Pile Foundation

	φ1.0m	φ1.2m	φ1.5m
Abutments			
Piers			
Cost (Rate)	1.13	1.00 (Recommended)	1.22

7) Methodology of Girder Erection

The erection girder method for girders erection is selected due to the following reasons;

- The girder casting/stockyard is provided on the approach road, which is at the same level of the bridge surface,
- In the case of a crane erection, a temporary girder casting/stockyard is provided outside of the approach road and the installation of a temporary stage on the river is needed, and
- The erection girder method is unaffected by snowmelt flood.

8) Other Accessories

Other accessories are listed in Table 2-2-32.

Table 2-2-32 List of Accessories of Bridge

Item	Content
Railing	Strength: To protect vehicles a falling from the bridge (Type A of Japan standard) Height: To protect pedestrians from falling from the sidewalk (H=1.1 m from surface of the sidewalk)
Bearing	Rubber type
Expansion joint	Rubber type
Approach slab	L=4.8m, W=11.4m
Pavement	Asphalt; Carriageway t=8cm, Sidewalk t=3cm
Drainage	Vertical pipe 

9) Maintenance

Target life span of superstructure and substructure of bridges are generally 100 years on the assumption of conducting appropriate maintenance. Life span of joints and bearings of the bridge are approximately 25 years and 100 years respectively. Replacement of them shall be conducted adequately.

- Procedure of replacement of bridge joints

  Removal of existing joints(cutting AC pavement, chipping, etc.) ⇒ Installation of new joints (setting joints, concrete placement. etc.)

- Procedure of replacement of bridge bearing

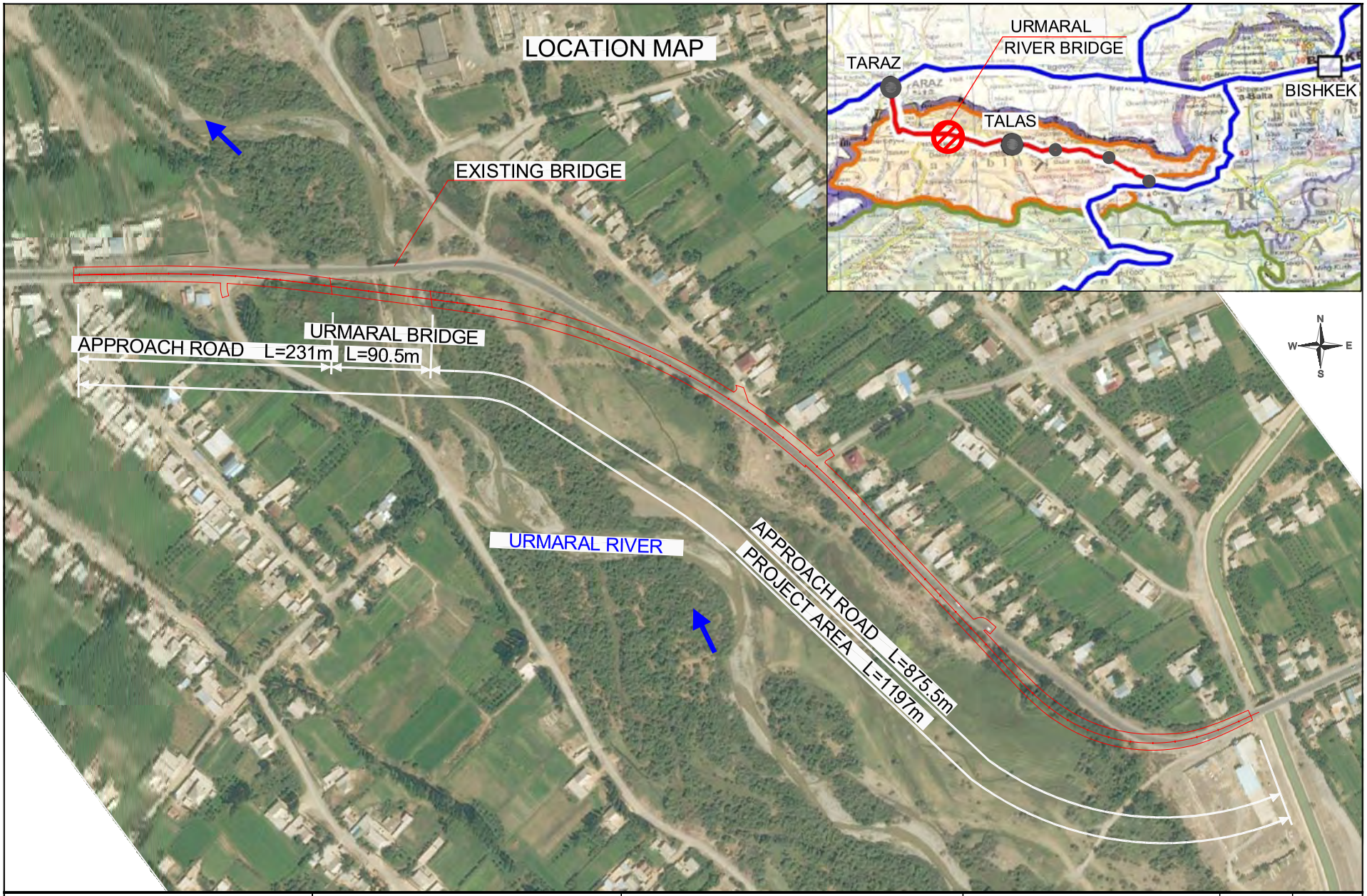
  Jacking up girders ⇒ Removal of existing bearing ⇒ Anchoring rebars ⇒ Installation of new bearing ⇒ Jacking down girder

2-2-3 Outline Design Drawings

Outline design drawings are presented from next page, and contents of the drawings are summarized in Table 2-2-33.

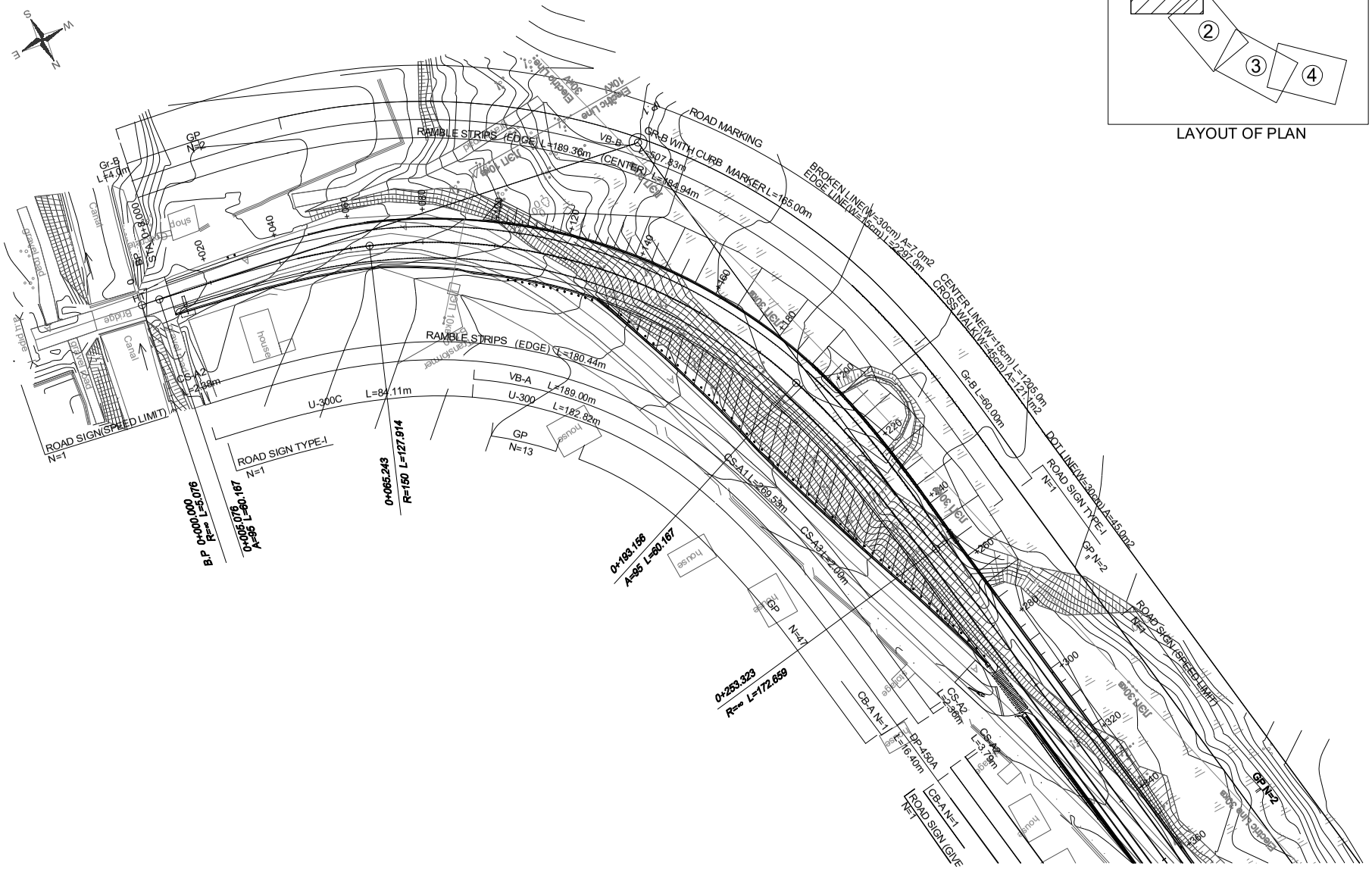
Table 2-2- 33 Contents of the Outline Design Drawings

Title of the Drawings	Number of the Drawings
Location Map	LM-01
Typical Cross Sections	TC-01
Key Plan	KP-01~02
Plan	PL-01~10
Profile	PR-01~06
Intersection Plan	IS-01~04
Curb Stone	CU-01~03
Drainages Structure	DR-01~03
Bus Stop	BS-01
Access Way	AC-01~02
Guard Fence	GF-01
Road Marking	RM-01
Road Sign	RS-01~02
Street Lighting	SL-01
Traffic Signal Plan	TS-01~05
Detail of Traffic Signal	TS-01~05
Hand Hole	HH-01



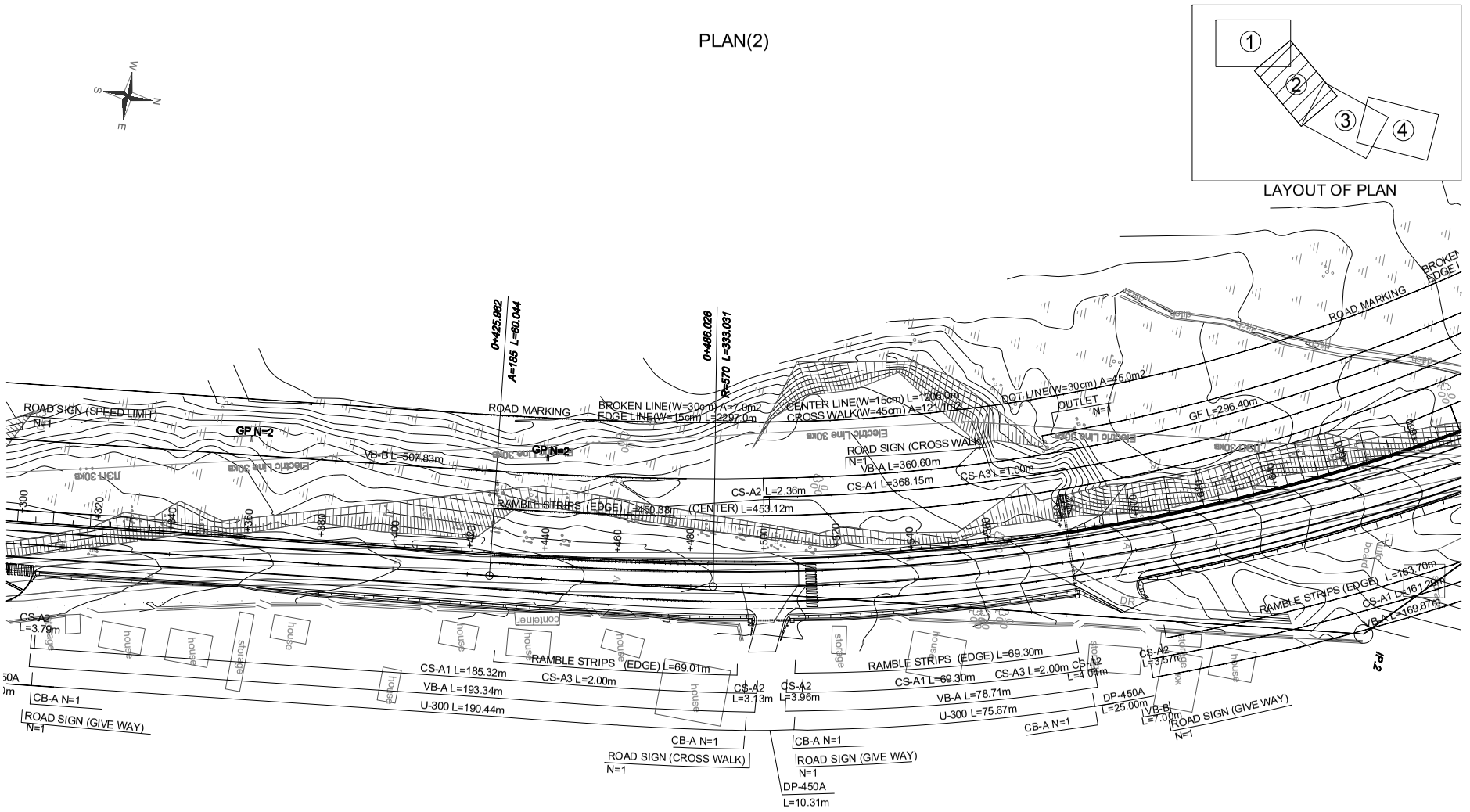
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : LOCATION MAP	Drawing No.	LC-01
				SCALE	1:3000
				DATE	MAR. 2018

PLAN(1)

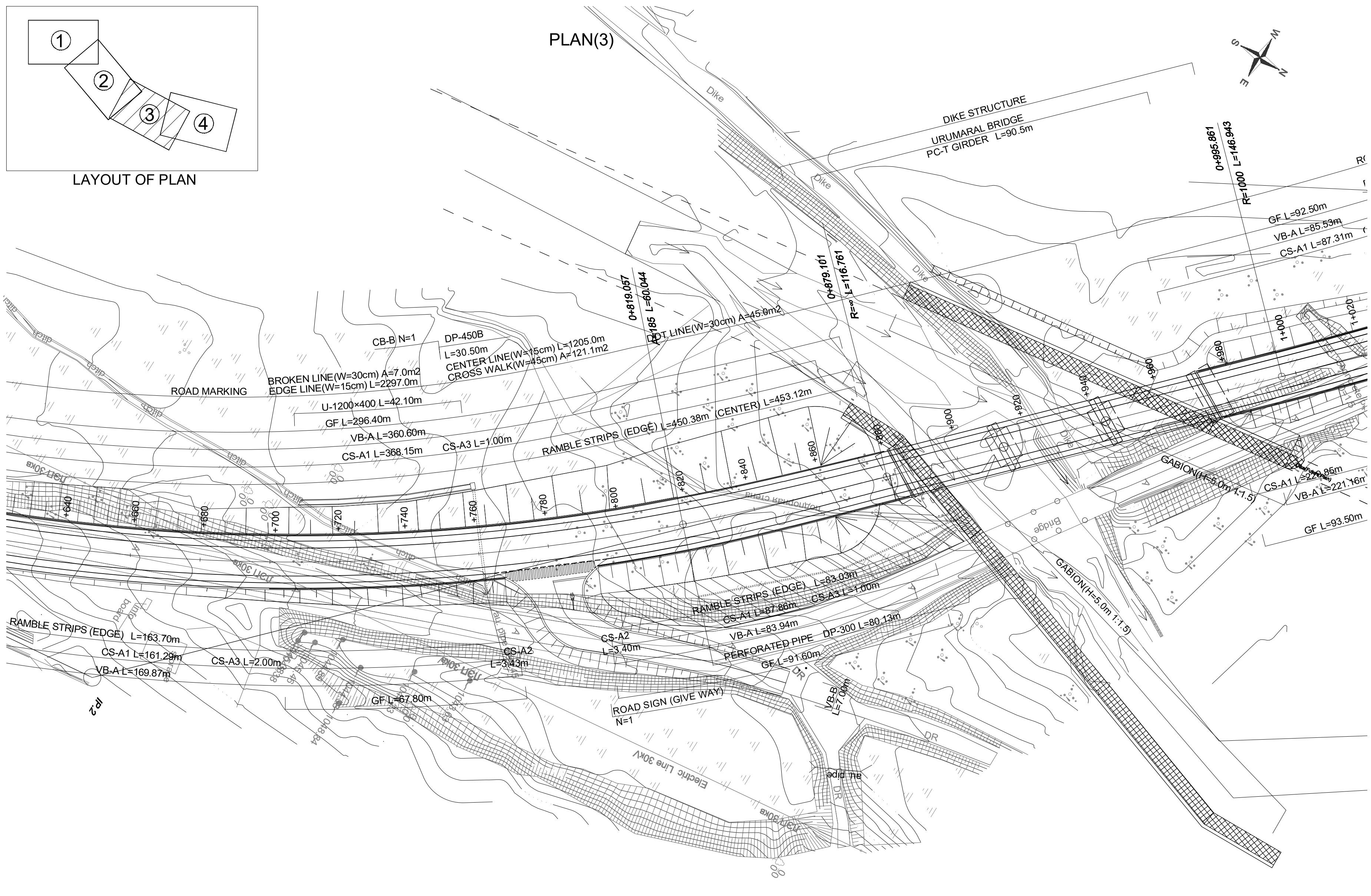


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : PLAN(1)	Drawing No.	PL-01
				SCALE	1 : 1000
				DATE	MAR. 2018

PLAN(2)

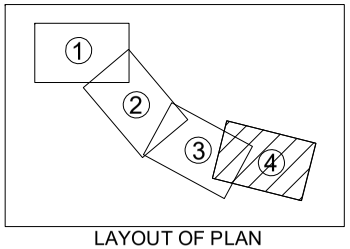


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : PLAN(2)	Drawing No.	PL-02
				SCALE	1 : 1000
				DATE	MAR. 2018

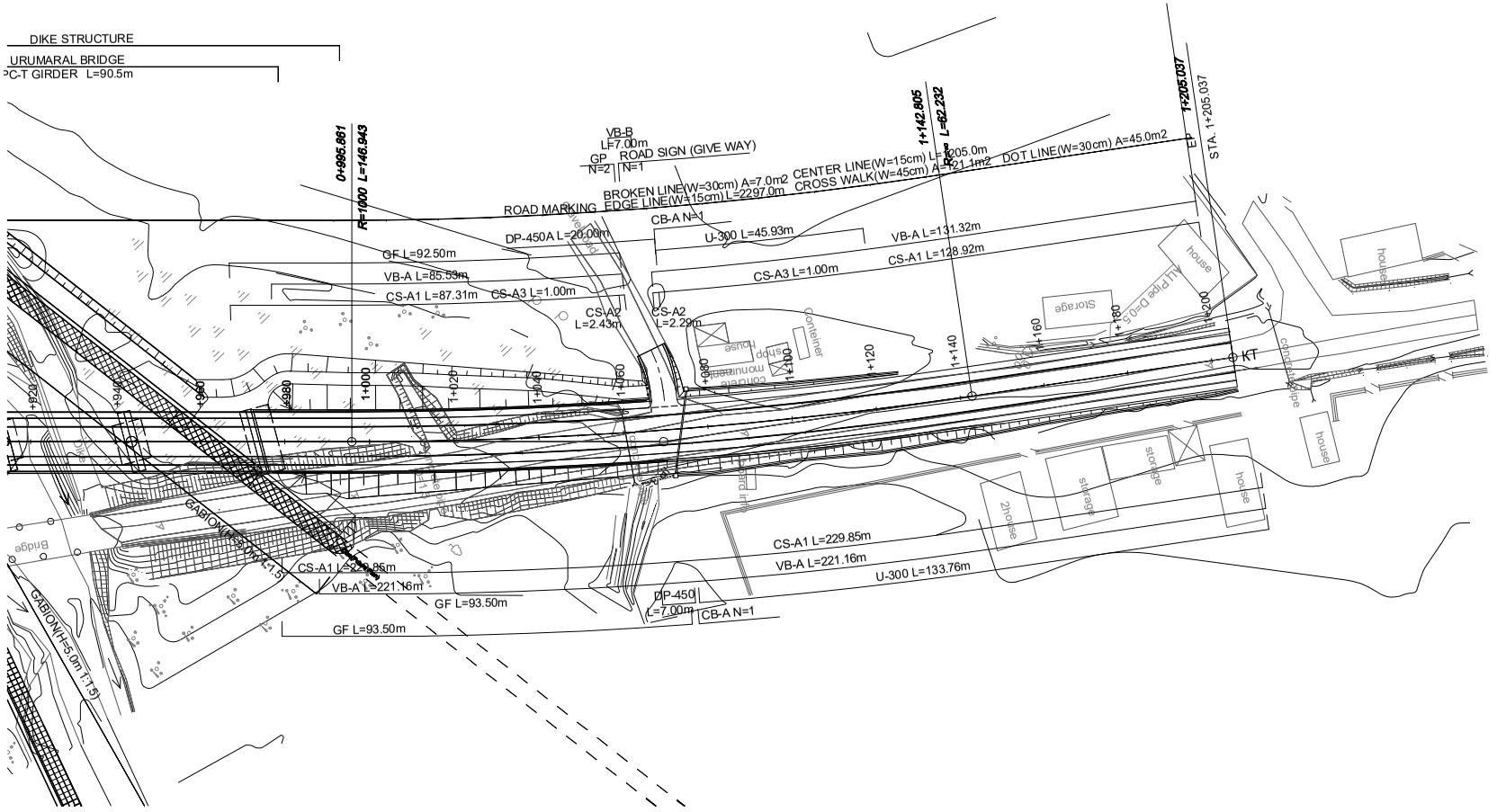


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : PLAN(3)	Drawing No.	PL-03
				SCALE	1 : 1000
				DATE	MAR. 2018

PLAN(4)



LAYOUT OF PLAN



MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : PLAN(4)	Drawing No.	PL-04
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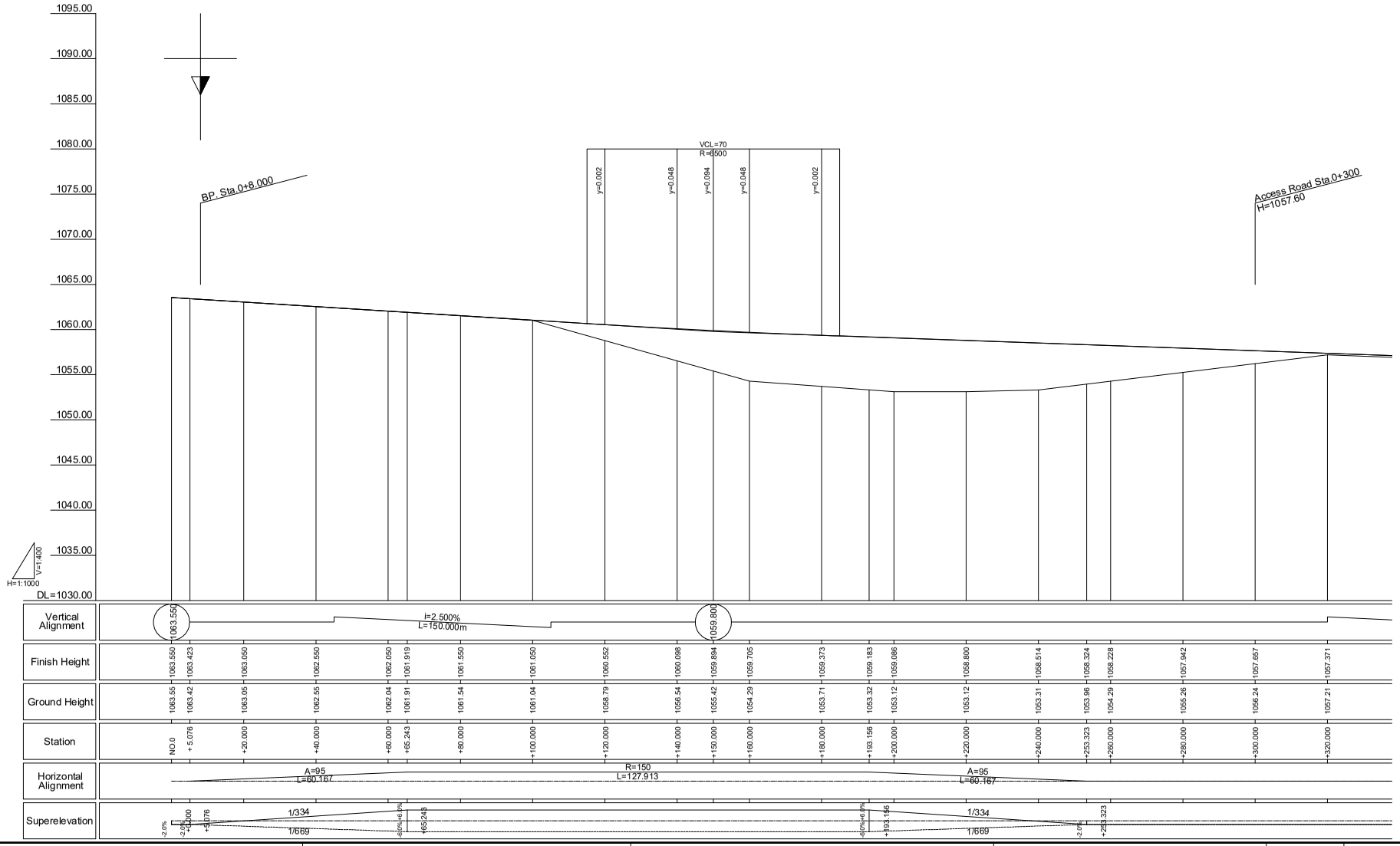
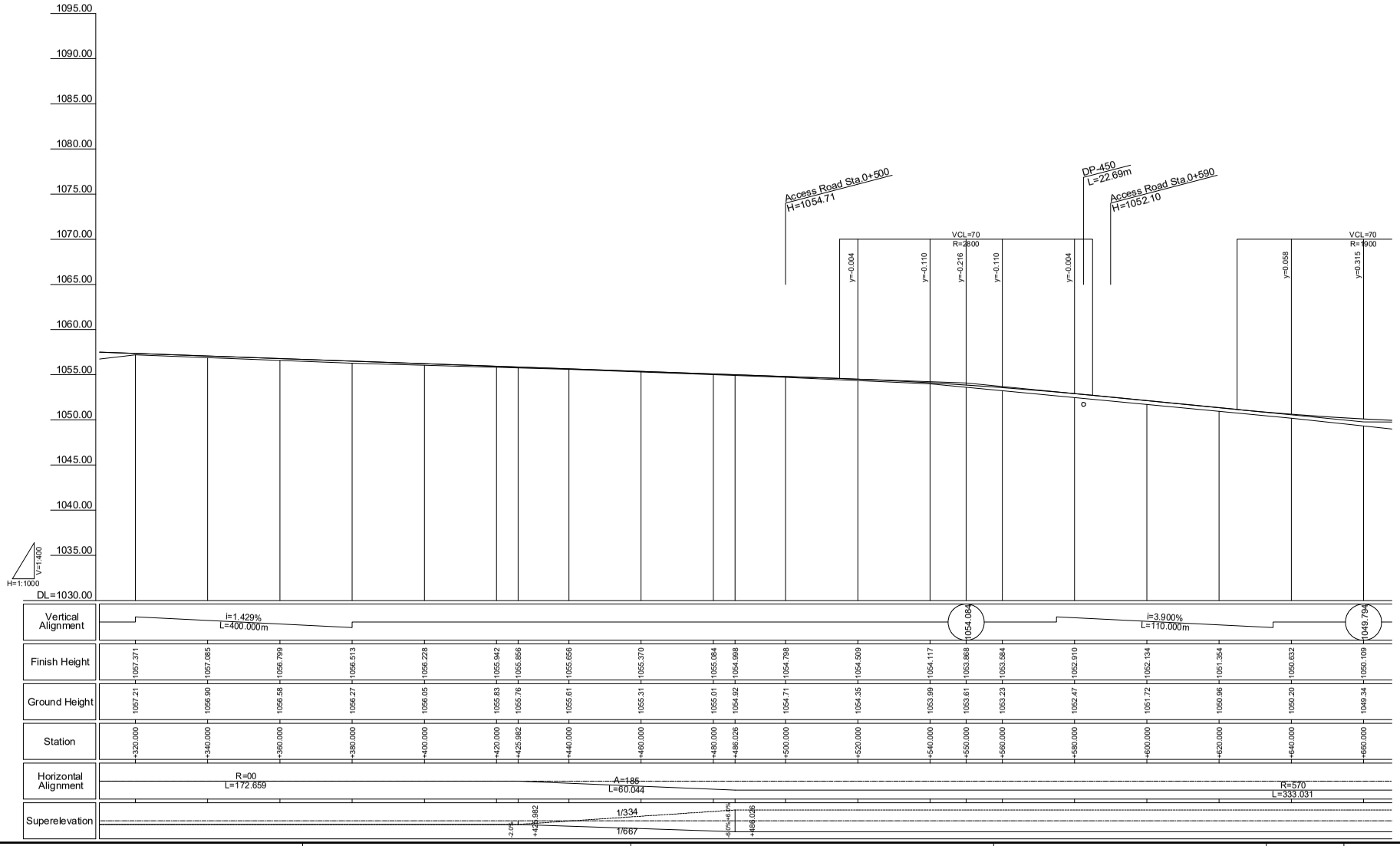
				DATE	MAR. 2018

PROFILE(1)



MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : PROFILE(1)	Drawing No.	PR-01
				SCALE	AS SHOW
				DATE	MAR. 2018

PROFILE(2)



MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : PROFILE(2)	Drawing No.	PR-02
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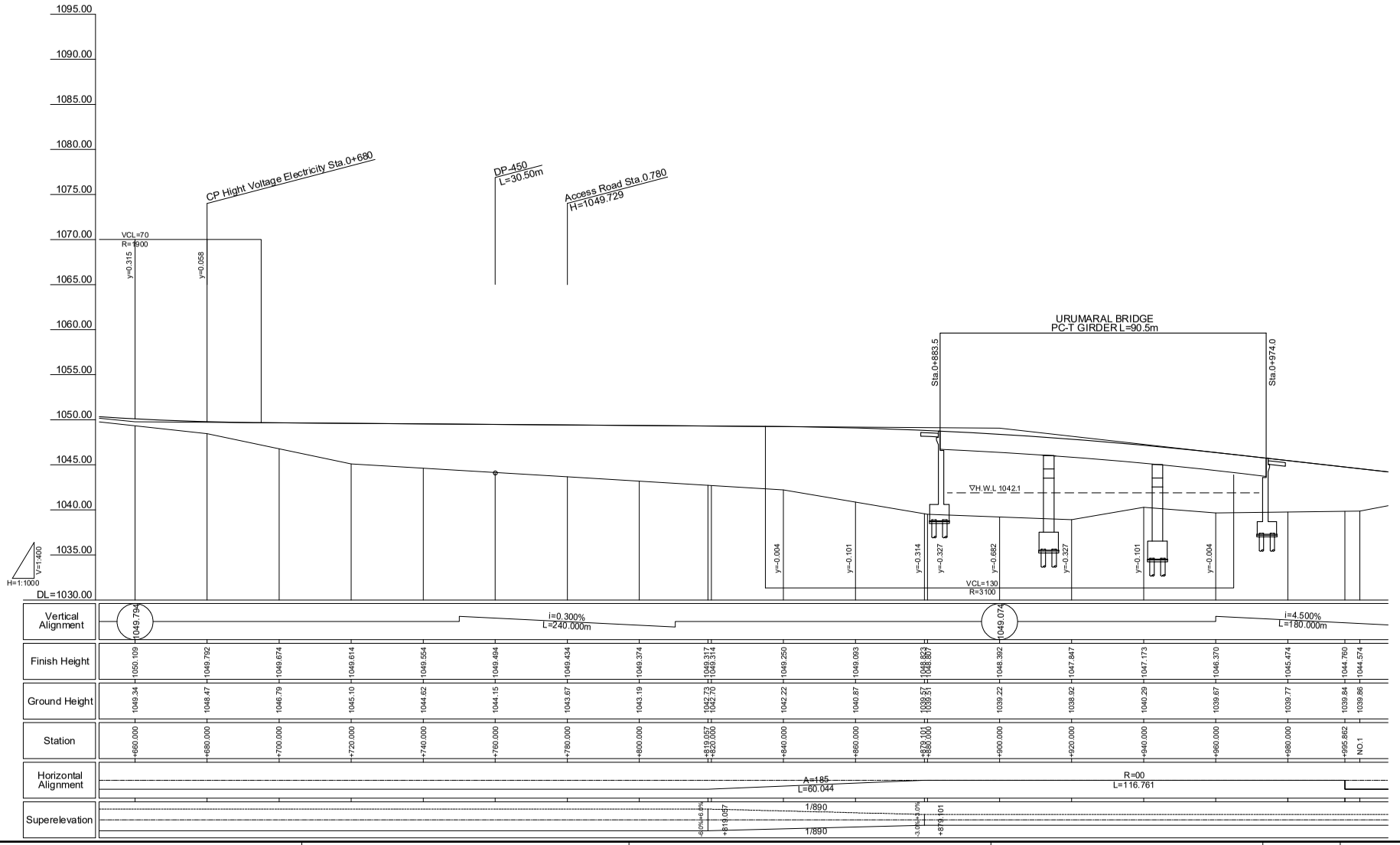
				DATE	MAR. 2018

PROFILE(3)



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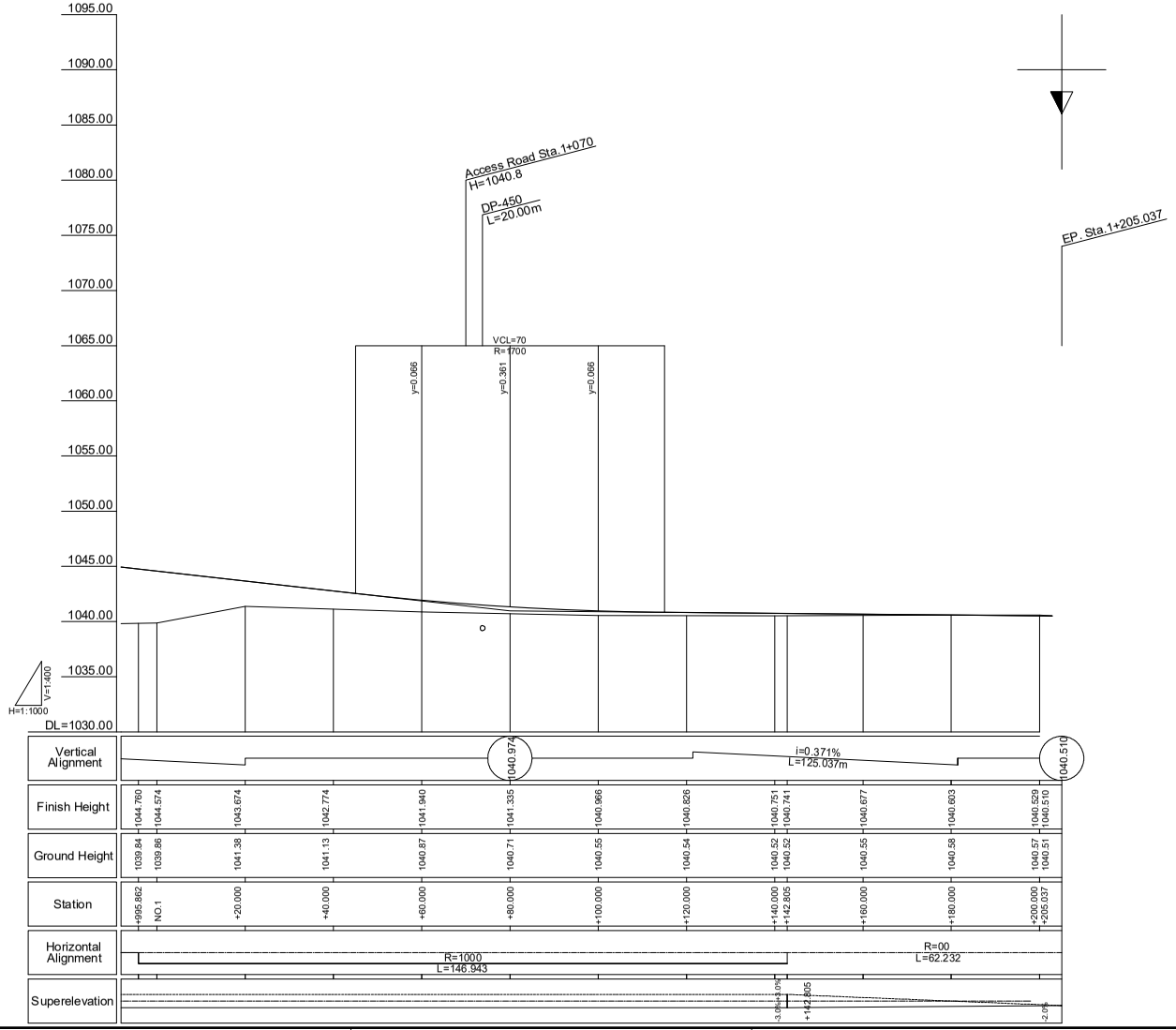
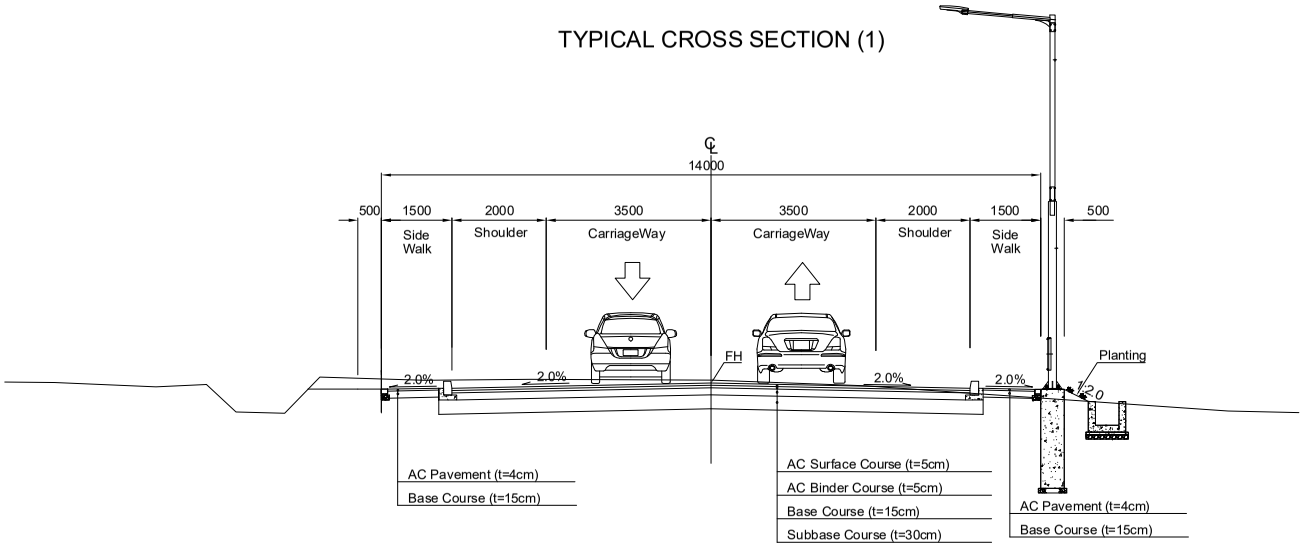
				SCALE	AS SHOW
				DATE	MAR. 2018

PROFILE(4)

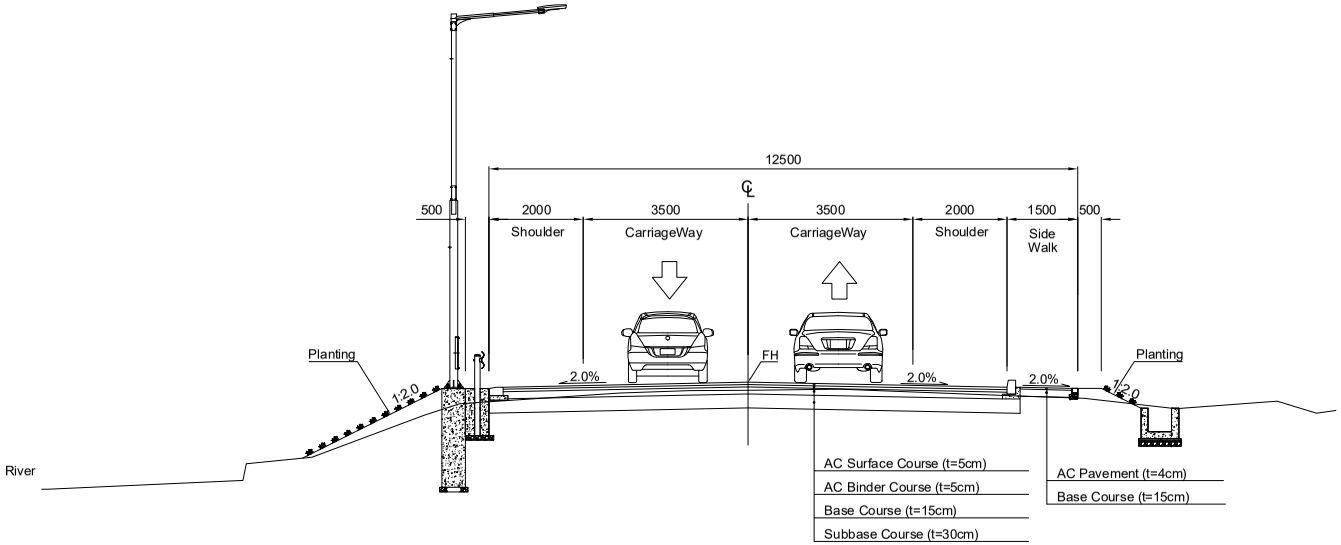


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : PROFILE(4)	Drawing No.	PR-04
				SCALE	AS SHOW
				DATE	MAR. 2018

TYPICAL CROSS SECTION (1)



GENERAL SECTION (STA.0+510.000～STA.1+205.037)



GENERAL SECTION (STA.0+8.000～STA.0+510.000)

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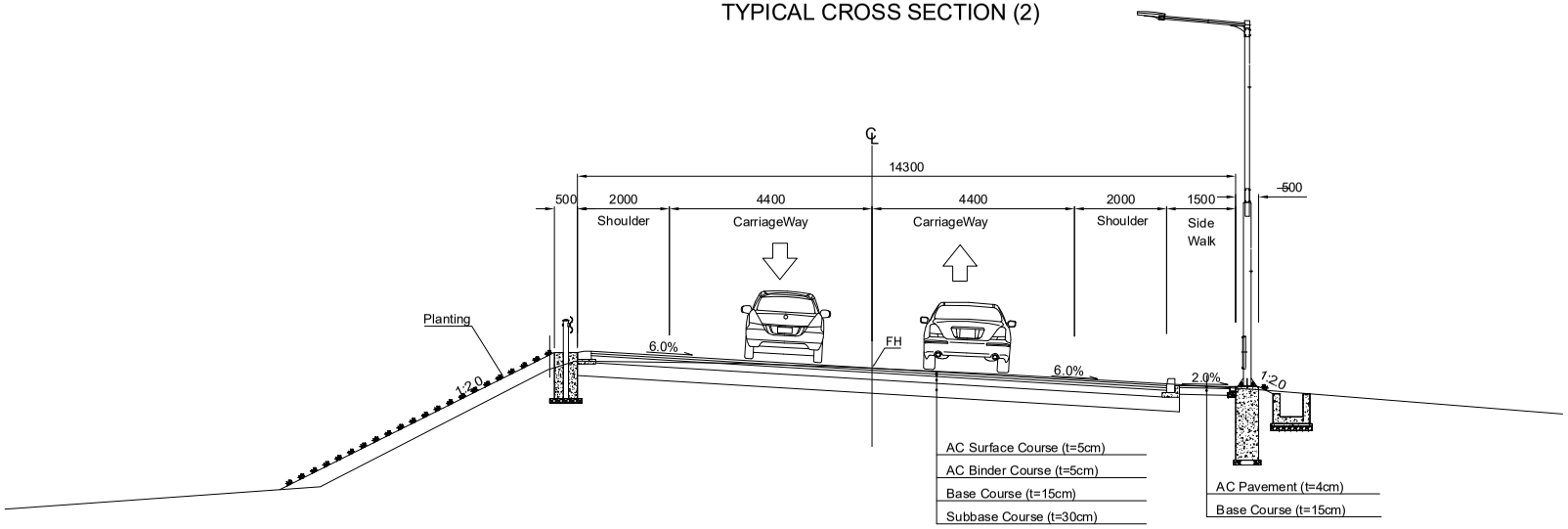
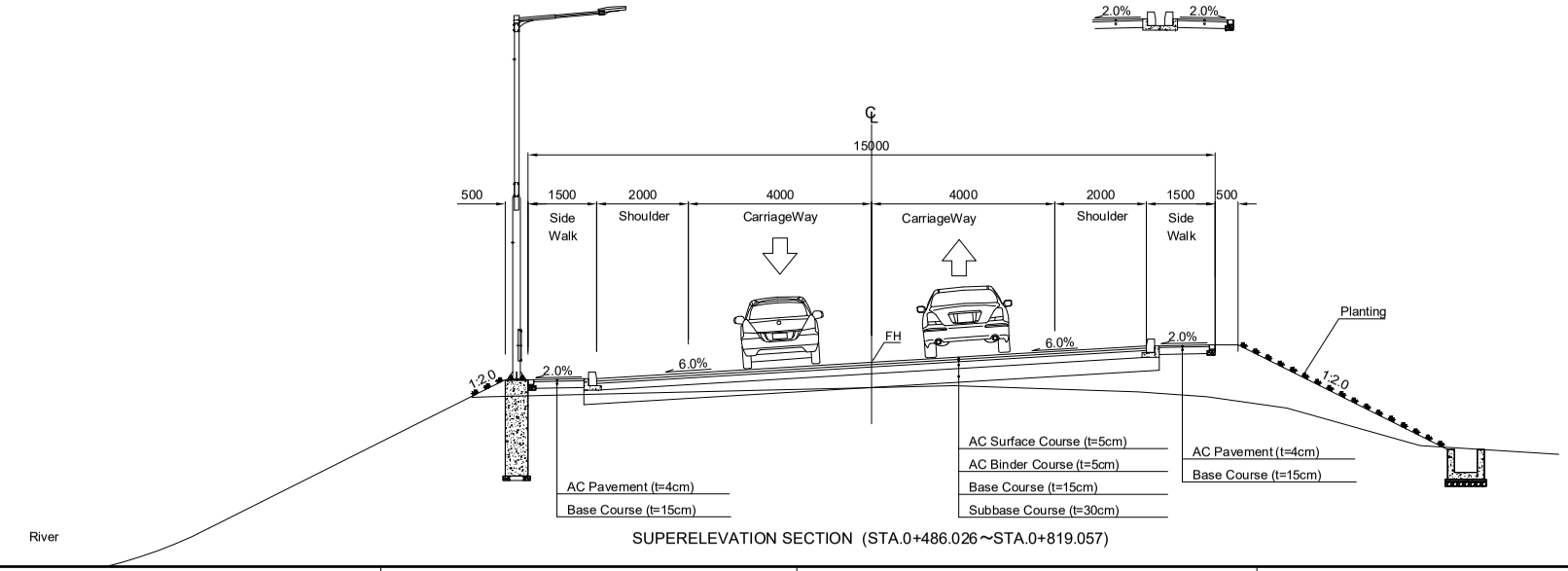
				DATE	MAR. 2018

TYPICAL CROSS SECTION (2)



SUPERELEVATION SECTION (STA.0+65.243～STA.0+193.156)



SUPERELEVATION SECTION (STA.0+486.026～STA.0+819.057)

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : TYPICAL CROSS SECTION (2)	Drawing No.	TC-02
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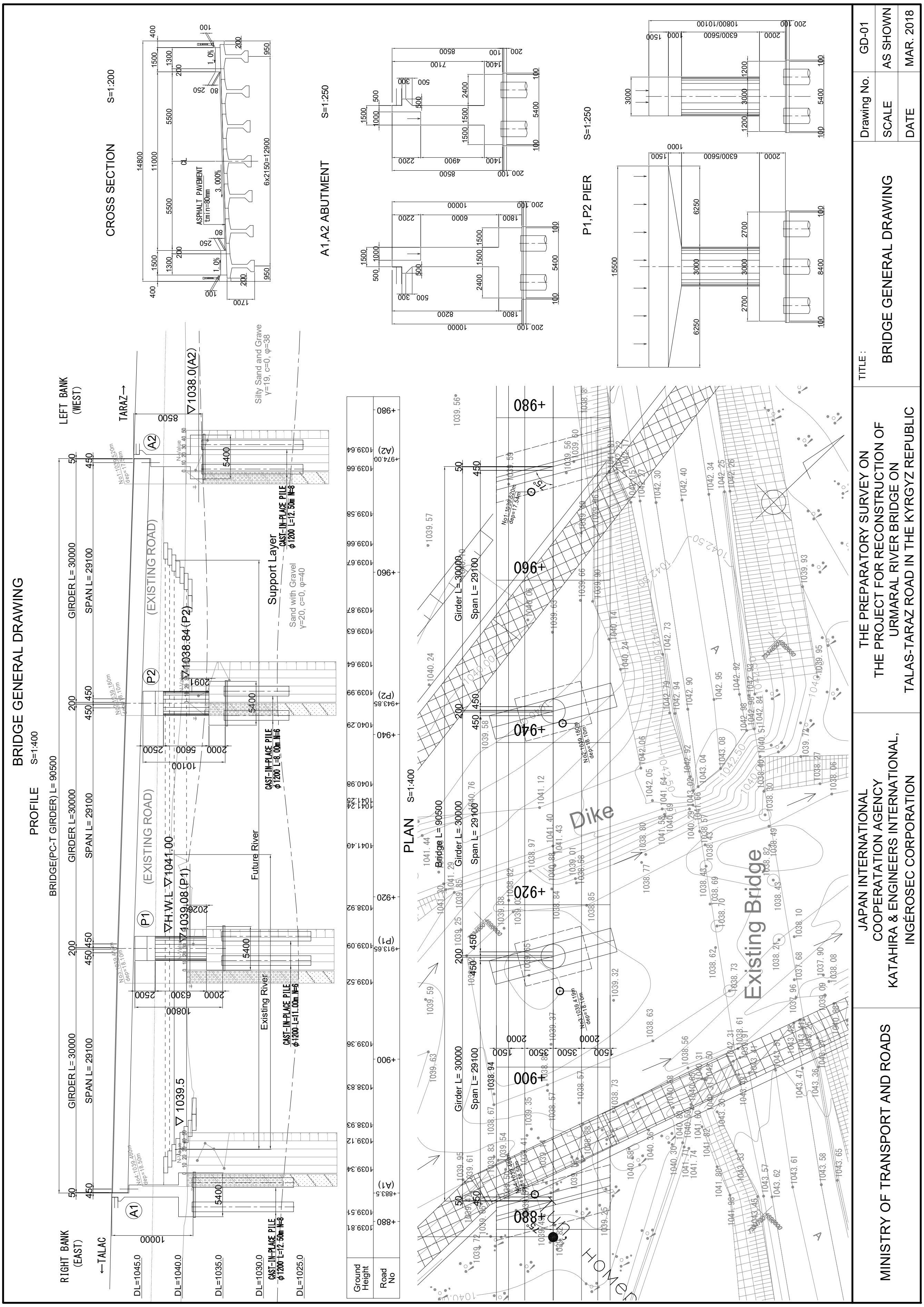
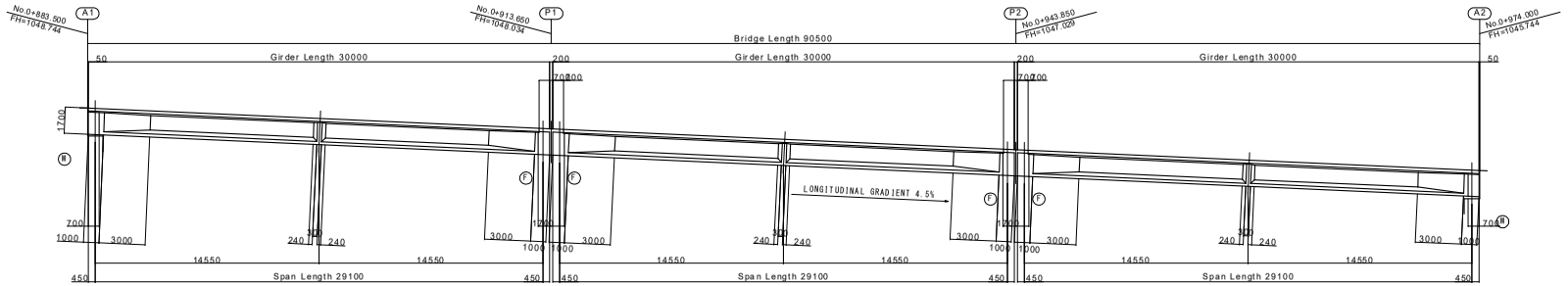
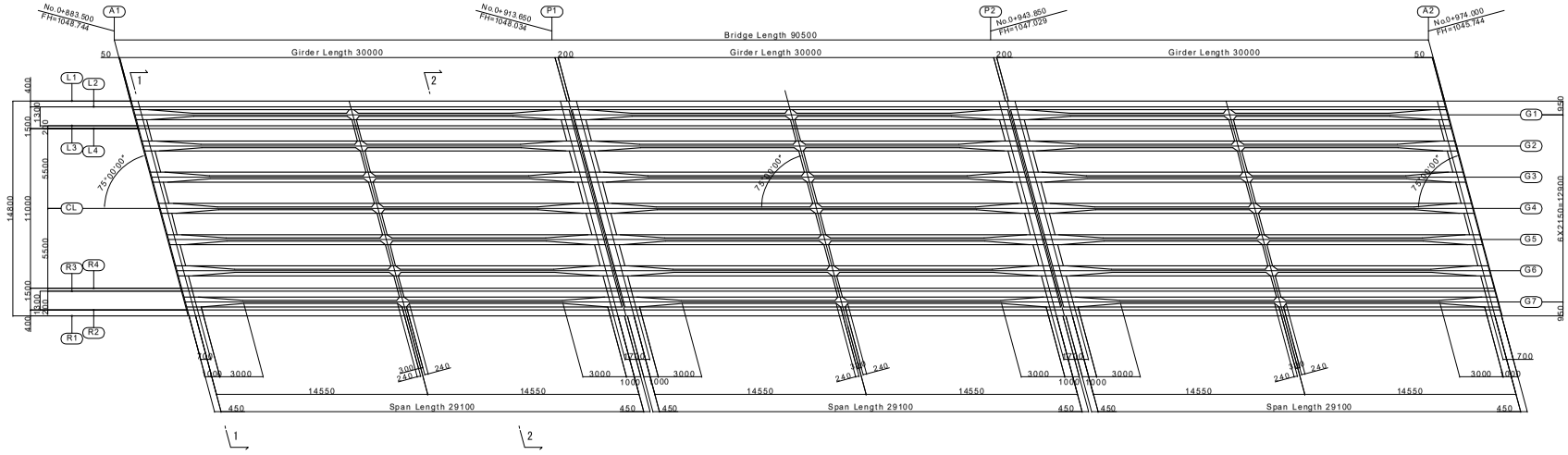

BRIDGE GENERAL DRAWING
PROFILE S=1:400
BRIDGE(PC-T GIRDER) L= 90500
GIRDER L= 30000
SPAN L= 29100
RIGHT BANK (EAST)
LEFT BANK (WEST)
←TALAC
TARAZ→
A1
P1
P2
A2
(EXISTING ROAD)
∇H.W.L ∇1041.00
∇1039.08(P1)
∇1038.84(P2)
∇1038.0(A2)
∇ 1039.5
Future River
Existing River
Support Layer
Sand with Gravel γ=20, c=0, φ=40
Silty Sand and Grave γ=19, c=0, φ=38
CAST-IN-PLACE PILE φ1200 L=12.50m N=8
CAST-IN-PLACE PILE φ1200 L=11.00m N=6
CAST-IN-PLACE PILE φ1200 L=8.00m N=6
DL=1045.0
DL=1040.0
DL=1035.0
DL=1030.0
DL=1025.0
Ground Height
Road No
PLAN S=1:400
Bridge L= 90500
Girder L= 30000
Span L= 29100
Dike
Existing Bridge
CROSS SECTION S=1:200
ASPHALT PAVEMENT tmin=80mm
6x2150=12900
A1,A2 ABUTMENT S=1:250
P1,P2 PIER S=1:250
MINISTRY OF TRANSPORT AND ROADS
JAPAN INTERNATIONAL COOPERATATION AGENCY
KATAHIRA & ENGINEERS INTERNATIONAL,
INGÉROSEC CORPORATION
THE PREPARATORY SURVEY ON
THE PROJECT FOR RECONSTRUCTION OF
URMARAL RIVER BRIDGE ON
TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC
TITLE :
BRIDGE GENERAL DRAWING
Drawing No. GD-01
SCALE AS SHOWN
DATE MAR. 2018

SUPER STRUCTURE(1)

PROFILE



PLAN

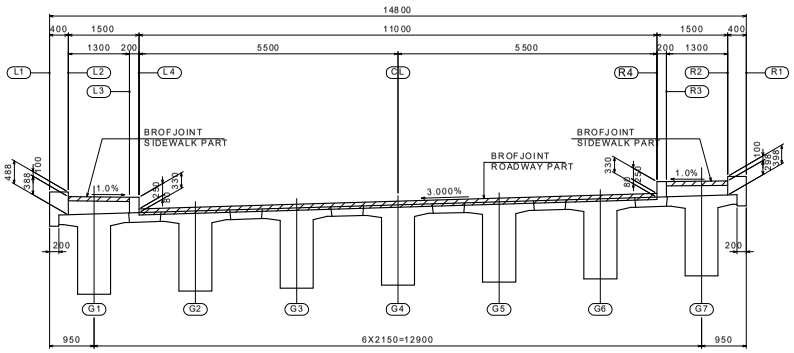


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : SUPER STRUCTURE(1)	Drawing No.	SP-01
				SCALE	1:300
				DATE	MAR. 2018

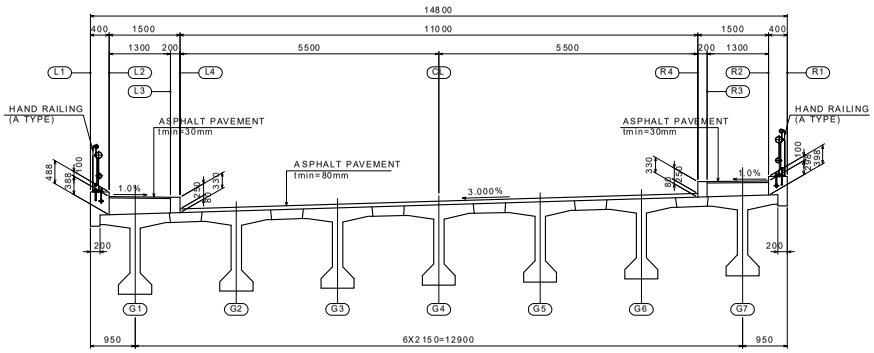
SUPER STRUCTURE(2)

CROSS SECTION S=1:100

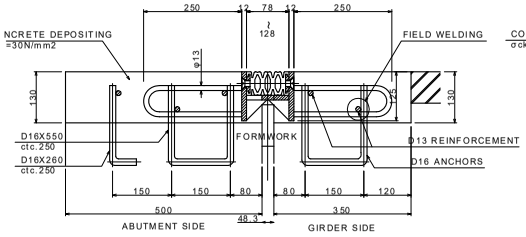
1 - 1



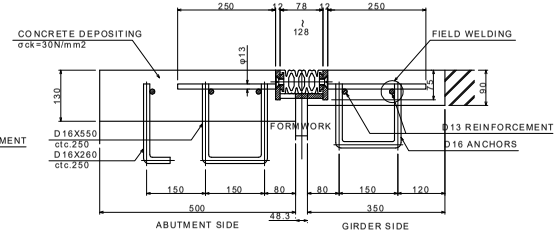
2 - 2



BROFJOINT TYPE NⅡ-50
ROADWAY PART



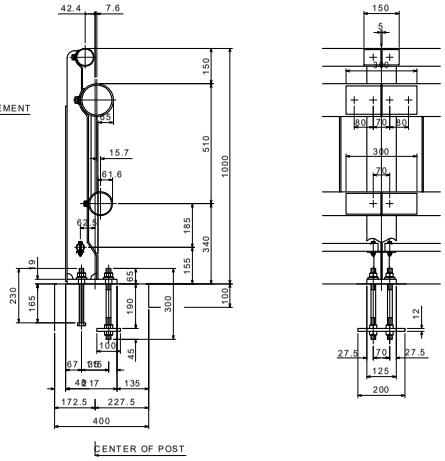
BROFJOINT TYPE NⅡ-50
SIDEWALK PART



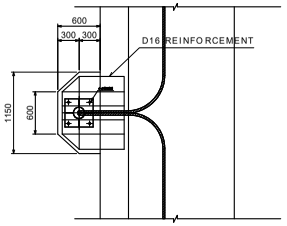
CROSS SECTION

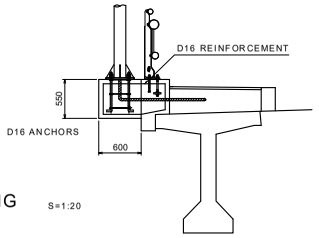
DETAIL OF EXPANSION JOINT S=1:12

KBH-DM1A-W100B1



BASE FOR LIGHT

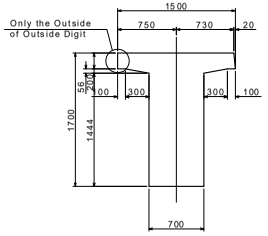




DETAIL OF HAND RAILING S=1:20

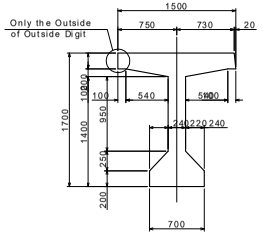
EDGE OF GIRDER

Outside Girder Inner Girder



CENTER OF GIRDER

Outside Girder Inner Girder



MAIN GIRDER CROSS SECTION S=1:60

MATERIAL STRENGTH AND ALLOWABLE STRESS

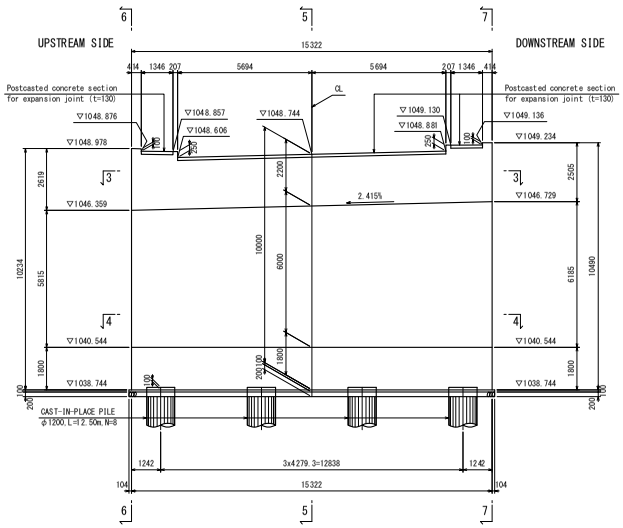
WORKITEM	ITEM	
CONCRETE DESIGN STANDARD STRENGTH		30 N/mm2
PC PRESTRESSING STEEL	CLARIFICATION	12S12.7
	TENSILE STRENGTH	1850 N/mm2
	YIELD POINT STRESS	1600 N/mm2
REINFORCEMENT	CLARIFICATION	SD345
	YIELD POINT STRESS	345 N/mm2

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : SUPER STRUCTURE(2)

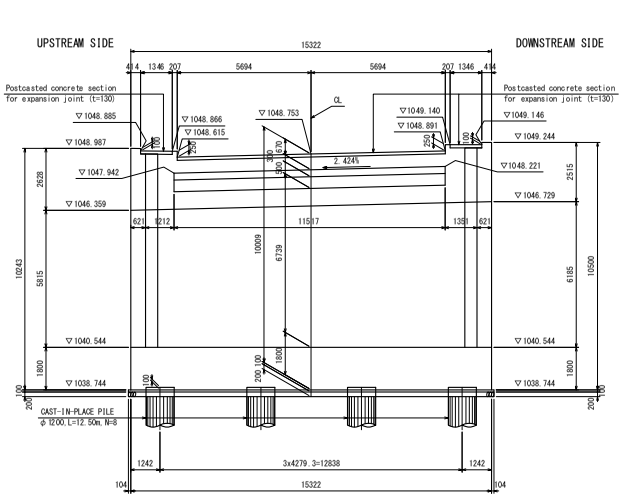
Drawing No.	SP-02
SCALE	AS SHOWN
DATE	MAR. 2018

SUBSTRUCTURE A1 (1)

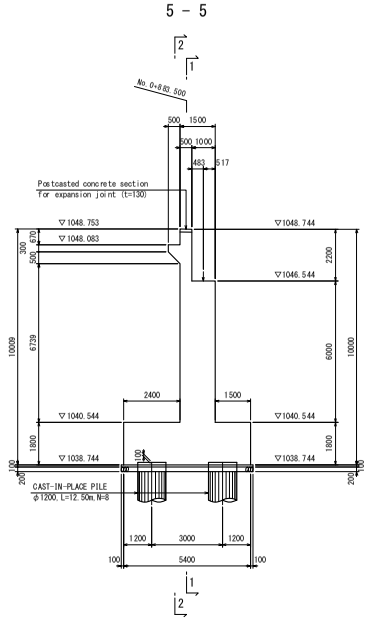
1 - 1



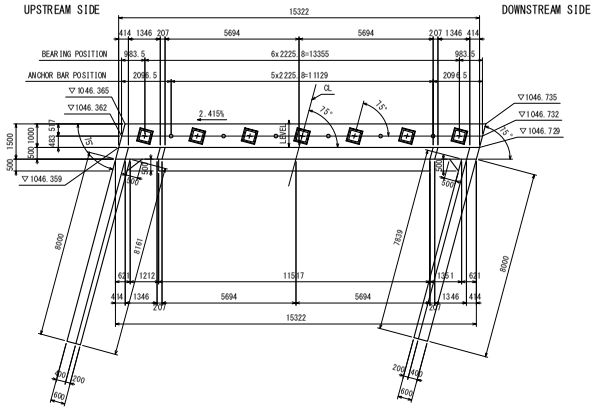
2 - 2



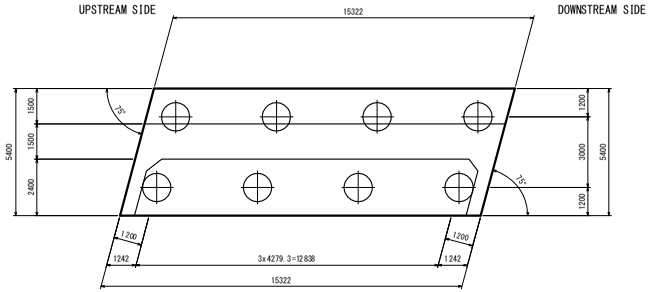
5 - 5



3 - 3



4 - 4

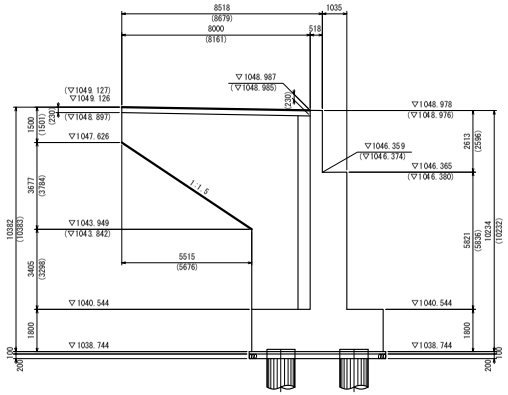


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : SUBSTRUCTURE A1 (1)	Drawing No.	SB-01
				SCALE	1:200
				DATE	MAR. 2018

SUBSTRUCTURE A1 (2)

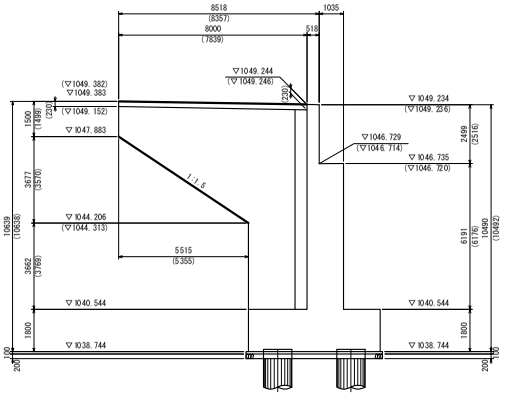
6 - 6 S=1:200

*( ) indicates internal dimension.



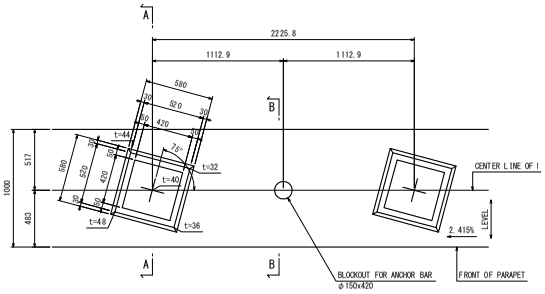
7 - 7 S=1:200

*( ) indicates internal dimension.



DETAIL OF BEARING S=1:40

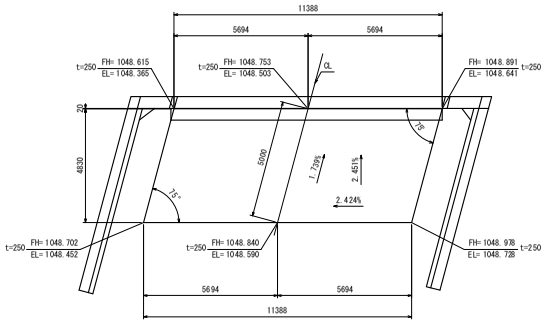
PLAN



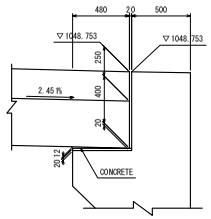
DETAIL OF APPROACH SLAB S=1:200

(Thickness = 400)

* ROAD HEIGHT:FH / TOP HEIGHT OF SLAB:EL , t=THICKNESS OF PAVEMENT

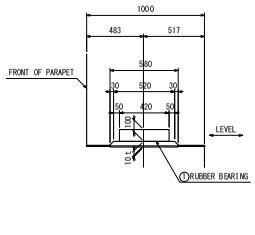


DETAIL OF TABLE S=1:40



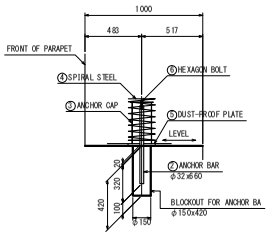
A - A

LONGITUDINAL



B - B

LONGITUDINAL



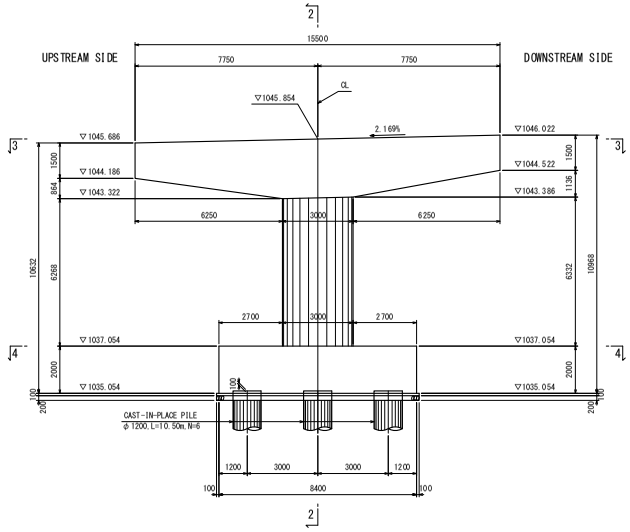
Material

No.	Name	Dimension	Sign	Qty.	Weight (kg)	Note
1	RUBBER BEARING	420x420x100	NR+SS400	7	286.3	
②	ANCHOR BAR	φ32x660	SS400	6	25.0	
③	ANCHOR CAP	42x162x350	SS400	6	21.9	
④	SPIRAL STEEL	φ8x5220	———	6	12.4	
5	DUST-PROOF PLATE	100x230x20	Rubber	6	———	
⑥	HEXAGON BOLT	M8x60	———	6	———	
Hot - dip Zinc galvanizing		Galvanizing parts with ◯ on its label				
		Adhesion amount 550g/m² above, 350g/m² above for bolt				

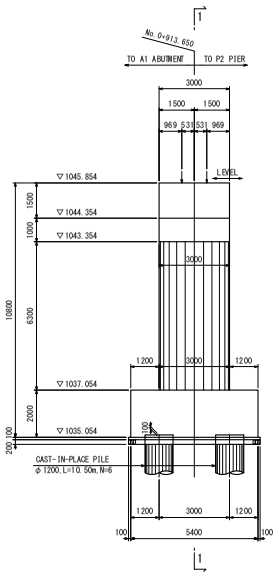
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : SUBSTRUCTURE A1 (2)	Drawing No.	SB-02
				SCALE	AS SHOWN
				DATE	MAR. 2018

SUBSTRUCTURE P1

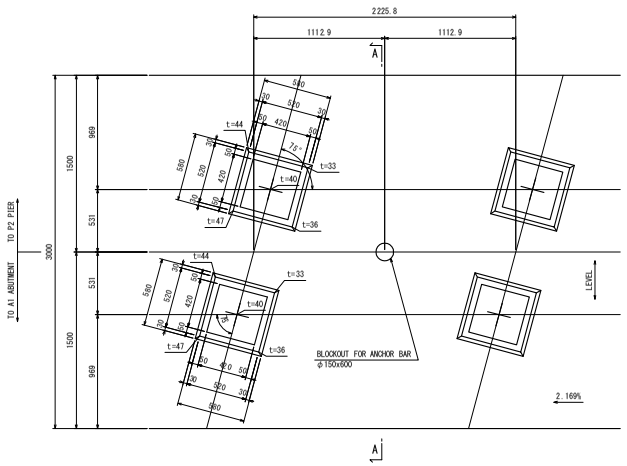
1 – 1 S=1:200



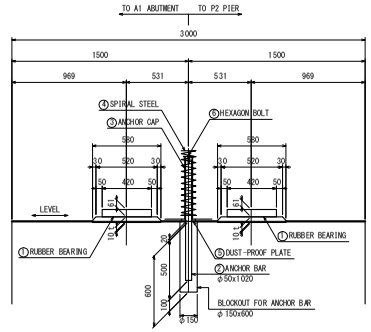
2 – 2



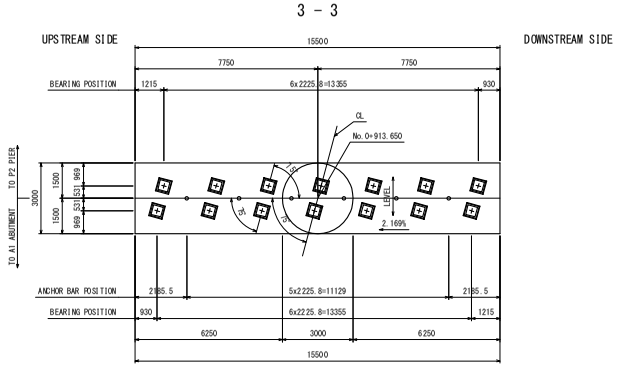
PLAN S=1:40



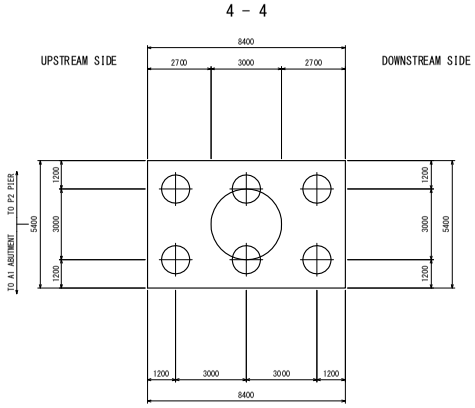
A – A



3 – 3



4 – 4

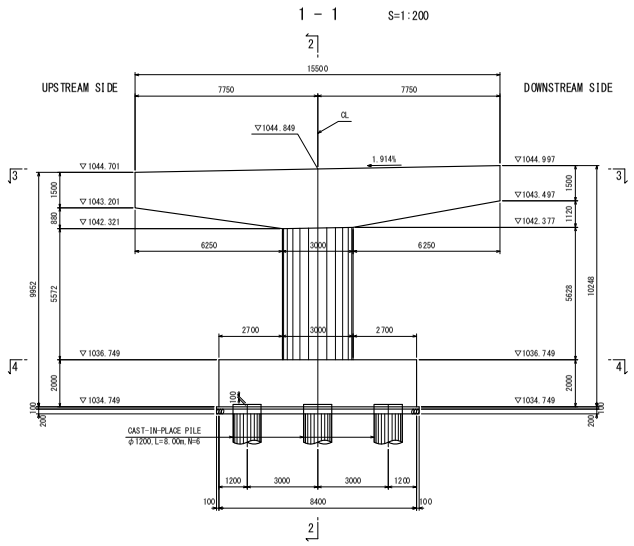


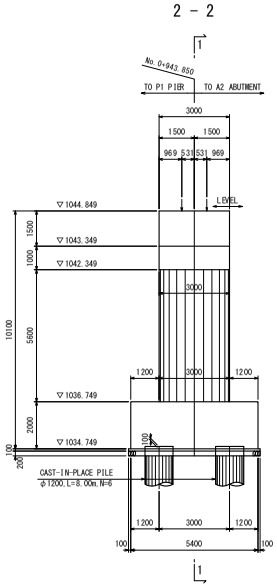
Material

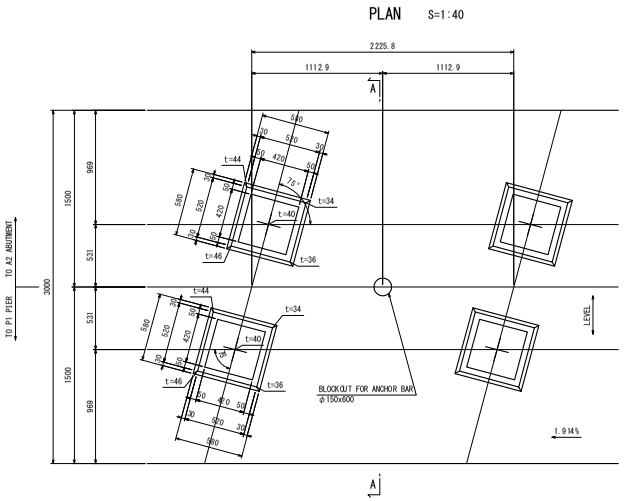
No.	Name	Dimension	Sign	Qty.	Weight (kg)	Note
1	RUBBER BEARING	420x420x61	NR+SS400	14	365.4	
②	ANCHOR BAR	φ50x1020	SS400	6	94.3	
③	ANCHOR CAP	φ60x530	SS400	6	16.7	
④	SPIRAL STEEL	φ8x5160	———	6	12.2	
5	DUST-PROOF PLATE	120x120x20	Rubber	6	———	
⑥	HEXAGON BOLT	M8x60	———	6	———	
Hot-dip Zinc galvanizing		Galvanizing parts with ◯ on its label				
		Adhesion amount 550g/m² above, 350g/m² above for bolt				

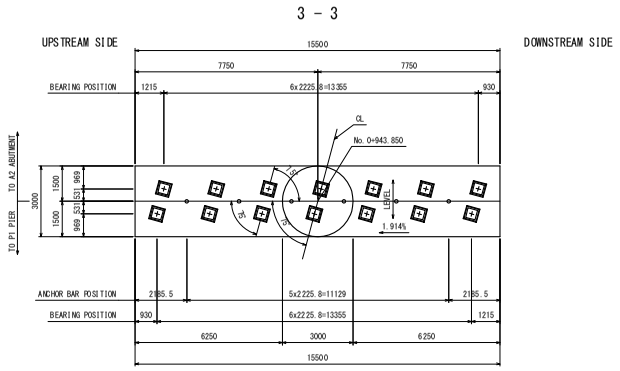
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : SUBSTRUCTURE P1	Drawing No.	SB-03
				SCALE	AS SHOWN
				DATE	MAR. 2018

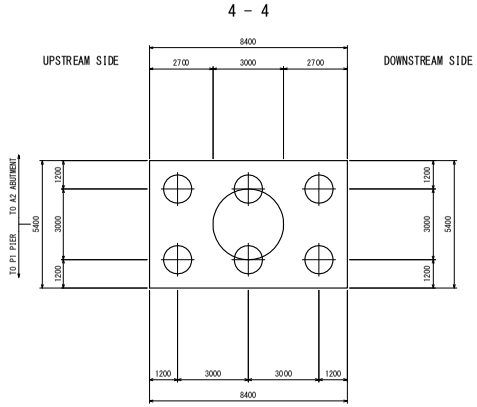
SUBSTRUCTURE P2

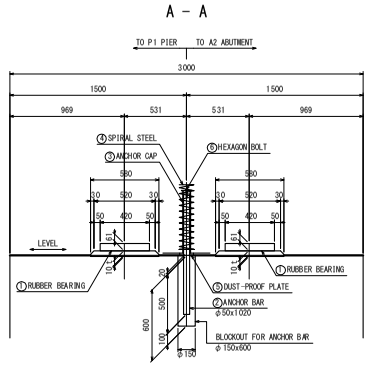












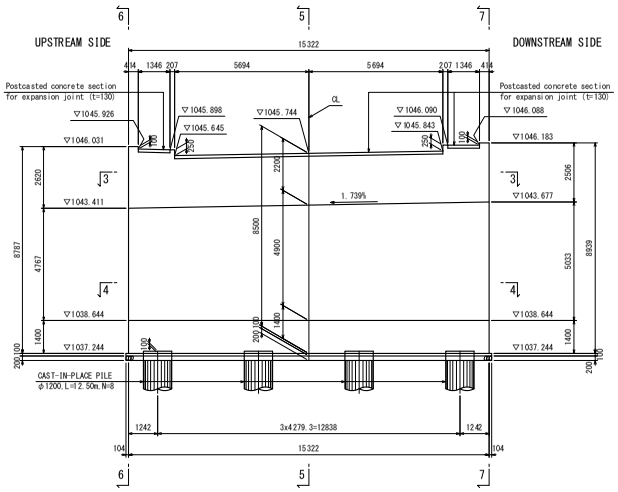
Material

No.	Name	Dimension	Sign	Qty.	Weight (kg)	Note
1	RUBBER BEARING	420x420x61	NR+SS400	14	365.4	
(2)	ANCHOR BAR	φ50x1020	SS400	6	94.3	
(3)	ANCHOR CAP	φ60x530	SS400	6	16.7	
(4)	SPIRAL STEEL	φ8x5160	———	6	12.2	
5	DUST-PROOF PLATE	120x120x20	Rubber	6	———	
(6)	HEXAGON BOLT	M8x60	———	6	———	
Hot - dip Zinc galvanizing		Galvanizing parts with ◯ on its label				
		Adhesion amount 550g/m² above, 350g/m² above for bolt				

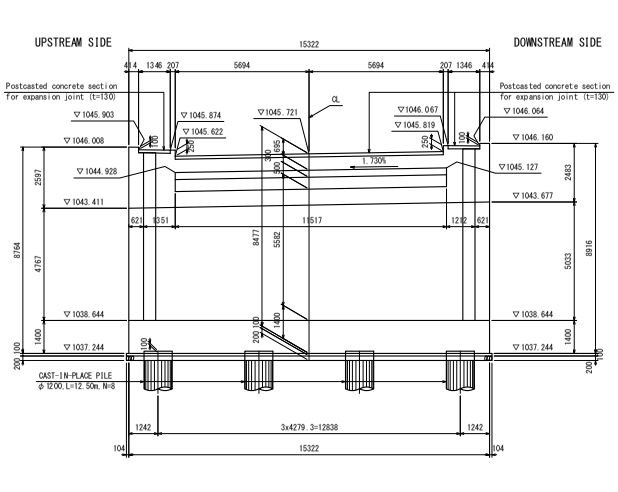
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : SUBSTRUCTURE P2	Drawing No.	SB-04
				SCALE	AS SHOWN
				DATE	MAR. 2018

SUBSTRUCTURE A2 (1)

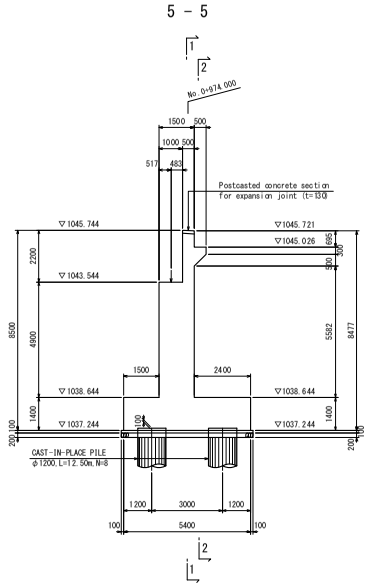
1 - 1



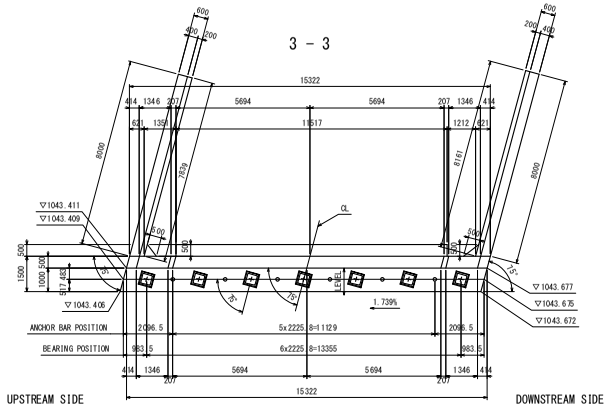
2 - 2



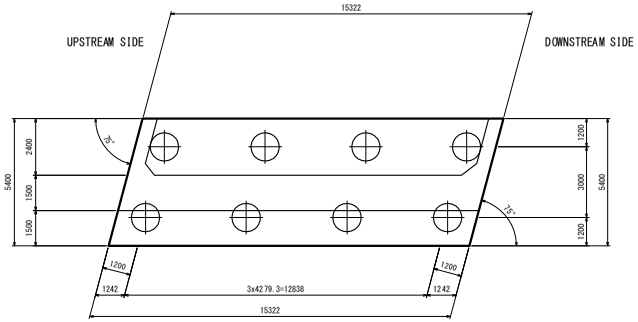
5 - 5



3 - 3



4 - 4

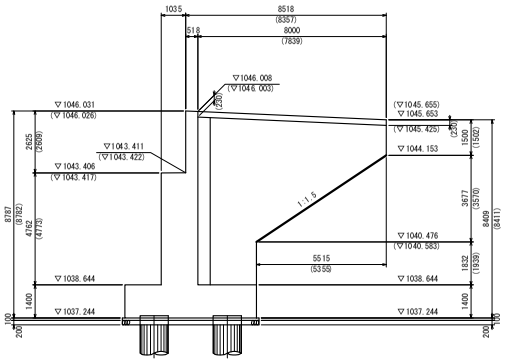


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : SUBSTRUCTURE A2 (1)	Drawing No.	SB-05
				SCALE	1:200
				DATE	MAR. 2018

SUBSTRUCTURE A2 (2)

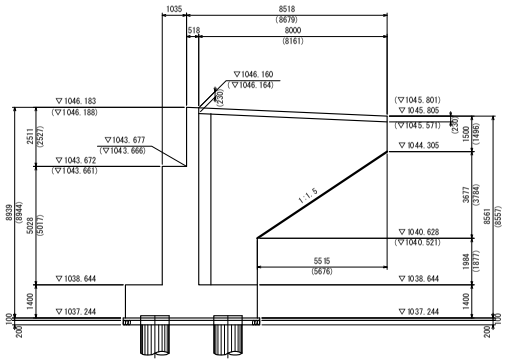
6 - 6 S=1:200

*( ) indicates internal dimension.



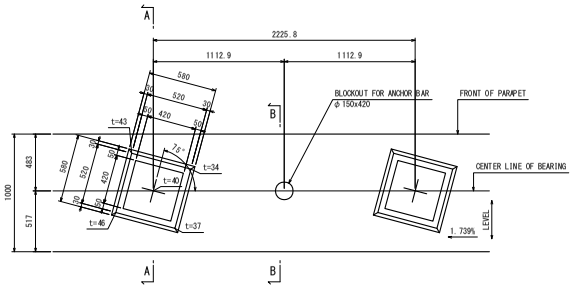
7 - 7

*( ) indicates internal dimension.



DETAIL OF BEARING S=1:40

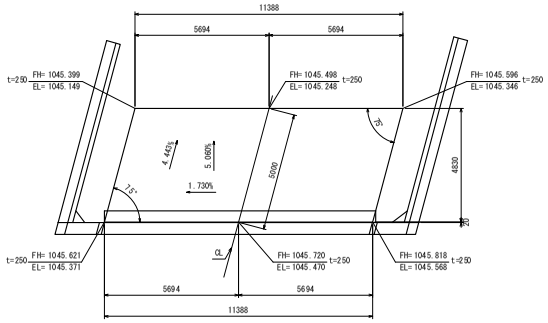
PLAN



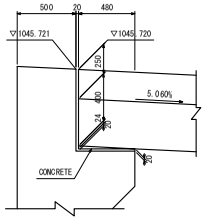
DETAIL OF APPROACH SLAB S=1:200

(Thickness = 400)

* ROAD HEIGHT:FH / TOP HEIGHT OF SLAB:EL , t=THICKNESS OF PAVEMENT

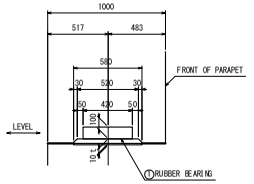


DETAIL OF TABLE S=1:40



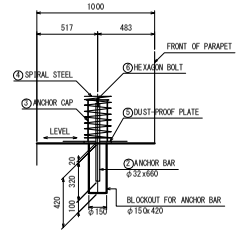
A - A

LONGITUDINAL



B - B

LONGITUDINAL



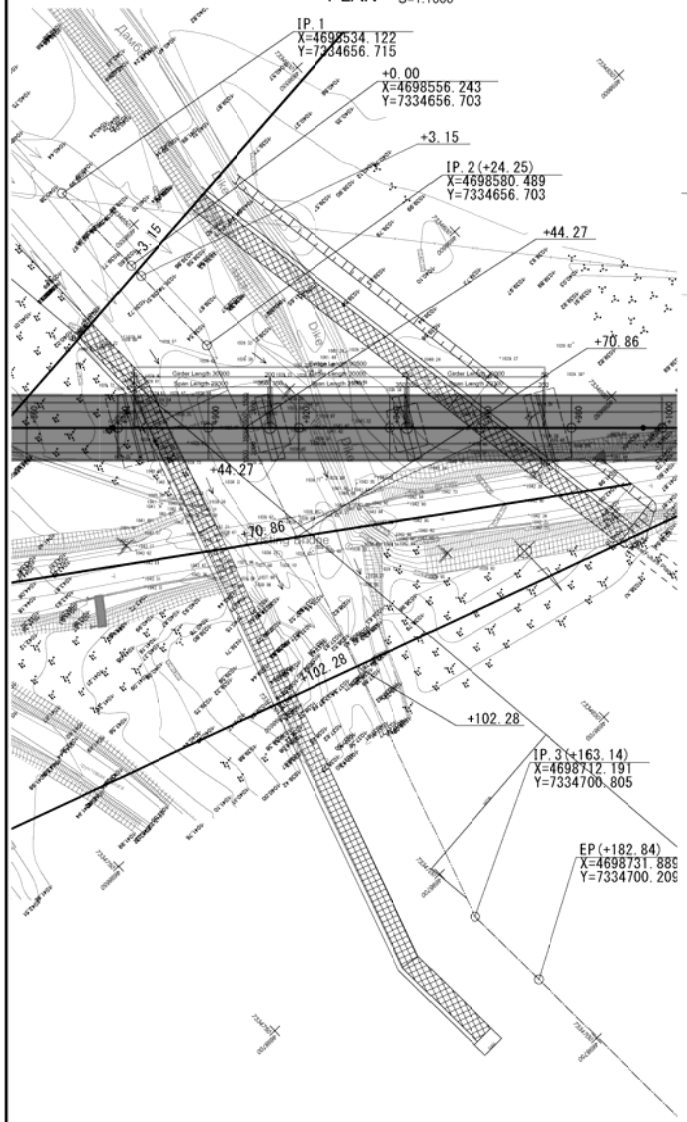
Material

No.	Name	Dimension	Sign	Qty.	Weight (kg)	Note
1	RUBBER BEARING	420x420x100	NR+SS400	7	286.3	
②	ANCHOR BAR	φ32x660	SS400	6	25.0	
③	ANCHOR CAP	42x162x350	SS400	6	21.9	
④	SPIRAL STEEL	φ8x5220	———	6	12.4	
5	DUST-PROOF PLATE	100x230x20	Rubber	6	———	
⑥	HEXAGON BOLT	M8x60	———	6	———	
Hot - dip Zinc galvanizing		Galvanizing parts with ◯ on its label				
		Adhesion amount 550g/m² above, 350g/m² above for bolt				

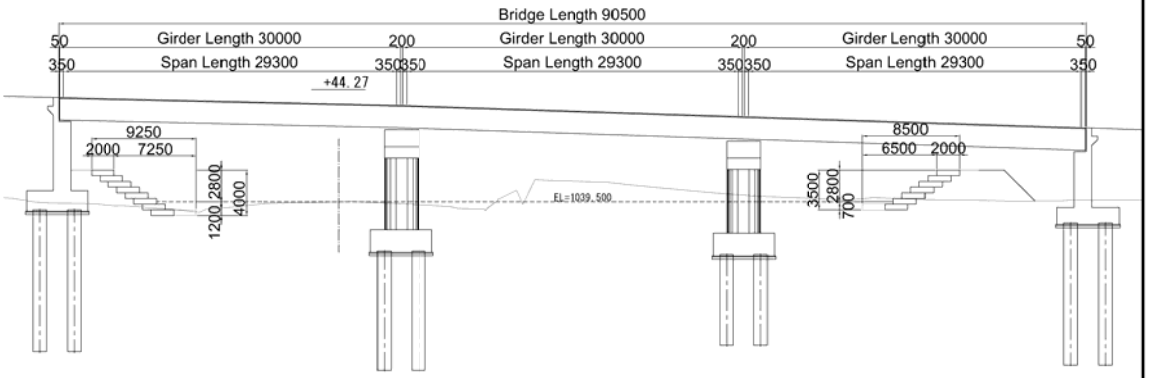
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : SUBSTRUCTURE A2 (2)	Drawing No.	SB-06
				SCALE	AS SHOWN
				DATE	MAR. 2018

DIKE GENERAL DRAWING

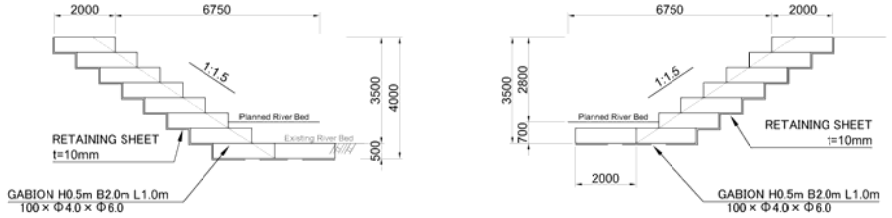
PLAN S=1:1000



TYPICAL CROSS SECTION S=1:400

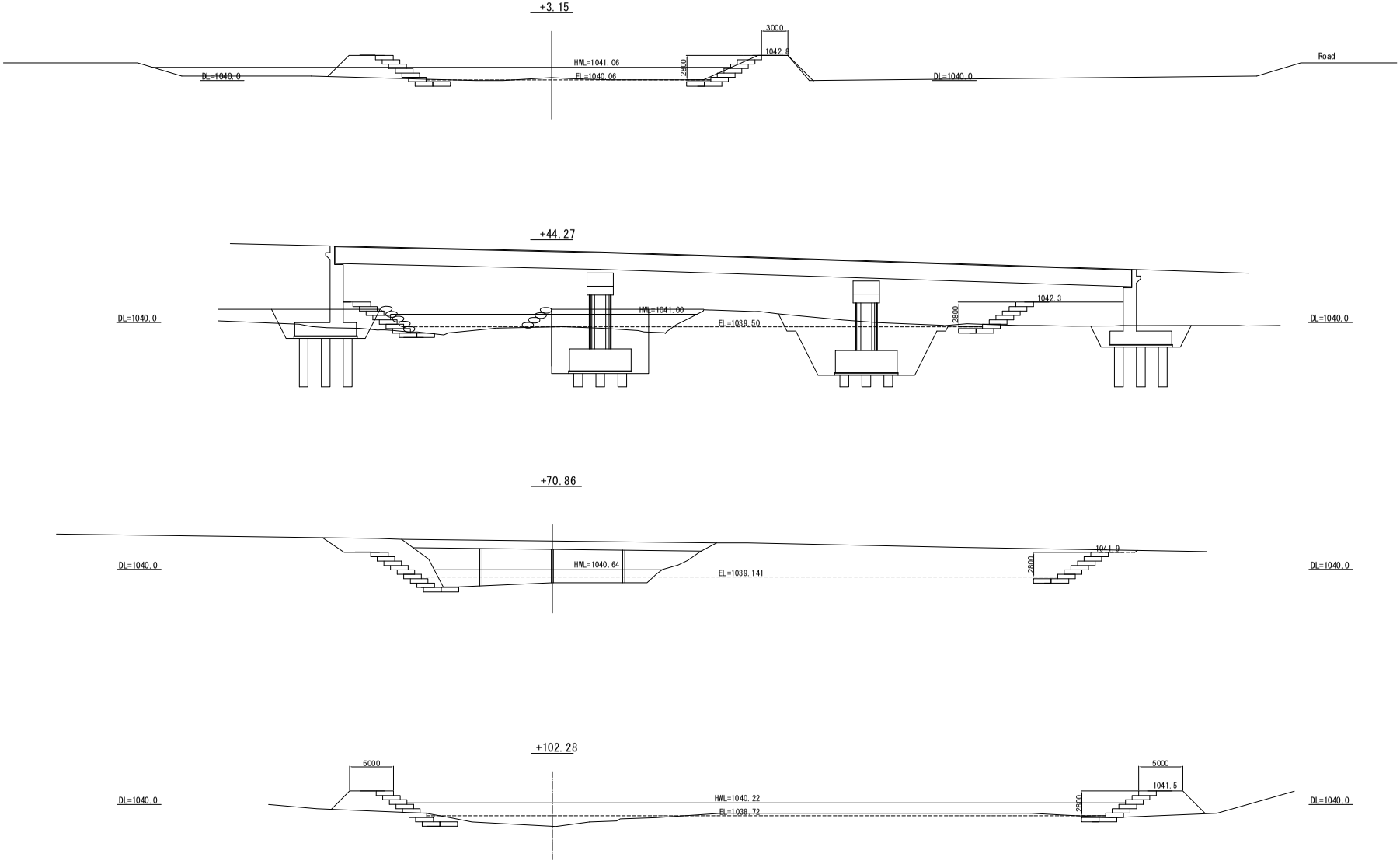


DIKE STRUCTURE S=1:150



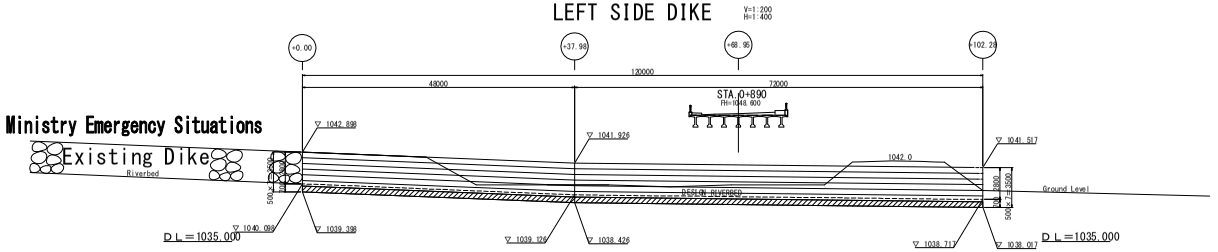
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DIKE GENERAL DRAWING	Drawing No.	DG-01
				SCALE	AS SHOWN
				DATE	MAR. 2018

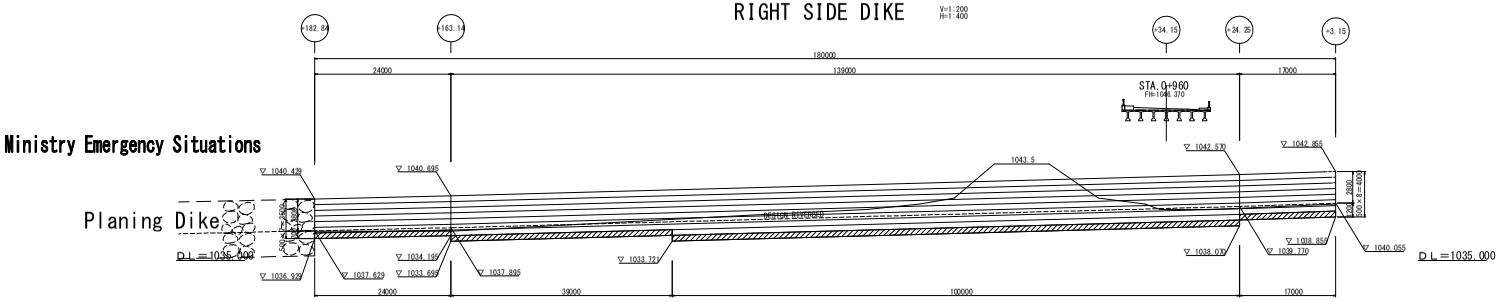
DIKE CROSS-SECTION



MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DIKE CROSS-SECTION	Drawing No.	DC-01
				SCALE	S=1:400
				DATE	MAR. 2018

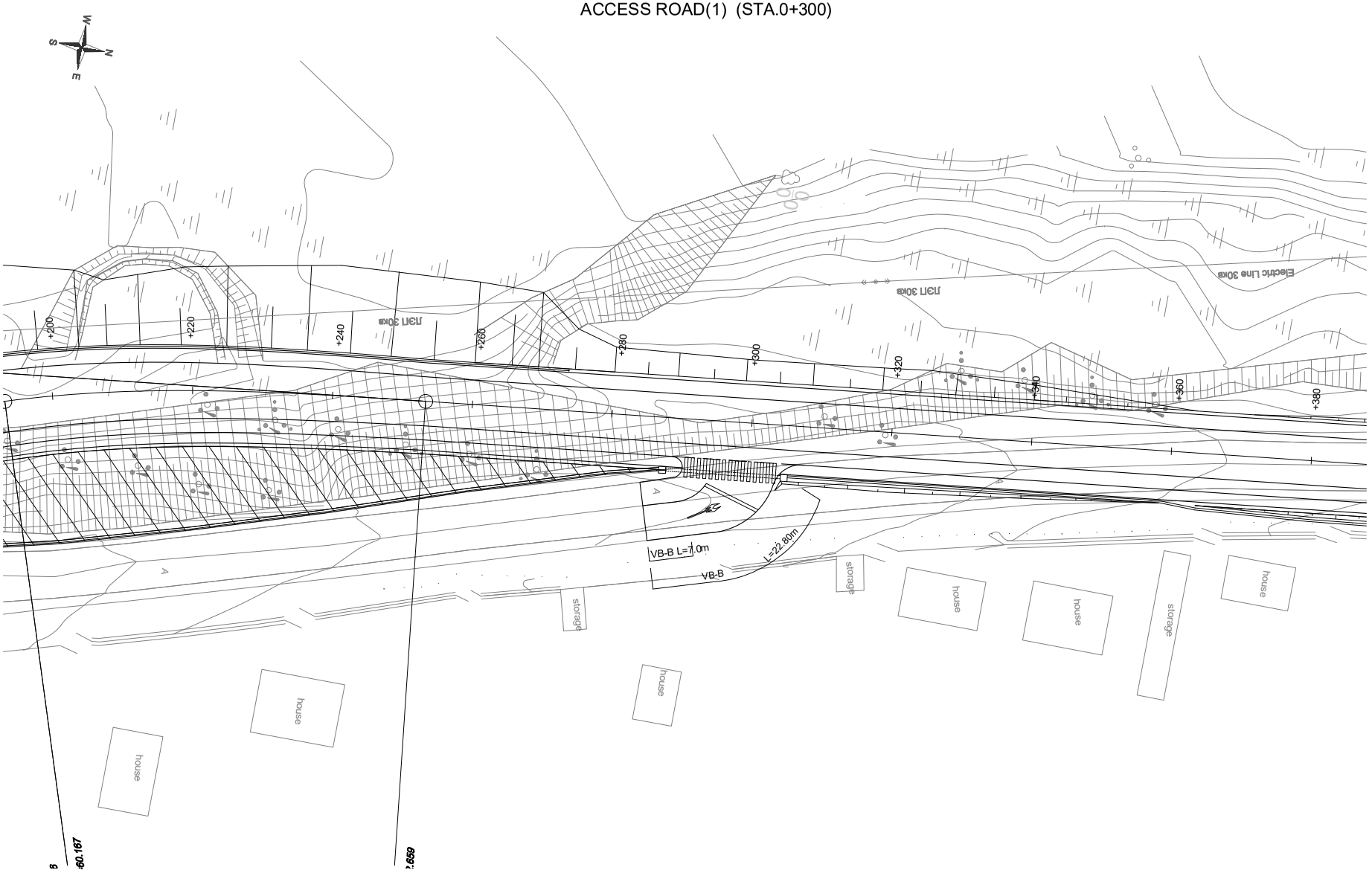
DIKE PROFILE



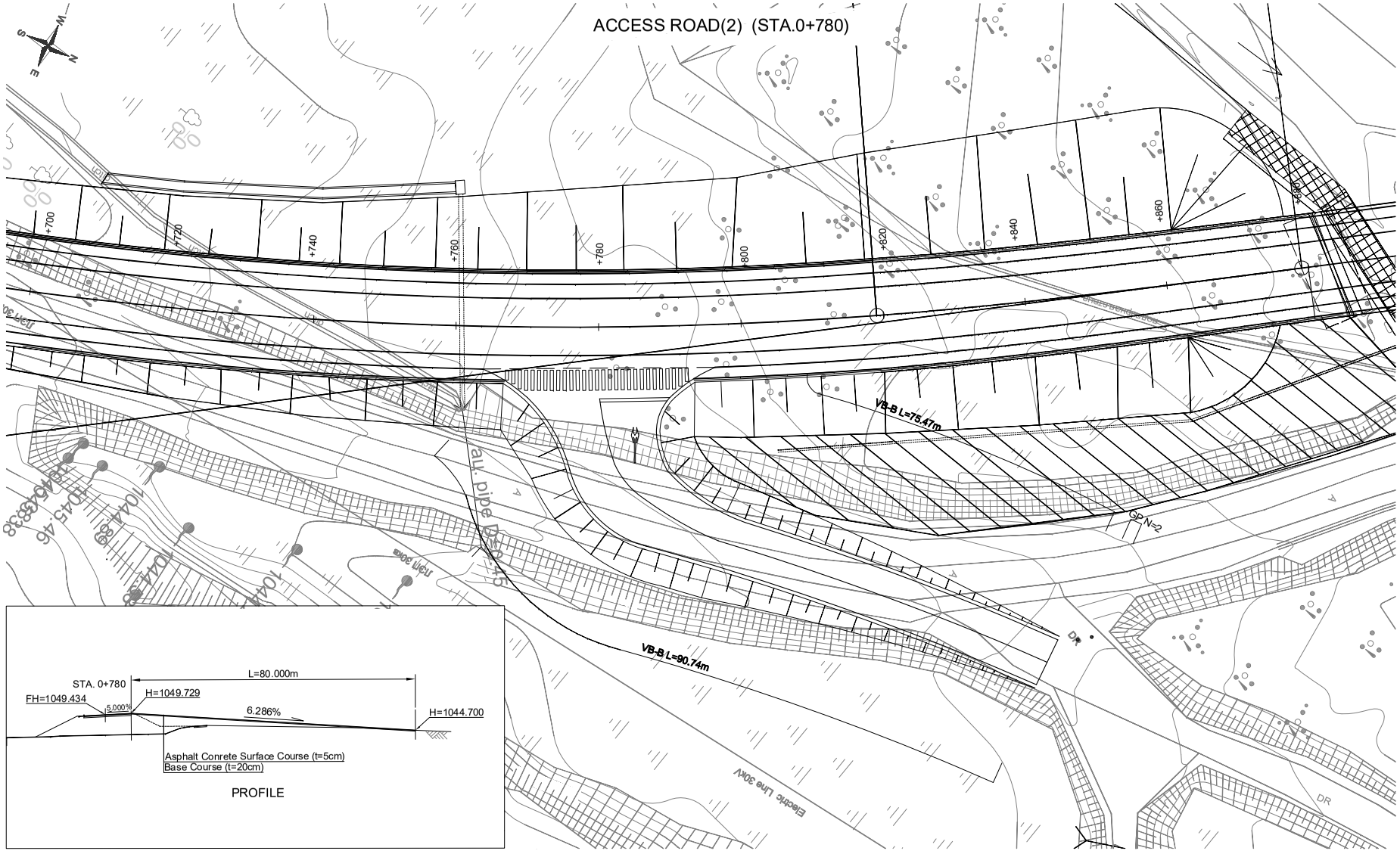


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DIKE PROFILE	Drawing No.	DP-01
				SCALE	AS SHOWN
				DATE	MAR. 2018

ACCESS ROAD(1) (STA.0+300)

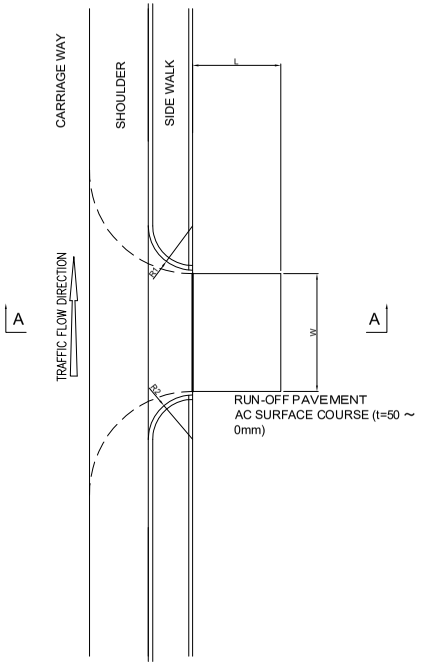


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : ACCESS ROAD(1) (STA.0+300)	Drawing No.	AR-01
				SCALE	1 : 500
				DATE	MAR. 2018

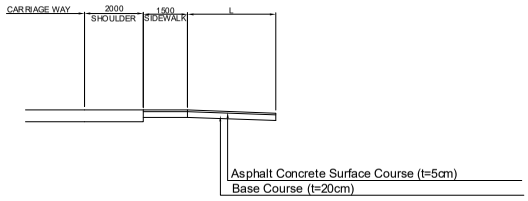


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : ACCESS ROAD(2) (STA.0+780)	Drawing No.	AR-02
				SCALE	1:500
				DATE	MAR. 2018

ACCESS ROAD(3)



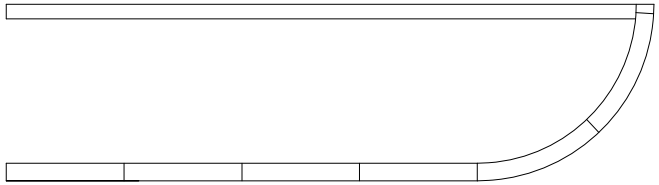
PLAN



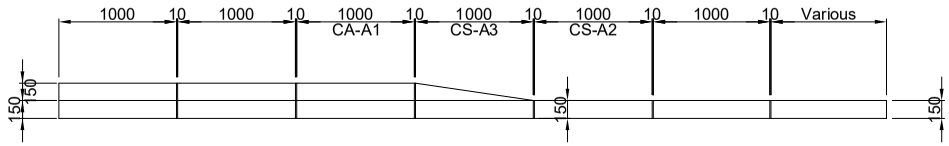
A - A SECTION

SCHEDULE OF ACCESS ROAD

No.	STATION	R/L	R1	R2	W	L	REMARKS
1	0+300	L	1.5	4.0	8.5	10.0	
2	0+500	L	3.0	5.0	7.0	10.0	
3	0+590	L	5.0	4.0	4.0	10.0	
4	0+780	L	22.0	22.0	7.0	80.0	
5	1+070	R	1.5	1.5	6.0	10.0	



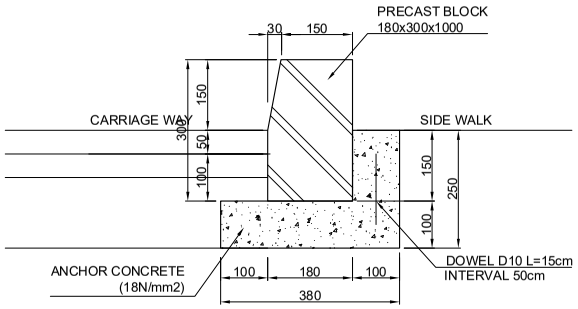
PLAN



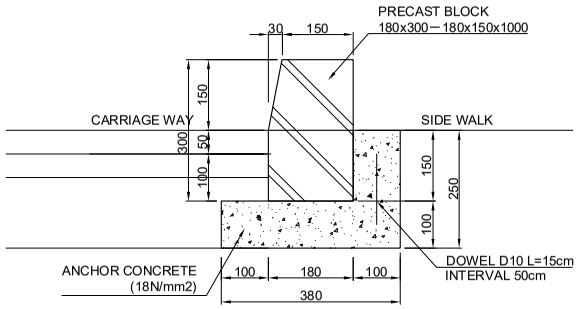
SIDE VIEW

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : ACCESS ROAD (3)	Drawing No.	AR-03
				SCALE	NO SCALE
				DATE	MAR. 2018

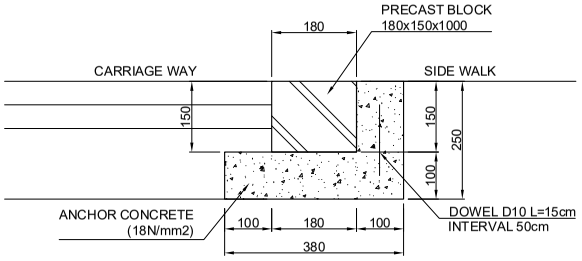
ROAD STRUCTURE



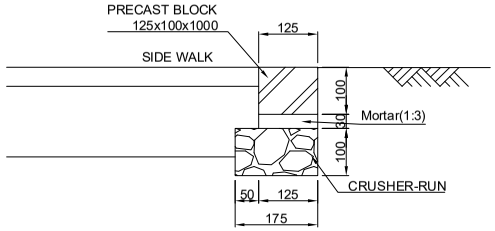
CS-A1 S=1/50



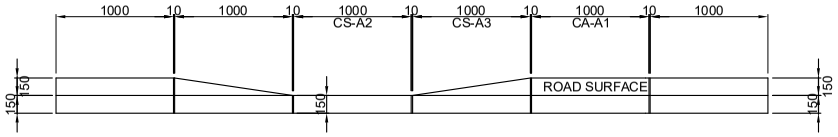
CS-A3 S=1/50



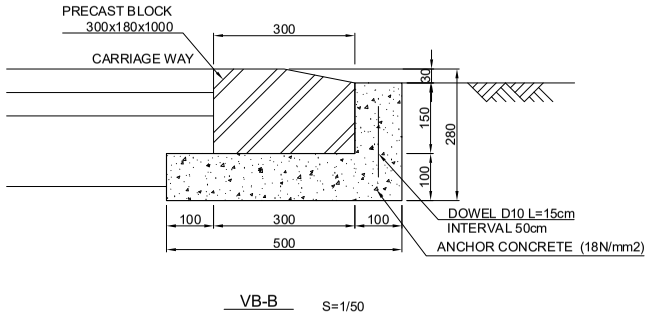
CS-A2 S=1/50



VB-A S=1/50



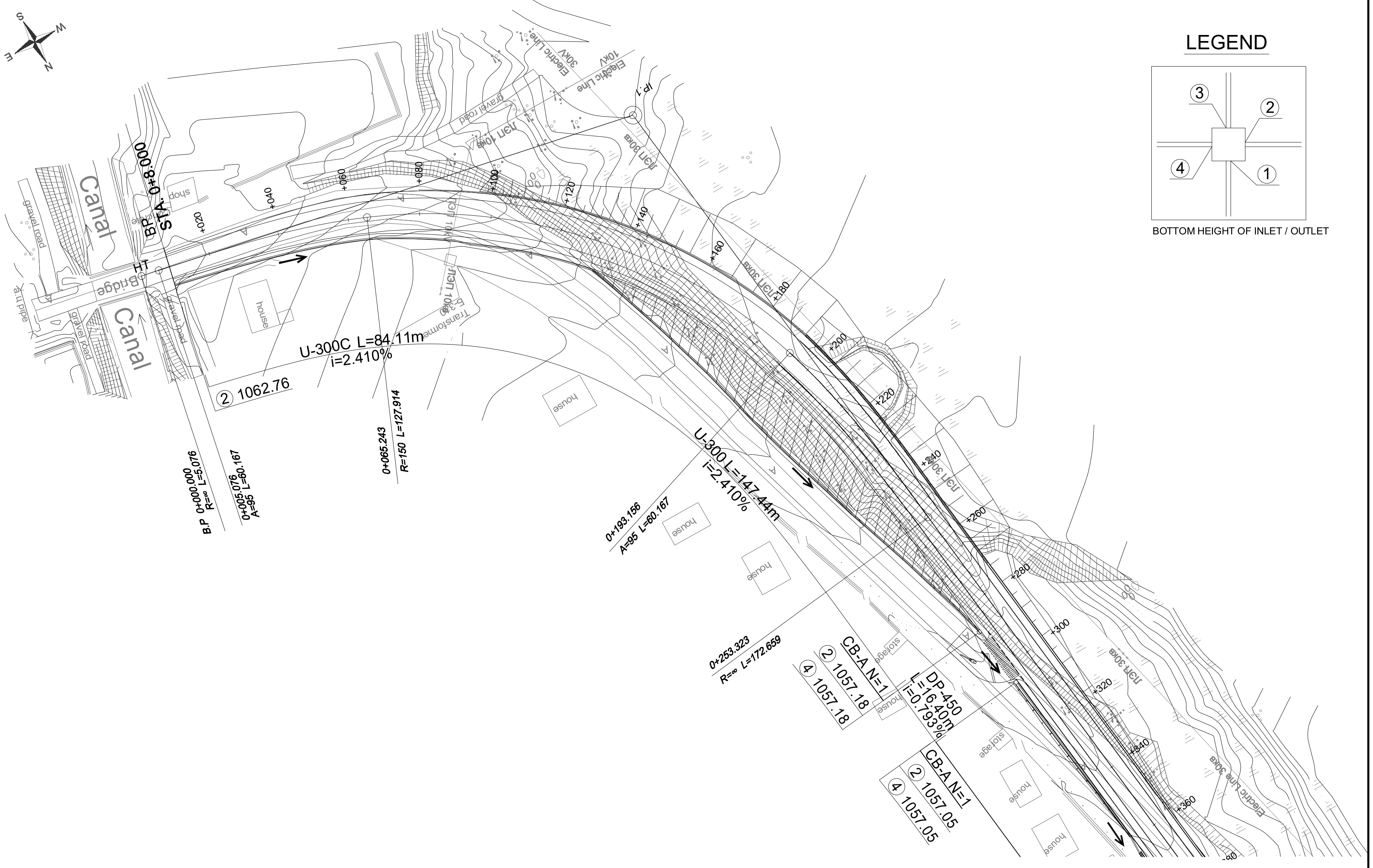
PLAN S=1/200



VB-B S=1/50

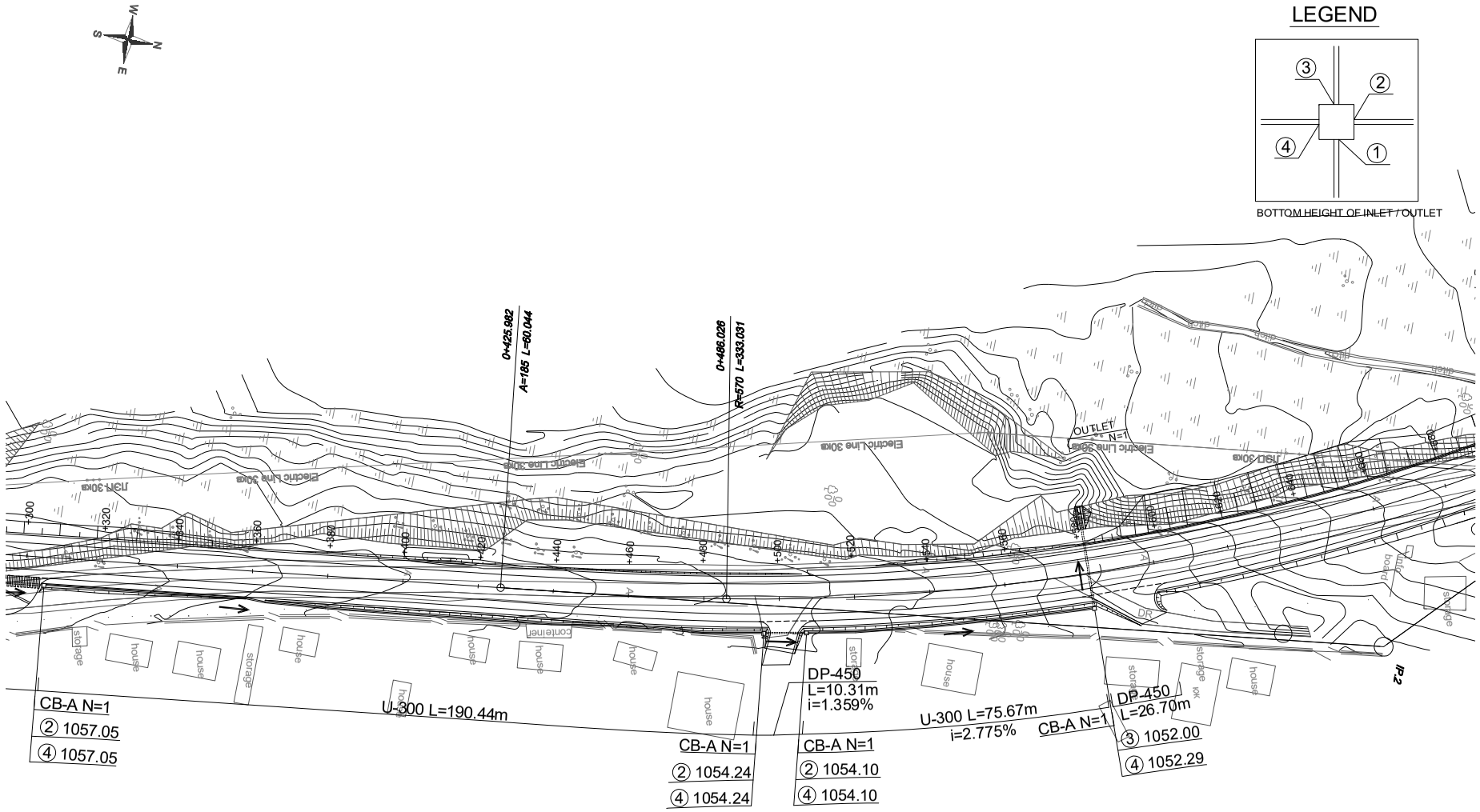
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : ROAD STRUCTURE	Drawing No.	RS-01
				SCALE	AS SHOWN
				DATE	MAR. 2018

DRAINAGE SYSTEM(1)

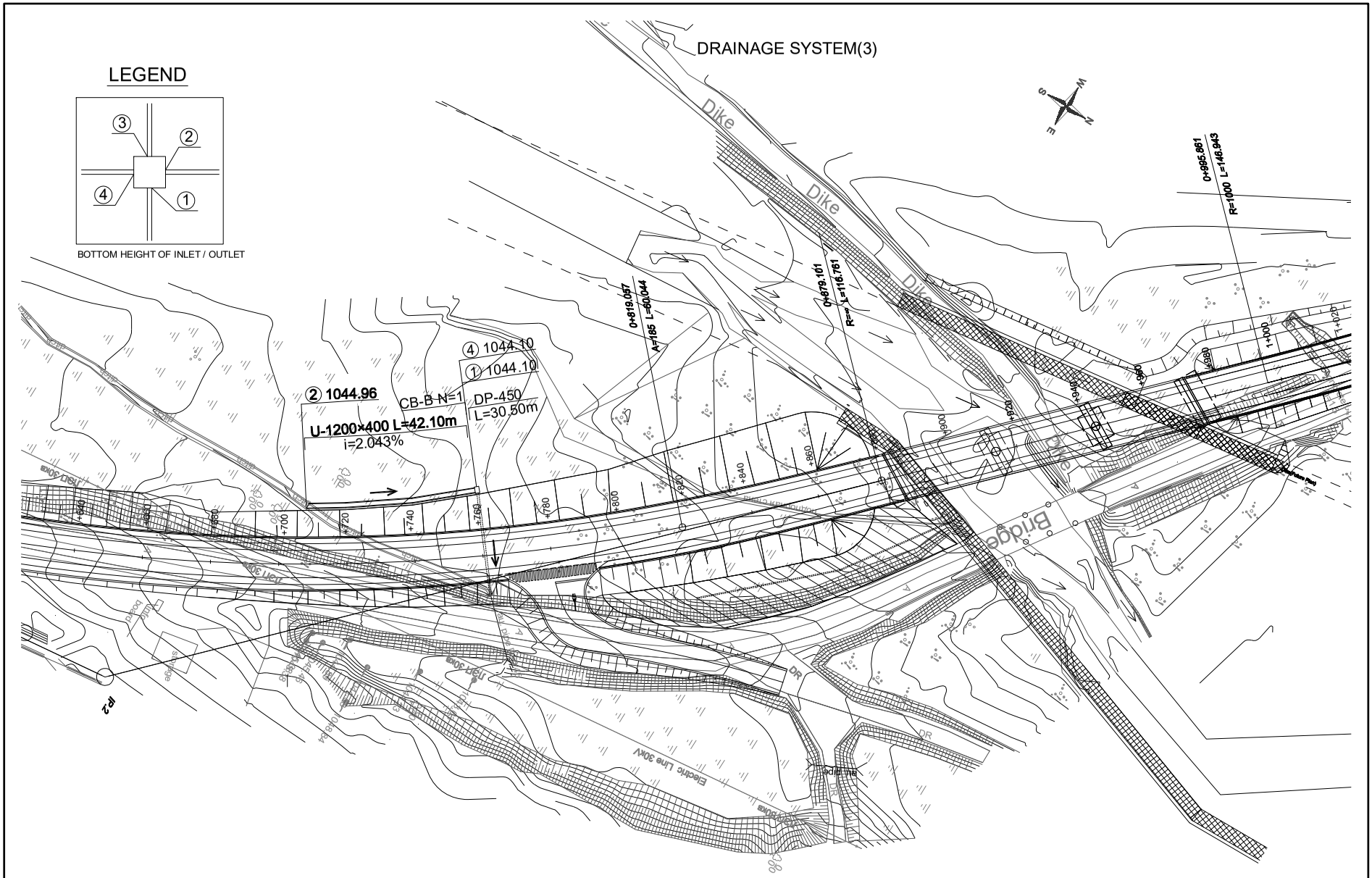


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE SYSTEM(1)	Drawing No.	DS-01
				SCALE	1 : 1000
				DATE	MAR. 2018

DRAINAGE SYSTEM(2)

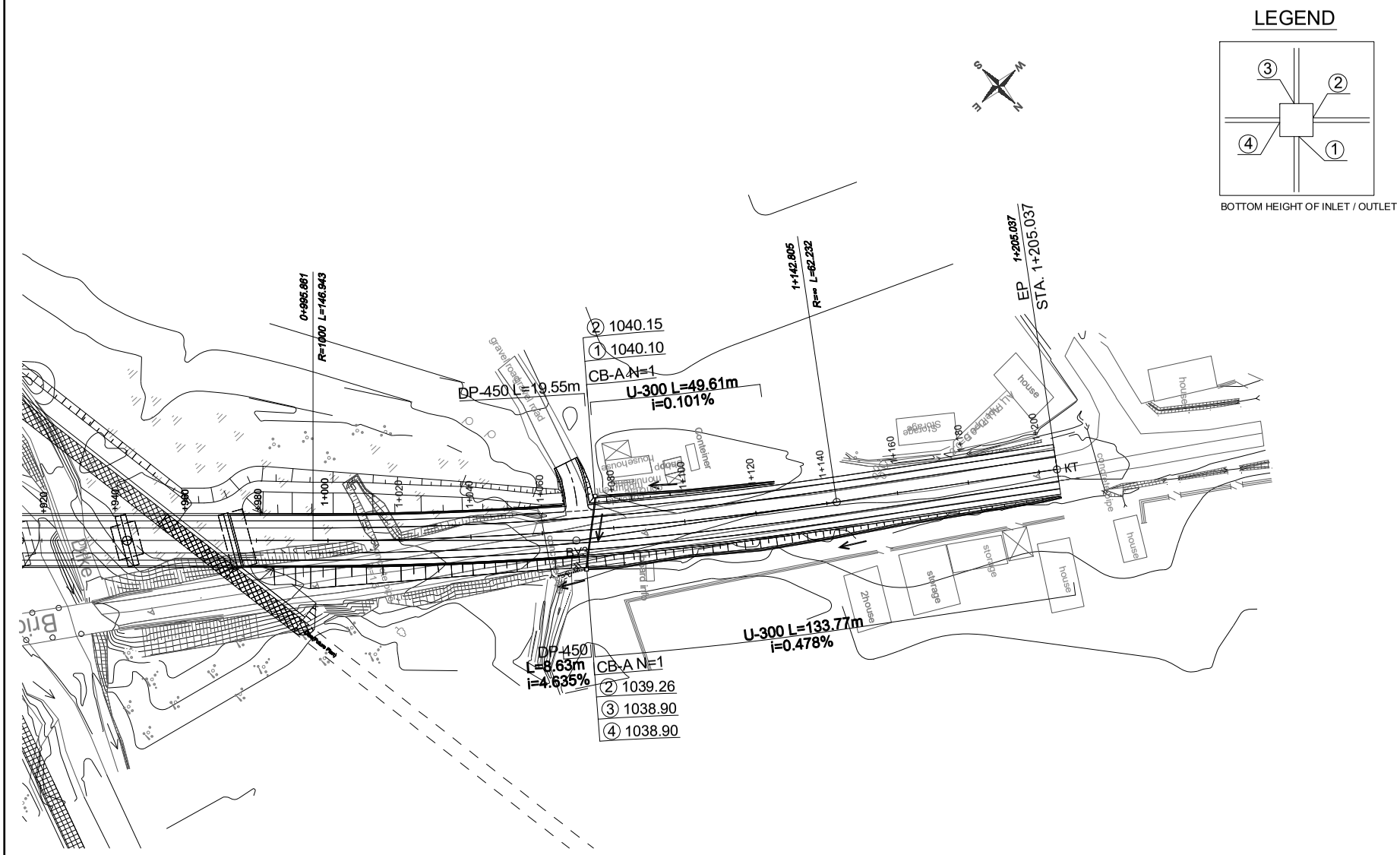


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE SYSTEM(2)	Drawing No.	DS-02
				SCALE	1 : 1000
				DATE	MAR. 2018



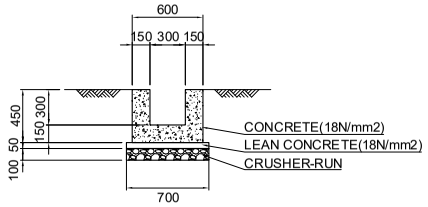
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE SYSTEM(3)	Drawing No.	DS-03
				SCALE	1 : 1000
				DATE	MAR. 2018

DRAINAGE SYSTEM(4)

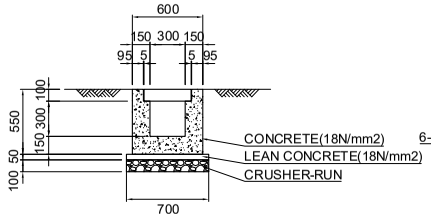


MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE SYSTEM(4)	Drawing No.	DS-04
				SCALE	1 : 1000
				DATE	MAR. 2018

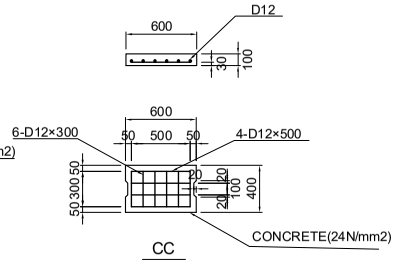
DRAINAGE STRUCTURES(1)



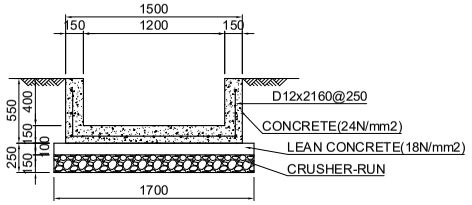
U-300



U-300C



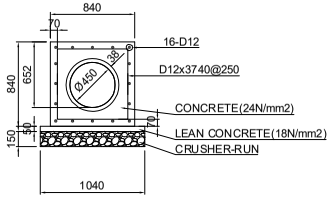
CC



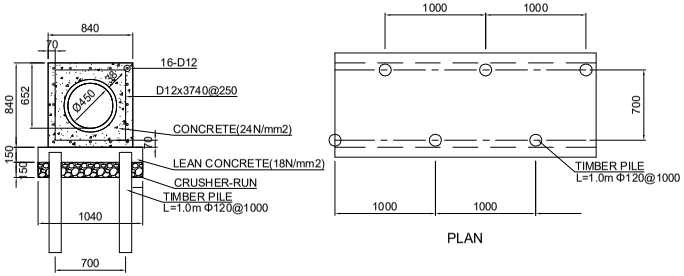
U-1200

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE STRUCTURES(1)	Drawing No.	DS-05
				SCALE	S=1/50
				DATE	MAR. 2018

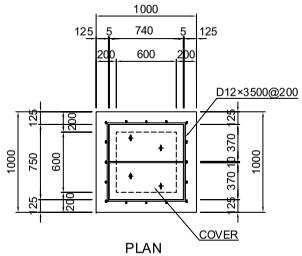
DRAINAGE STRUCTURES(2)



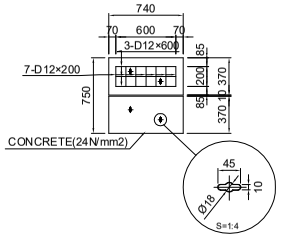
DP450A (Co.360° Base)



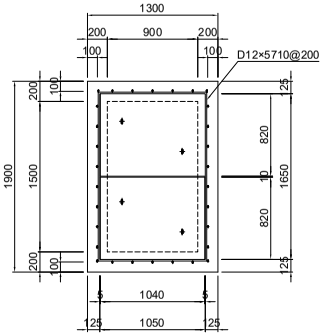
DP450B (TIMBER PILE)



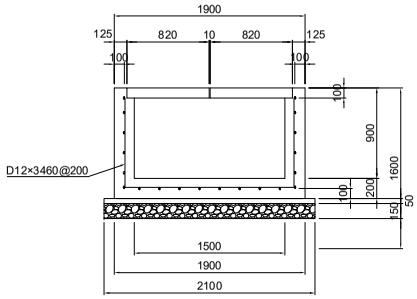
PLAN



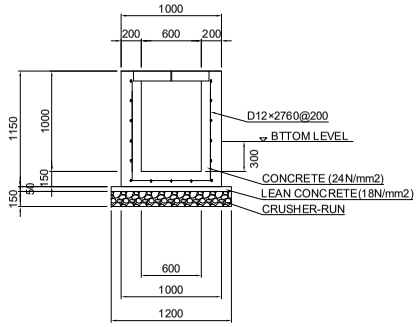
COVER 370×740



PLAN

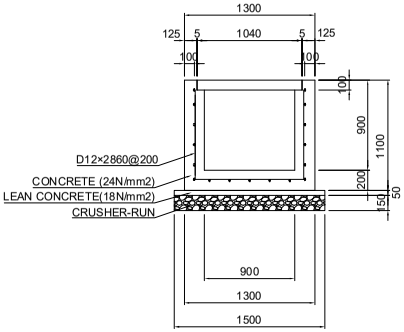


ELEVATION



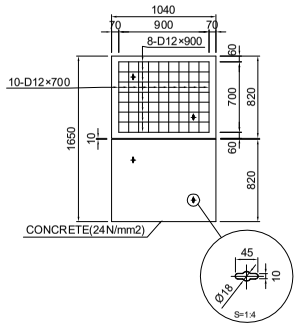
SECTION

CB-A



SECTION

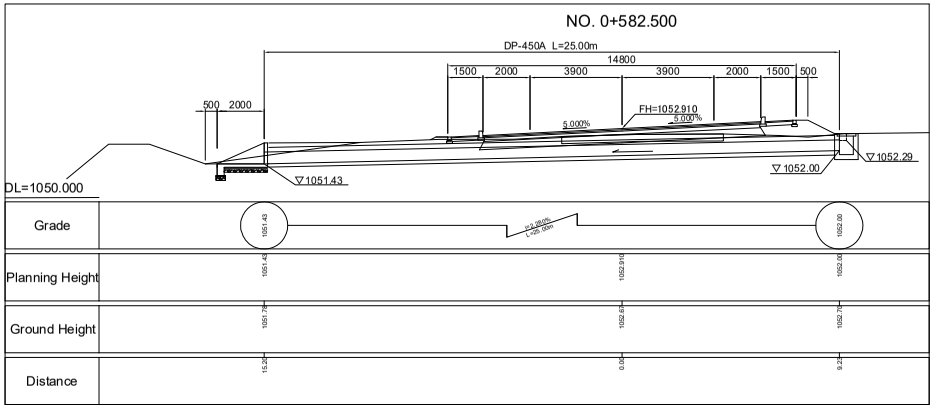
CB-B



COVER 820×1040

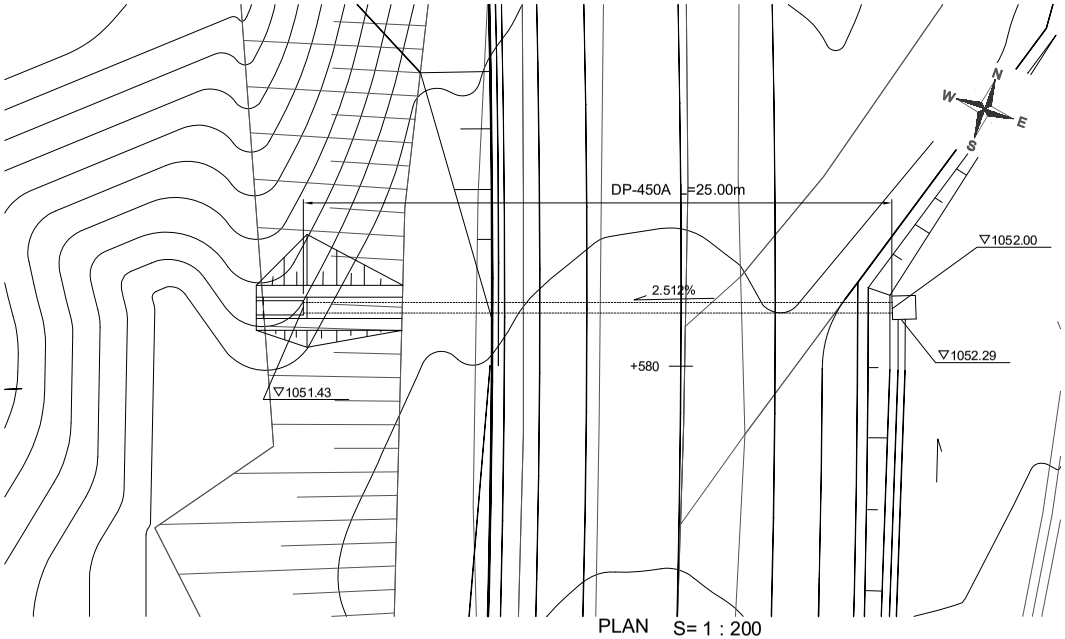
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE STRUCTURE (2)	Drawing No.	DS-06
				SCALE	S=1/50
				DATE	MAR. 2018

DRAINAGE STRUCTURE(3)

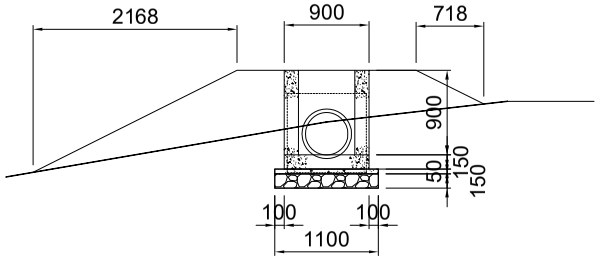


PROFILE S= 1 : 200

STA.0 +582.500



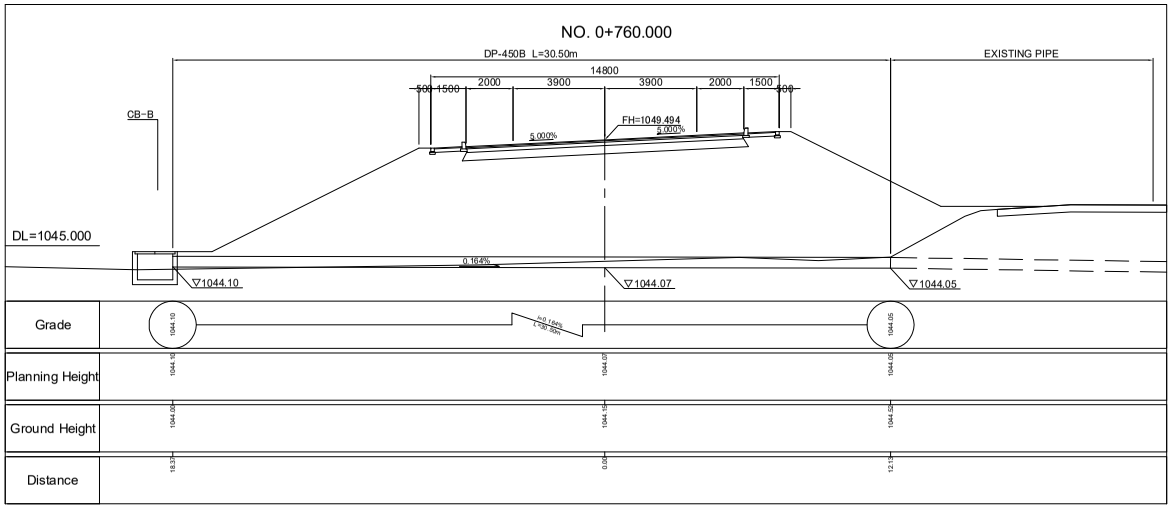
PLAN S= 1 : 200



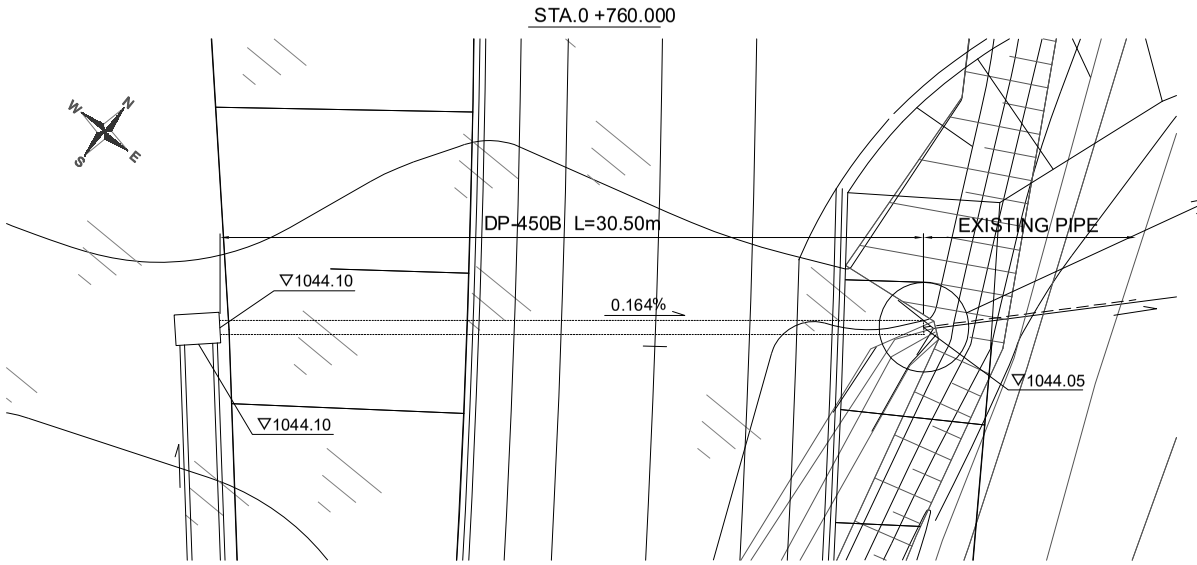
CROSS SECTION S= 1 : 100

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE STRUCTURE(3) CONCRETE PIPE CULVERT	Drawing No.	DS-07
				SCALE	AS SHOW
				DATE	MAR. 2018

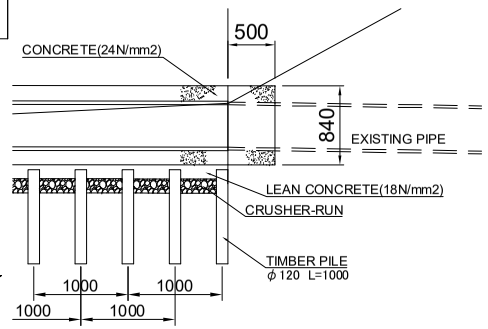
DRAINAGE STRUCTURE(4)



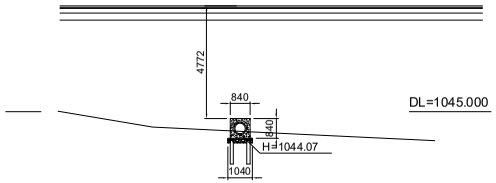
PROFILE S= 1 : 200



PLAN S= 1 : 200



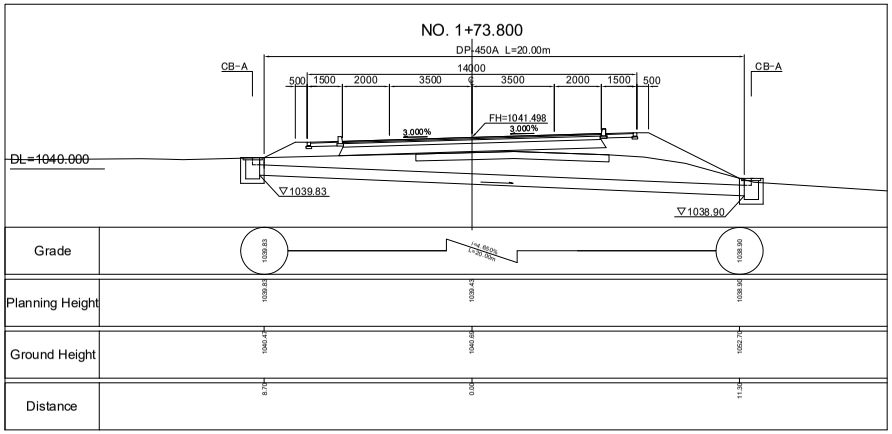
DETAIL OF CONNECT S= 1 : 100



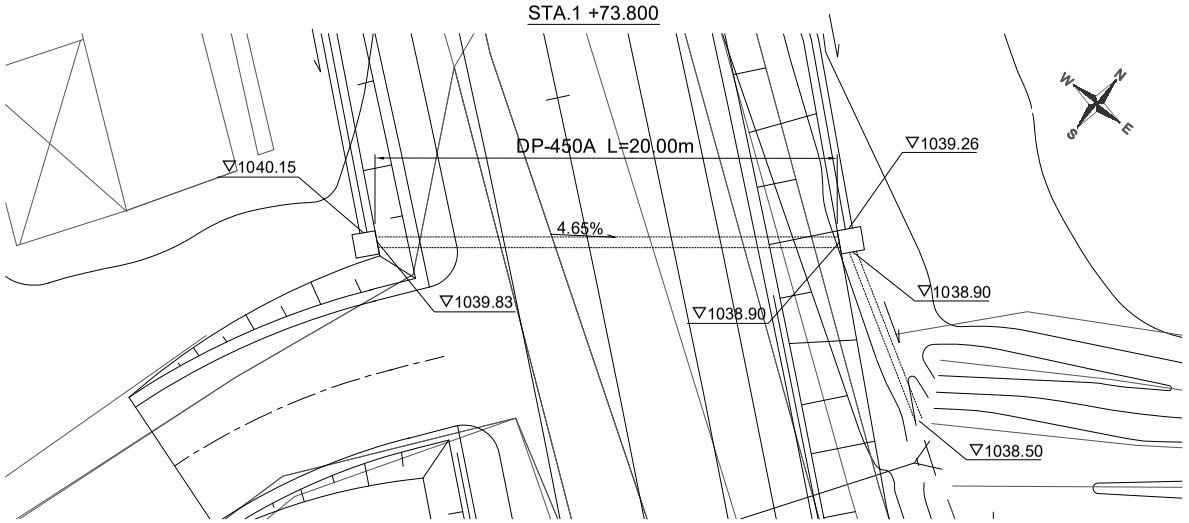
CROSS SECTION S= 1 : 200

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE STRUCTURE(4) CONCRETE PIPE CULVERT	Drawing No.	DS-08
				SCALE	AS SHOW
				DATE	MAR. 2018

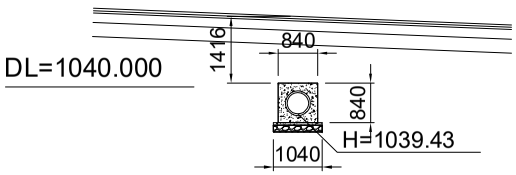
DRAINAGE STRUCTURE(5)



PROFILE S= 1 : 200



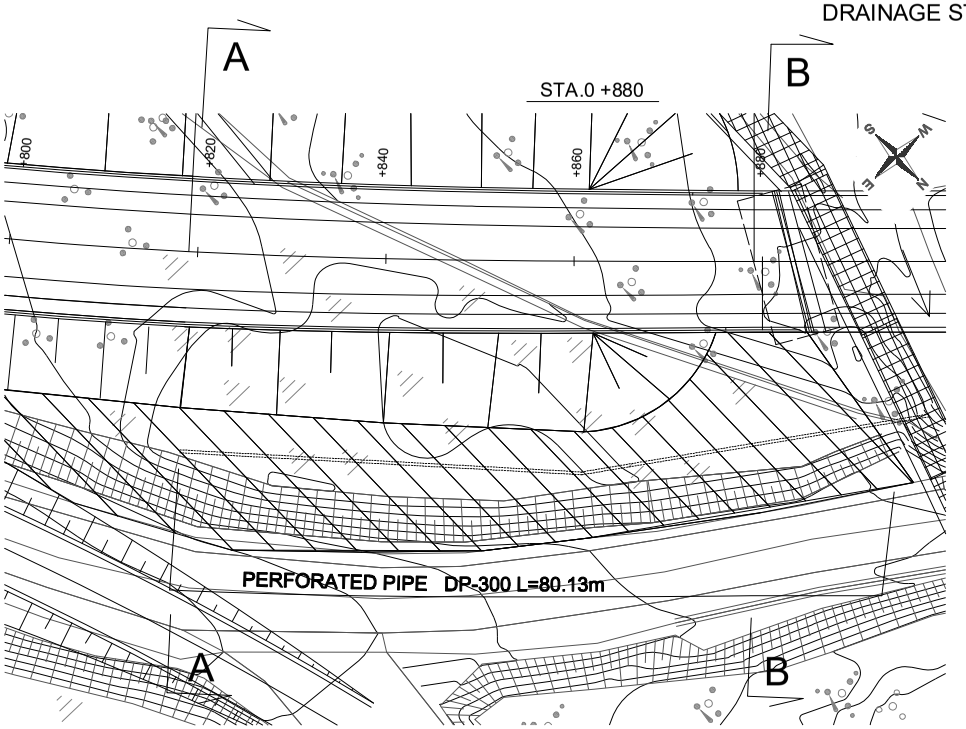
PLAN S= 1 : 200



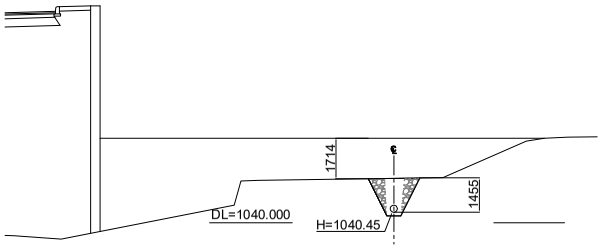
CROSS SECTION S= 1 : 100

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE STRUCTURE(5) CONCRETE PIPE CULVERT	Drawing No.	DS-09
				SCALE	AS SHOW
				DATE	MAR. 2018

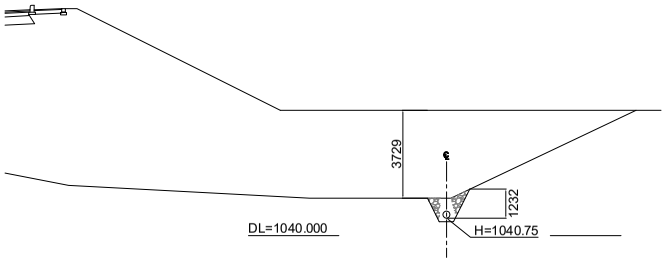
DRAINAGE STRUCTURE(6)



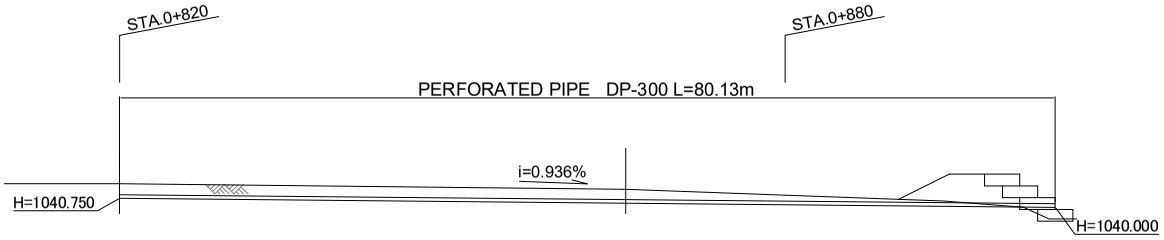
PLAN S=1:500



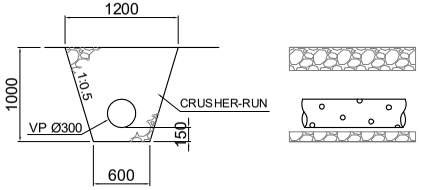
B－B SECTION S=1:500
（STA.0+880）



A－A SECTION S=1:500
(STA.0+820)



PROFILE S=1:500

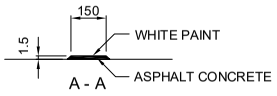


PERFORATED PIPE S=1:50

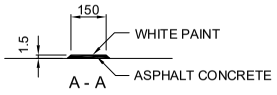
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : DRAINAGE STRUCTURE(6)	Drawing No.	DS-10
				SCALE	AS SHOWN
				DATE	MAR. 2018

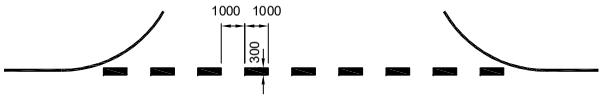
ROAD MARKING

CENTRE LINE

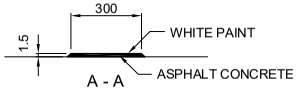


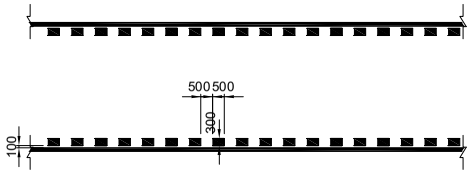
EDGE LINE



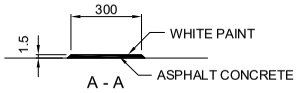


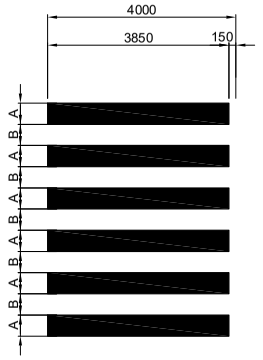
BROKEN LINE



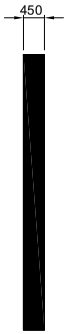


DOT LINE





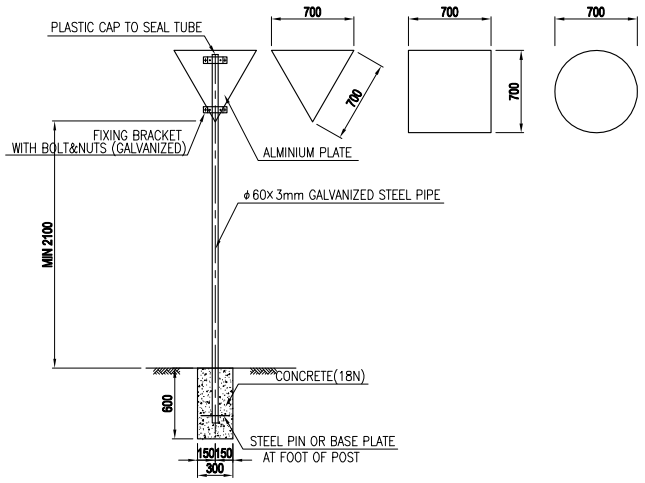
CROSS WALK



STOP LINE

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : ROAD MARKING	Drawing No.	RM-01
				SCALE	S=1/200
				DATE	MAR. 2018

ROAD SIGN (1)



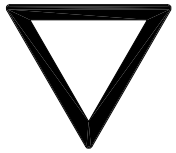
DETAIL OF ROAD SIGN S=1/40

SCHEDULE OF ROAD SIGN

SPEED LIMIT (50km/h)	0-50 (R)	0+300 (L)
CROSS WALK	0+495 (R)	0+525 (L)
GIVE WAY	0+305 (R)	0+505 (R)
	0+600 (R)	0+790 (R)
	1+65 (L)	

SPEED LIMIT
(50km)

CROSS WALK

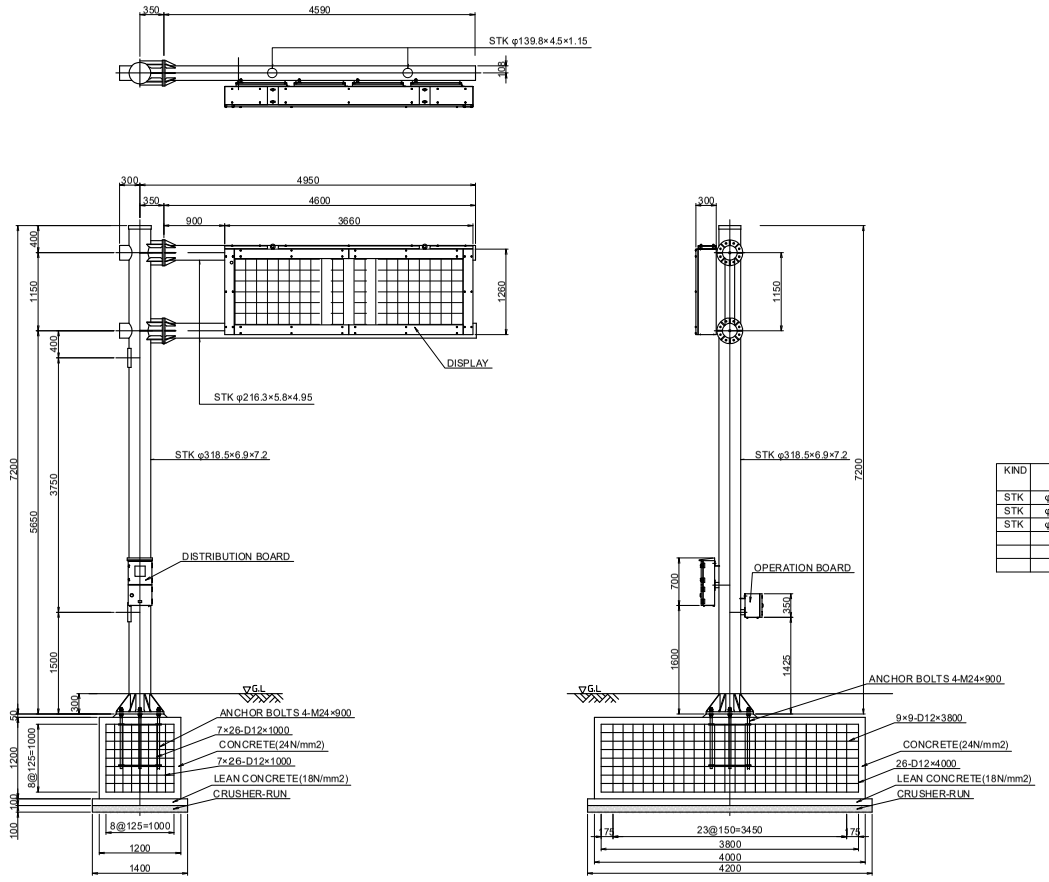


GIVE WAY

SIGN BOAD S=1/20

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : ROAD SIGN (1) (DETAIL AND SCHEDULE)	Drawing No.	RS -01
				SCALE	AS SHOWN
				DATE	MAR. 2018

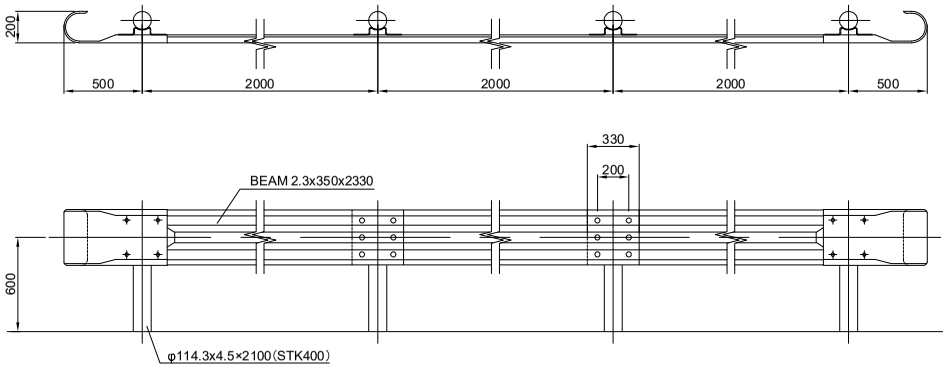
LIGHTING DISPLAY BOARD



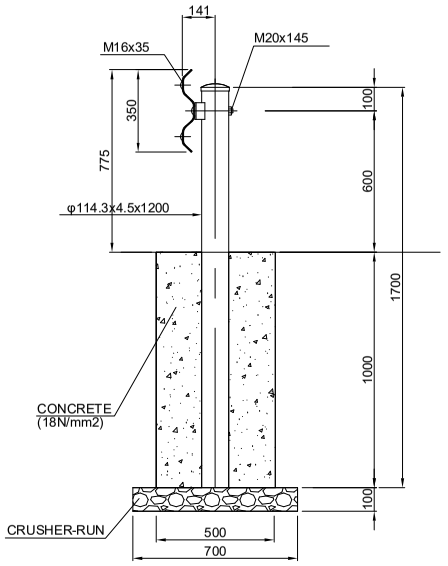
KIND	DIMENSION	UNIT WEIGHT (KG)	NUMBER	TOTAL WEIGHT	NOTE
STK	φ318.5×6.9×7.2	381.6	1	381.6	
STK	φ216.3×5.8×4.95	149.0	2	298.0	
STK	φ139.8×4.5×1.15	17.25	2	34.5	
	TOTAL			714.1	

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : ROAD SIGN(2) LIGHTING DISPLAY BOARD	Drawing No.	RS-02
				SCALE	1 : 60
				DATE	MAR. 2018

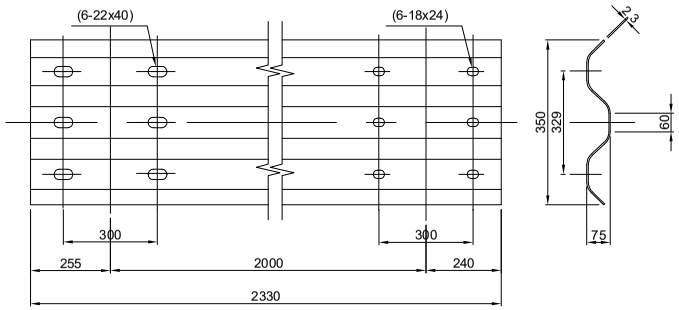
GUARDRAIL (GR- B-2B)



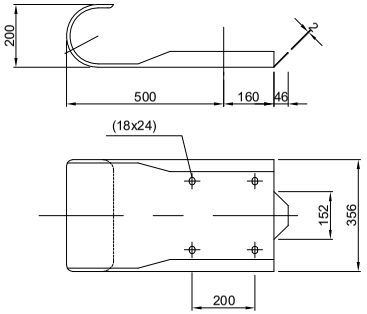
PLAN & SIDE VIEW S=1 : 30



POST S=1 : 20



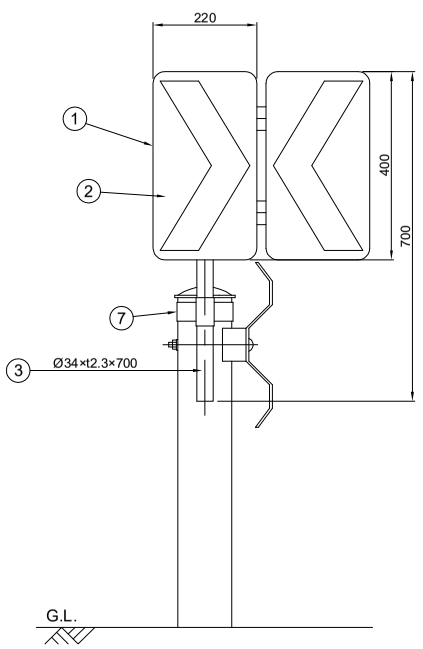
BEAM 2.3x350x2330 S=1 : 10

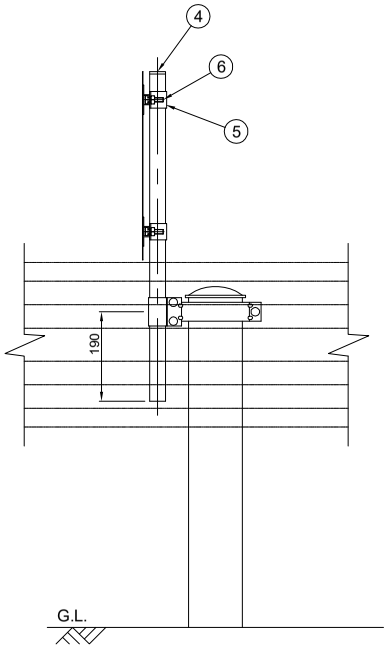


END BEAM S=1 : 10

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : GUARD RAIL (GR- B-2B)	Drawing No.	GR-01
				SCALE	AS SHOWN
				DATE	MAR. 2018

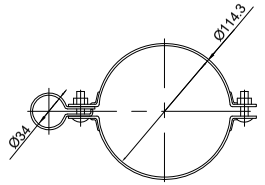
GUARD RAIL WITH CURB MARKER



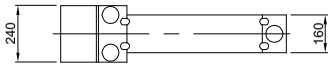


CURB MARKER DETAILE S=1/10

CURB MARKER		
No.	NAME	VOLUME
①	BASE PLATE(ALUMINIUM ALLOY)	2
②	REFLECTION SHEET	2
③	POST	1
④	CAP	1
⑤	U-BAND	2
⑥	BOLT/NUT	4
⑦	BRACKET RING	1



PLAN

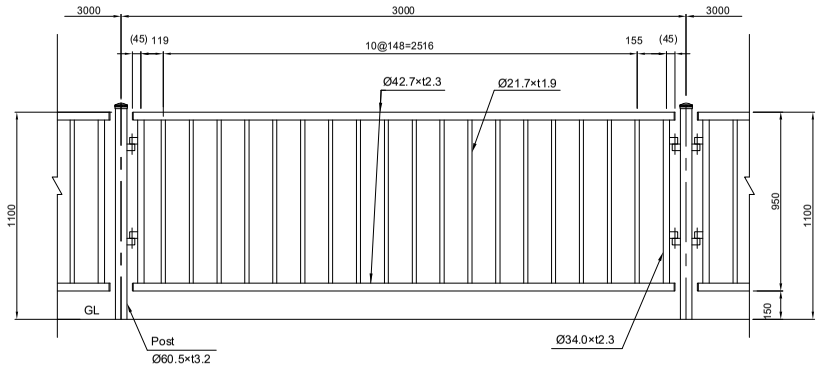


SIDE VEIW

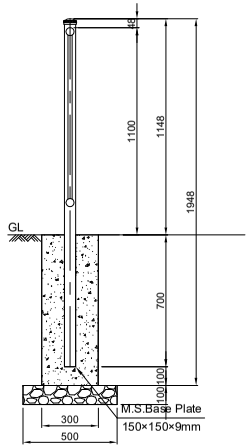
⑦ BRACKET RING S=1/5

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : GUARD RAIL WITH CURB MARKER	Drawing No.	GR -02
				SCALE	AS SHOWN
				DATE	MAR. 2018

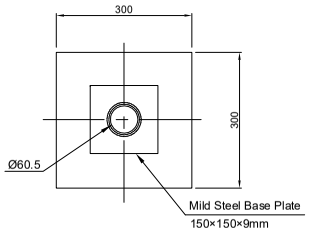
GUARD FENCE (GF)



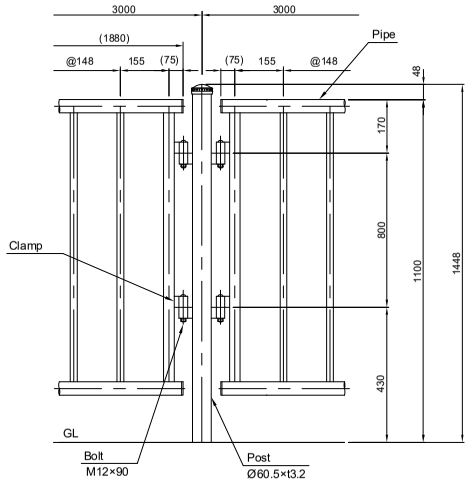
ELEVATION S=1/25



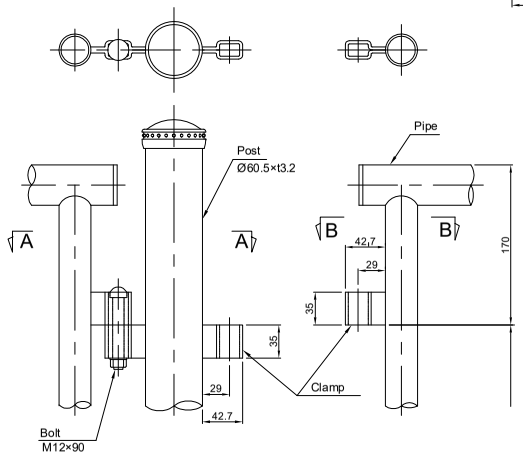
SECTION S=1/25



BASE PLATE DETAIL S=1/10



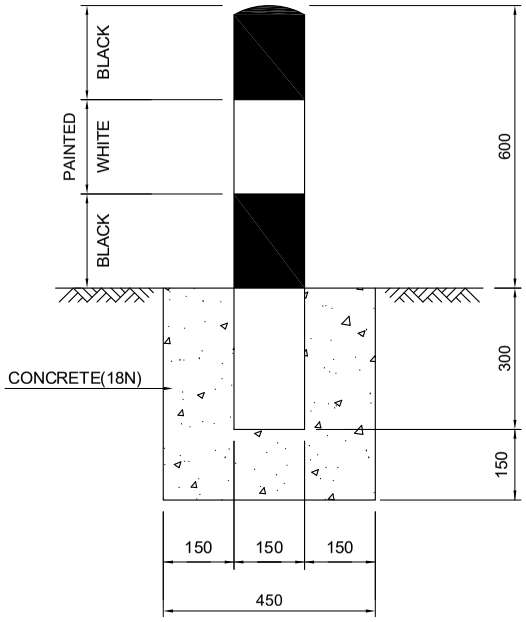
POST S=1/15



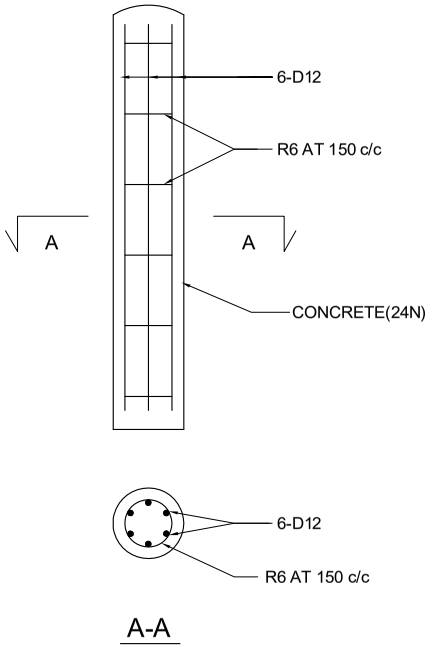
MOUNTING DETAIL S=1/5

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : GUARD FENCE (GF)	Drawing No.	GF-01
				SCALE	AS SHOWN
				DATE	MAR. 2018

GUARD POST (GP)



GUARD POST

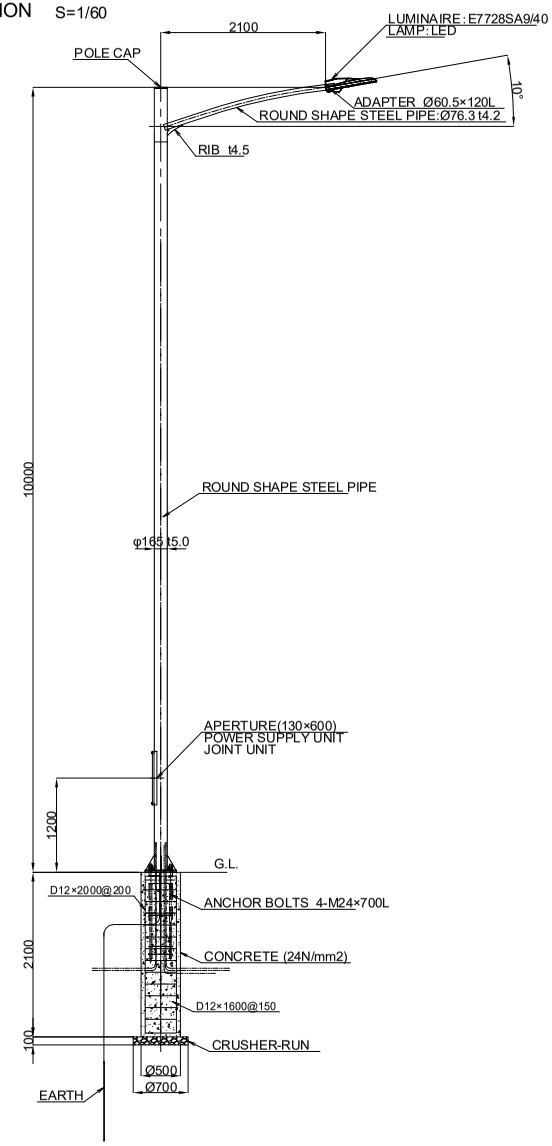


REINFORCEMENT

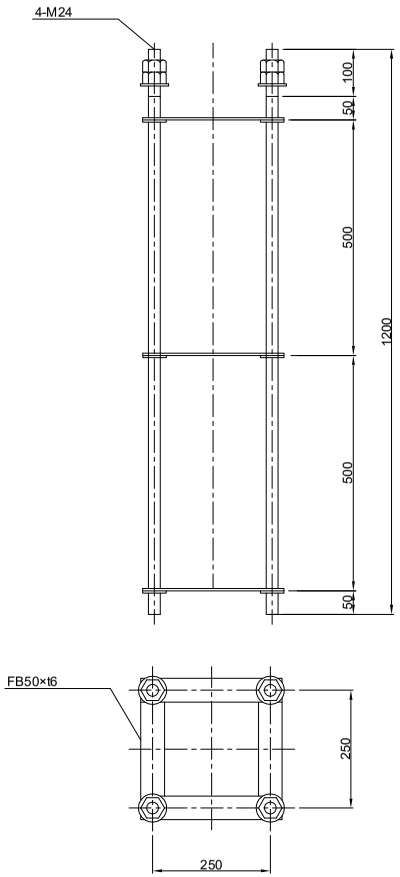
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : GUARD POST (GP)	Drawing No.	GP-01
				SCALE	S=1/10
				DATE	MAR. 2018

STREET LIGHT(1)

SECTION S=1/60



ANCHOR BOLT S=1/10

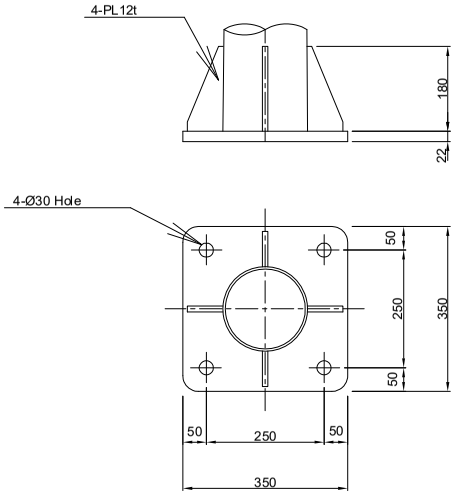


※Screw part galvanization

SCHEDULED LIST OF STREET LIGHTING

No.	Location	No.	Location
1	STA.0+040 L	2	STA.0+080 R
3	STA.0+120 L	4	STA.0+160 R
5	STA.0+200 L	6	STA.0+240 R
7	STA.0+280 L	8	STA.0+320 R
9	STA.0+360 L	10	STA.0+400 R
11	STA.0+440 L	12	STA.0+480 R
13	STA.0+520 L	14	STA.0+560 R
15	STA.0+600 L	16	STA.0+640 R
17	STA.0+680 L	18	STA.0+720 R
19	STA.0+760 L	20	STA.0+800 R
21	STA.0+890 L	22	STA.0+840 R
23	STA.0+970 L	24	STA.0+930 R
25	STA.1+050 L	26	STA.1+010 R
27	STA.1+130 L	28	STA.1+090 R
		29	STA.1+170 R

BASE PLATE S=1/10



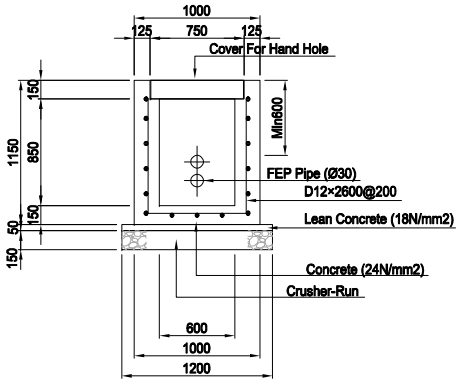
Specification

1.Surface Treatment : Hot dip Galvanized

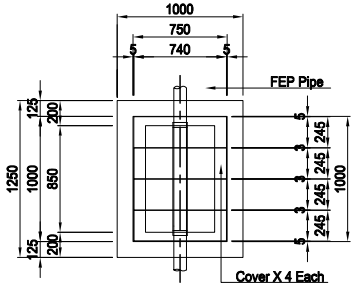
2.Design Wind Speed : 50m/sec

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : STREET LIGHT(1)	Drawing No.	SL-01
				SCALE	AS SHOWN
				DATE	MAR. 2018

STREET LIGHT(2)

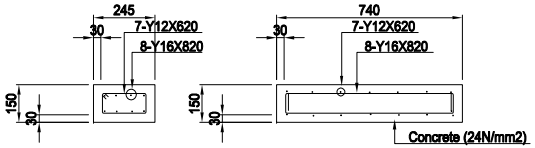


ELEVATION

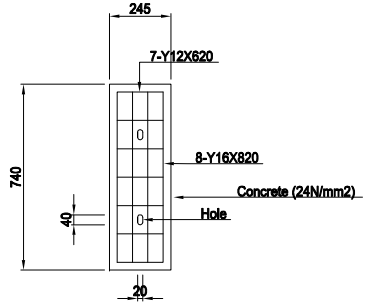


PLAN

HAND HOLE(HH) S=1/10

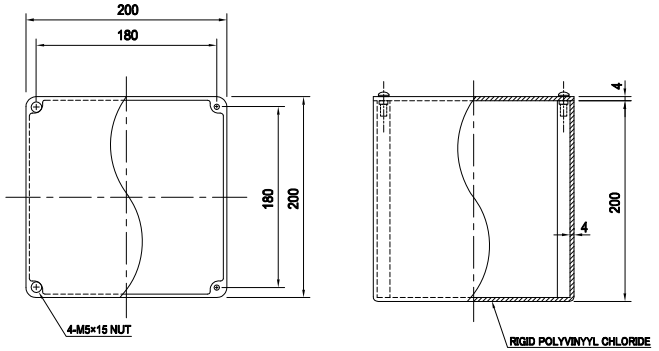


SECTION ELEVATION



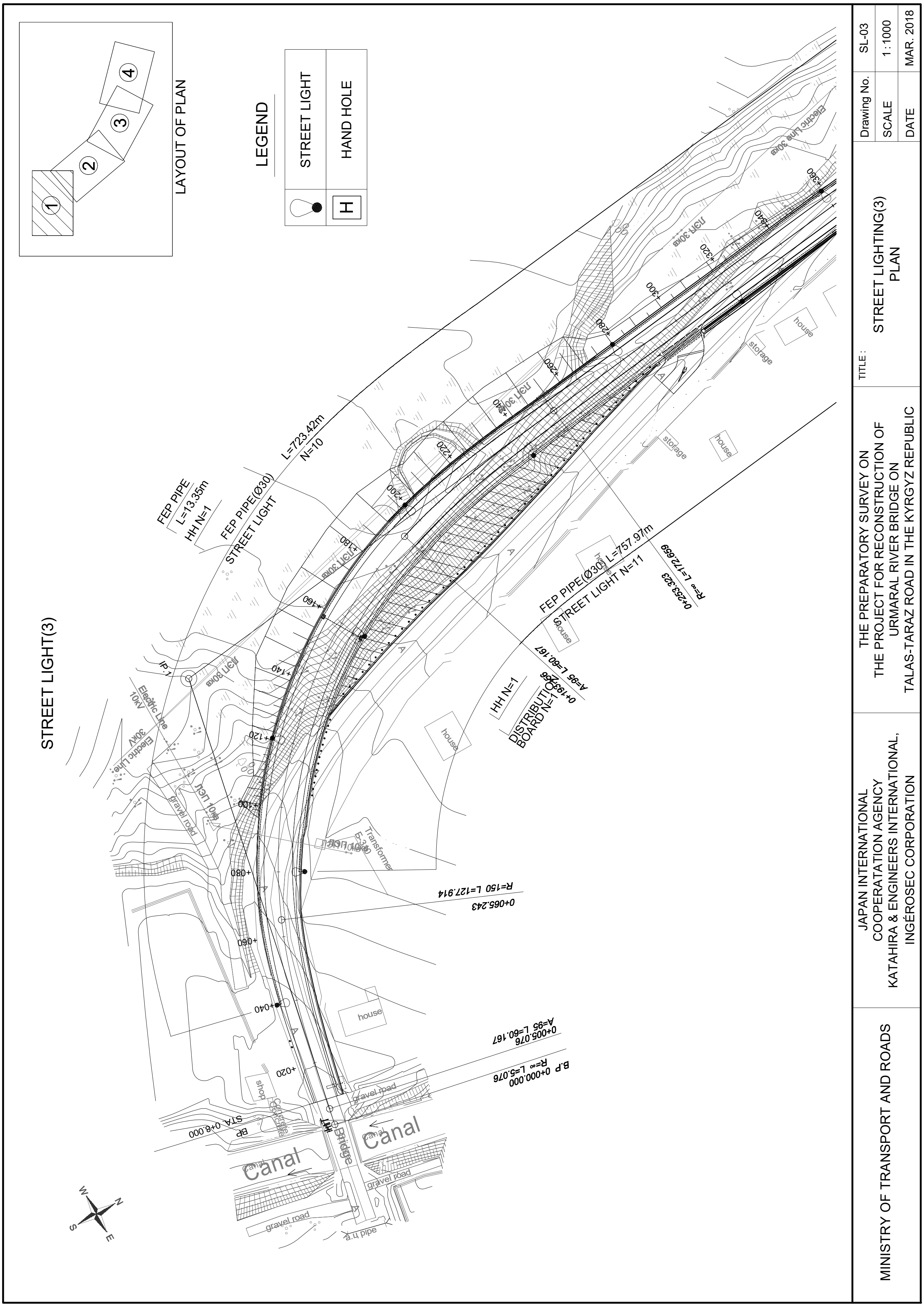
PLAN

COVER S=1/10



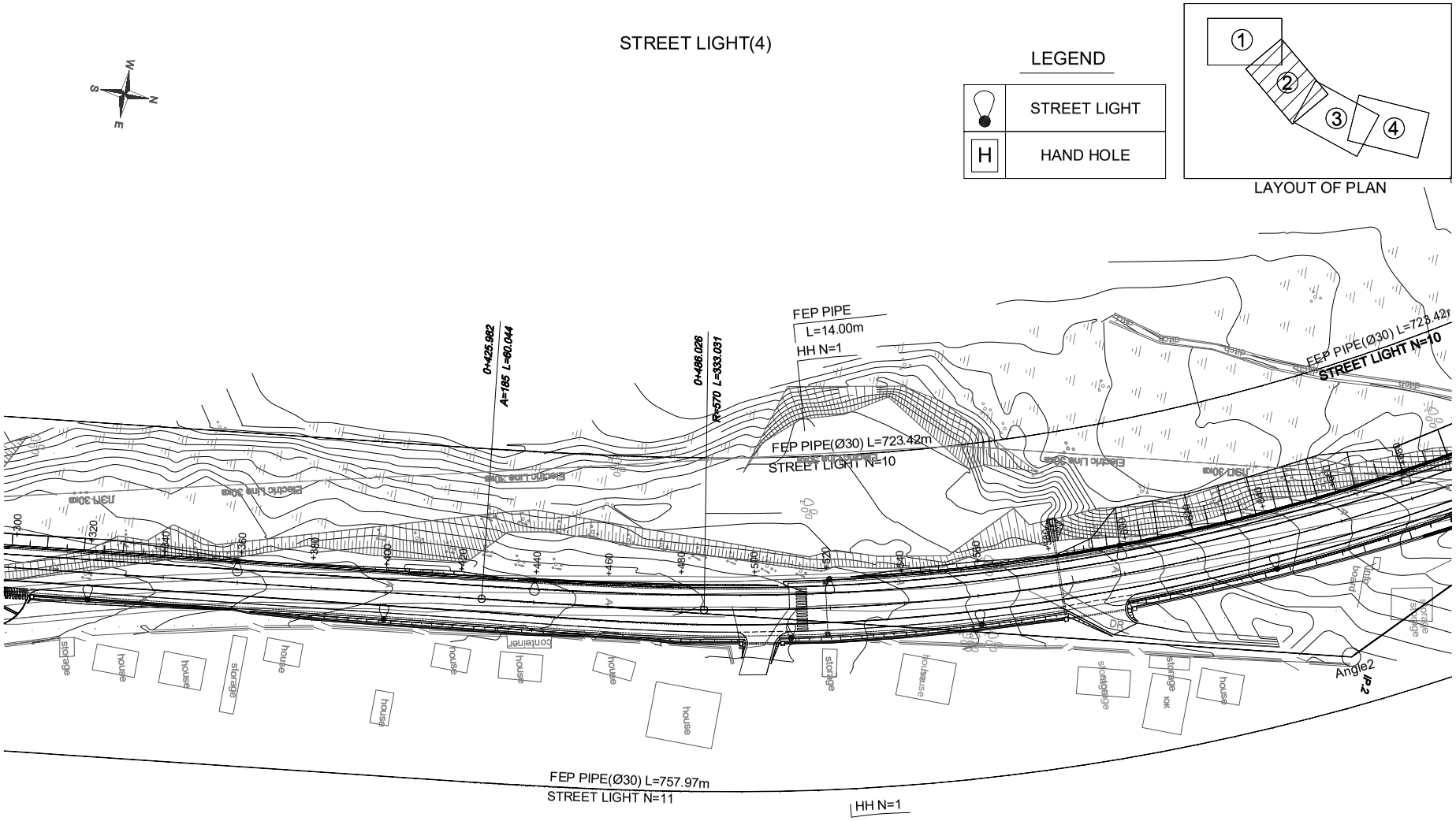
PULL BOX S=1/5

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : STREET LIGHT(2) DUCT PIPE HAND HOLE	Drawing No.	SL-02
				SCALE	AS SHOWN
				DATE	MAR. 2018

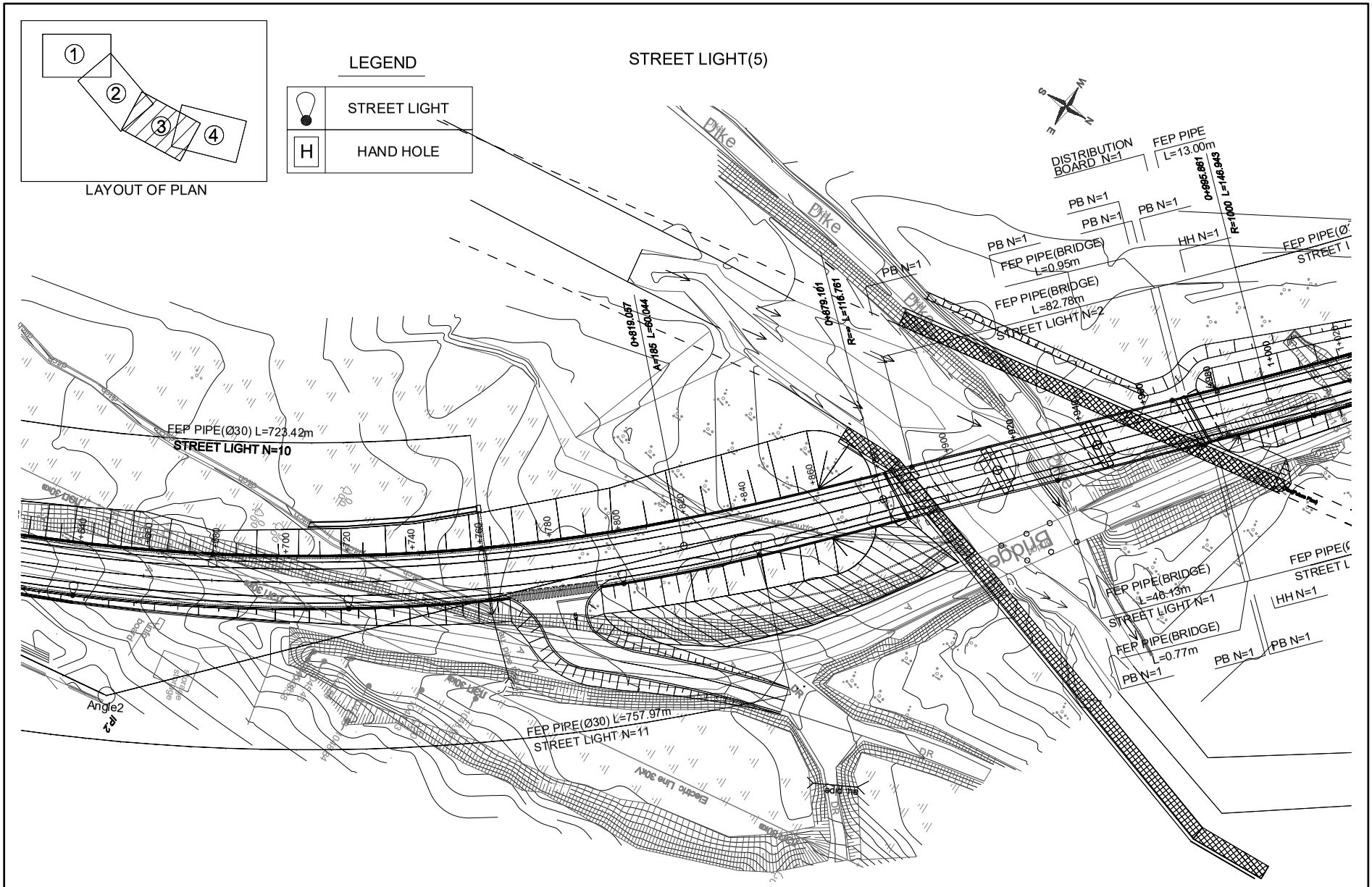


STREET LIGHT(3)
LAYOUT OF PLAN
1
2
3
4
LEGEND
STREET LIGHT
H
HAND HOLE
FEP PIPE
L=13.35m
HH N=1
FEP PIPE(Ø30)
STREET LIGHT
L=723.42m
N=10
FEP PIPE(Ø30) L=757.97m
STREET LIGHT N=11
HH N=1
DISTRIBUTION
BOARD N=1
R=∞ L=172.659
0+253.323
A=95 L=60.167
0+193.156
R=150 L=127.914
0+065.243
A=95 L=60.167
0+005.076
R=∞ L=5.076
B.P 0+000.000
BP STA. 0+8.000
Electric Line 10kV
Electric Line 30kV
Transformer
gravel road
Canal
Bridge
Concrete
shop
house
storage
a.u pipe
+020
+040
+060
+080
+100
+120
+140
+160
+180
+200
+220
+240
+260
+280
+300
+320
+340
+360
MINISTRY OF TRANSPORT AND ROADS
JAPAN INTERNATIONAL
COOPERATATION AGENCY
KATAHIRA & ENGINEERS INTERNATIONAL,
INGÉROSEC CORPORATION
THE PREPARATORY SURVEY ON
THE PROJECT FOR RECONSTRUCTION OF
URMARAL RIVER BRIDGE ON
TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC
TITLE :
STREET LIGHTING(3)
PLAN
Drawing No.
SL-03
SCALE
1:1000
DATE
MAR. 2018

STREET LIGHT(4)

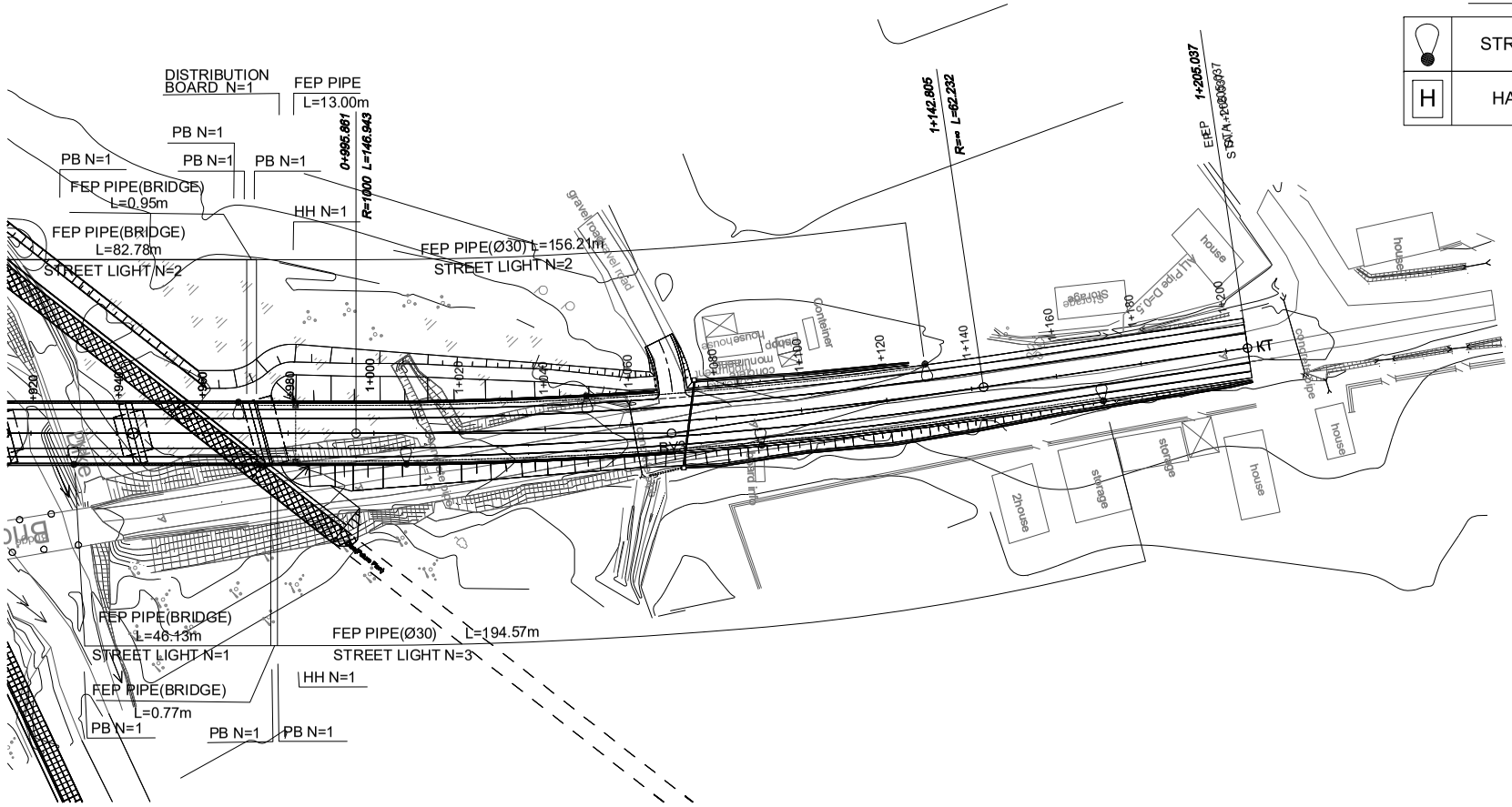


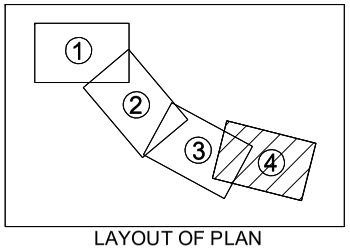
MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : STREET LIGHTING(4) PLAN	Drawing No.	SL-04
				SCALE	1 : 1000
				DATE	MAR. 2018



MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : STREET LIGHTING(5) PLAN	Drawing No.	SL-05
				SCALE	1 : 1000
				DATE	MAR. 2018

STREET LIGHT(6)





LAYOUT OF PLAN

LEGEND

	STREET LIGHT
H	HAND HOLE

MINISTRY OF TRANSPORT AND ROADS	JAPAN INTERNATIONAL COOPERATATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL, INGÉROSEC CORPORATION	THE PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF URMARAL RIVER BRIDGE ON TALAS-TARAZ ROAD IN THE KYRGYZ REPUBLIC	TITLE : STREET LIGHTING(6) PLAN	Drawing No.	SL-06
				SCALE	1 : 1000
				DATE	MAR. 2018

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

Basic concepts for implementation of the Project are as follows;

- On reaching an agreement and signing the exchange of note by both the Government of Japan and Kyrgyz, the Project will be implemented in accordance with the guideline of Japan's Grant Aid,
- The Ministry of Transport and Road (MoTR)and the Government of Kyrgyz (GoK) are responsible for the Project implementation,
- Assistance in tendering and construction supervision will be undertaken by a Japanese consulting firm in accordance with a contract between the MoTR and the consultant, and
- A Japanese pre-qualified tenderer who has been awarded the contract by the MoTR will undertake the implementation of the Project.

Main concepts for the implementation are as follows;

- Materials and labor for the project are procured in Kyrgyz as much as possible. If required qualities and capacities are not enough, materials and labor can be procured effectively from third countries and/or Japan,
- Implementation method and schedule for the Project shall be planned on the basis of local meteorological, topographic and geological conditions, as well as, any natural conditions affected by the construction works,
- General and easy method without specific equipment and technology shall be planned,
- Appropriate standards and specifications for construction shall be proposed, and site organizations of both the contractor and consultant shall be arranged to comply the abovementioned standards and specifications,
- Facilities to strictly secure safety for construction staff and third parties shall be installed, and

Protection against water pollution and flooding by the implementation and operation of quarry sites and borrow pits shall be done in order to preserve the environment. Construction waste shall be treated and/or dumped in a proper site specified by the Government of Kyrgyz.

2-2-4-2 Implementation Conditions

The construction plan and method shall be prepared in order to secure the safety of the construction staff and the third parties as the first priority, as well as to consider preservation of the environment for the road users and the residents living on the roadside.

(1) Present Bridge/Approach Road Functions

The project bridge and approach road are located in Talas-Taraz Road, which connects to Kazakhstan and crosses Urmaral River. The bridge and approach road are used as international arterial roads particularly by heavy vehicles, and the river crossing road is used by neighboring residents. Therefore, their functions as international arterial and river crossing roads shall be preserved during construction.

(2) Climate and Natural Conditions

Regarding climate and natural conditions, the project area experiences severe winter from December to February and snowmelt flooding of the river from June to August. Therefore, the implementation plan shall consider such climate and natural conditions.

(3) Safety Management for Road Users and Construction Personnel

Although the replacement bridge is planned to be separated from the existing bridge on the upstream side, a part of the new approach road is planned on the section where the existing road connects with the new road. Therefore, a detour road shall be provided next to the existing road to secure the area of the new approach road and separate the construction area from the area where road users pass in order to ensure smooth traffic flow and road safety.

On the other hand, a new pier is planned to be installed within in the cofferdam with sheet piles on the present river waterway, so safety training shall be carried out to ensure safety.

1) Safety for Road Users;
   - Construction yards will be clearly separated.
   - The detour road will have a sidewalk that is separated from the carriageway.
   - Security facilities such as barricades, detour routes indication boards, and so on as well as traffic controllers.
   - Prevention measures to the construction machine/vehicles drivers and operators shall be carried out through periodical traffic and construction safety educations.

2) Safety Management to Construction Personnel;
   - The engineer of safety management of the pier construction in the river will set during that construction.
   - Prevention measures to the construction shall be carried out through periodical safety educations.

3) Consideration for Environment
   - Debris and waste from the removal of the existing pavement and bridges shall be done in a proper manner to mitigate adverse environmental impacts.
   - Selection of borrow pits and quarry sites will be made with consultation of the relevant authorities, and at the location with the least negative impacts on the environment.
   - Dust control measures shall be carried out by spraying water promptly.
   - Provision of information and educative training on labor safety, public health, natural environment preservation measures shall be conducted for the construction workforce.

4) Laws related Construction Safety
   - Labour Code of the Republic of Kyrgyzstan of 4 August 2004
   - Law No. 142 of 26 of July 2016 "To Amend the Law "On Labour Protection""

(4) Construction Condition

The important conditions for the construction planning of this project are described below.

1) Routes for transportation of construction materials and equipment

Importing

Pile driving machines, pre-casting machinery and equipment materials, erection equipment, pile cut material, some bridge materials, etc. will be imported from Japan. Sea and rail transport routes are the two routes shown in Figure 2-2-42 and Table 2-2-34.

Figure 2-2-42 Transportation Routes Map

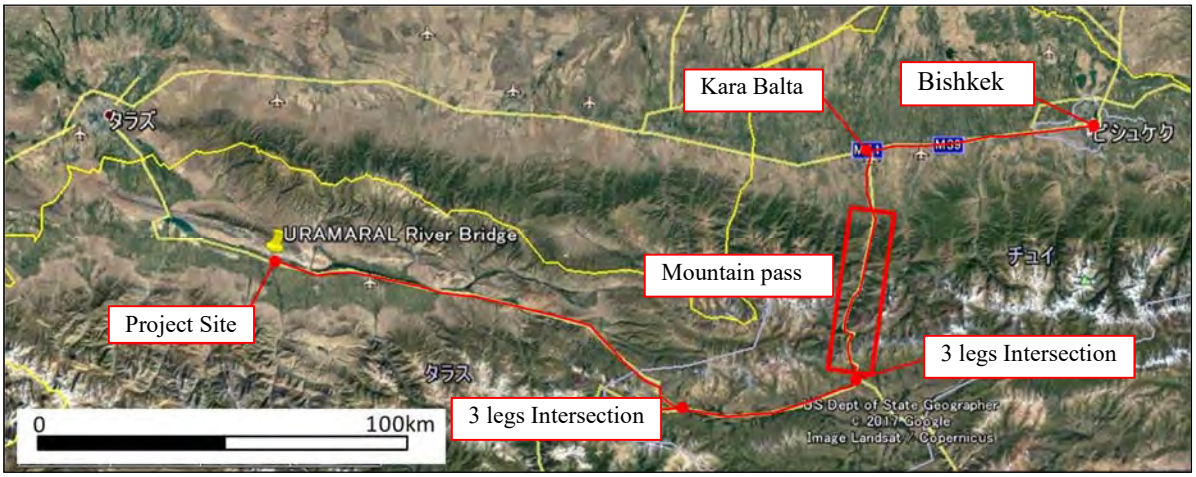
Table 2-2-34 Transportation Routes Description

Route	Features	Transportation contents
China	Cross China via Lianyungang and other places in China via the railway, reload to the Kazakhstan railway, because of the difference in rail width and transport to Bishkek city. Because of restrictions on transshipment, transportation by containers is the only actual experience in the past. The transportation period is about 60 days for one way.	Equipment materials that can be transported by containers. Unit of Transit is even number of 20' container.
Siberia	Transport from Japan to Bishkek via Siberian Railway via Vladivostok Port of Russia. The transportation period is about 80 days for one way.	Equipment to be parc cargo. There is also covered vehicles available.

Land transportation

Project site is located 320 km from Bishkek city, as shown in Figure 2-2-43. General equipment and materials can be delivered in Talas.

Procurement items from Japan must pass through customs in Bishkek, and imported materials and equipment must be transported to Talas by contractors.



Transportation Route: Bishkek- (westward around 65km) - Kara Balta- (Southward around 65km)- 3 legs Intersection- (westward around 50km)- 3 legs Intersection- (west northward around 30km)- Taldy Bulak- (westward 90km)- Project Site Total Length=320km

Transportation Time: Considering Mountain pass section between Kara Balta and 3 legs intersection

- Vehicles have to run upside and downside with low gear: travel speed is around 10km/h according to the relation table between traffic capacity and travel speed of the Japan Road Structure Ordinance
- The length of mountain pass section is around 85km
- Travel speed without load on the flat terrain is 50km/h, travel speed with load on the flat terrain is 40km/h considering winding road and parts of steep grade and use of gear from 3rd to top, referring the relation of the Japan Road Structure Ordinance.
- Average Travel Speed: (235*40+85*10+235*50+85*10)/320/2=36km/hr

Season Limitation of Transportation: On the severe winter season when is from December to February, inner transportation between Talas and Bishkek is difficult due to snow covering and freezing of mountain pass and no flat detour.

Figure 2-2-43 Land Transportation Route

2) Steel Sheet Pile Coffering

The bridge piers in the river plan to be constructed inside surrounded with the steel sheet pile coffering.

3) Detour Road

It is necessary to detour existing roads in a part of substructure works and integration parts with existing roads.

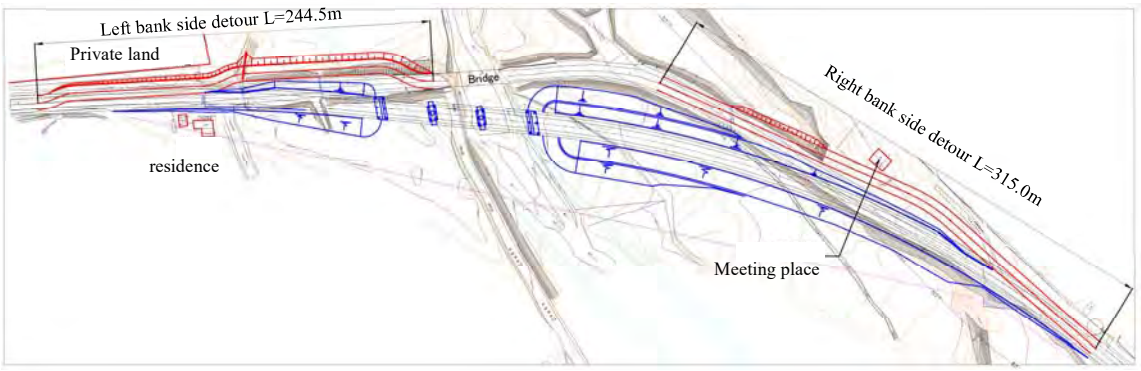


Figure 2-2-44 Plan of Detour Road

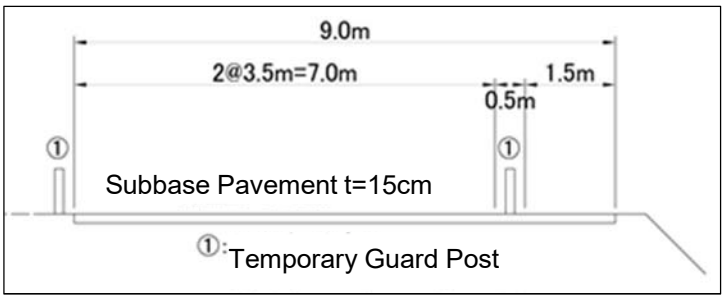


Figure 2-2-45 Cross-sectional View of a Detour Road

2-2-4-3 Scope of Works

Undertakings of both governments of Japan and Kyrgyz are listed in Table 2-2-35.

Table 2-2- 35 Undertakings of the Both Governments

Items	Contents	Undertaken by		Remarks
		Japan	Kyrgyz	
Procurement of Materials & Equipment	Procurement & Transportation	√		
	Procedure of Passing Customs		√	
Preparation Works	Lands & Right of Way Acquisitions		√	Including Spaces for Site Office, Stock Yard, Work Shop, etc.
	Provision of Borrow Pits, Quarry Sites, Waste Disposal Areas		√	
	Other Works	√		
Relocation & Removal of Various Obstacles	Relocation & Removal of Obstacles		√	Including Electric Poles & Wires, Telephone Poles & Cables, Traffic Signboards, etc.
	Removal of Existing Trees		√	
Main Works	Bridge & Approach Road Construction	√		
Supplemental Works	Installation & Removal of Detour Road	√		
	Removal of Existing Bridge	√		
	Maintenance of Existing Bridge & Road during Construction		√	

2-2-4-4 Consultant Supervision

A Japanese consultant will carry out detailed design, assistance in tendering and construction supervision in accordance with the consultant contract agreed by the Government of Kyrgyz and the Consultant.

1) Detailed Design Services

The following services shall be carried out as the Detailed Design Services by the Consultant;

- To confirm the contents of the Project with the Implementing Agencies in Kyrgyz through, discussions, detailed designs, and field survey,
- To review the detailed design and drawings, wherever necessary, and
- To review the procurement plan and project cost estimate, wherever necessary.

Period for the Detailed Design Service will be as follows;

- 3.0 months from verification of agreement of detailed design.

2) Tender Related Services

The following services shall be carried out as the Tender Related Services in the period from tender notice to construction contract by the Consultant;

- Preparation of Tender Documents (shall be done in line with above-mentioned Detailed Design Services),
- Tender Notice,
- Pre-Qualification,
- Tendering,
- Tender Evaluation, and
- Contract Facilitation.

Period for the Tender Related Services will be as follows;

- 3.0 months from verification of agreement of detailed design.

3) Construction Supervision Services

The following services shall be carried out as the Construction Supervision Services of the construction to be executed by the Contractor according to the contract and implementation plan by the Consultant. Major items are as follows;

- Inspections and Approvals of the Site Surveys
- Inspections and Approvals of the Construction Plans
- Quality Control
- Progress Control
- Measurement of the Works
- Inspection of the Safety Aspects
- Final Inspection and Delivery

The Consultant will provide a Resident Management Engineer and an assistant Engineer. During the construction, the Consultant will manage to work in cooperation with the person in charge of safety management of the Contractor to prevent from any accidents at the site.

2-2-4-5 Quality Control Plan

1) Quality Control Plan of Concrete, Earth and Pavement Works

Quality control plans for concrete works and earth & pavement works are shown in Table 2-2-36 and Table 2-2-37, respectively;

Table 2-2-36 Quality Control Plan for Concrete Works

Item	Test Item	Test Method (Specification)	Frequency of Tests
Cement	Physical Property Test	AASHTO M85	Once before trail mix; thence once in every 500m^3 of concrete or when material is changed
Fine Aggregate	Physical Property Test	AASHTO M6	Once before trail mix; thence once in every 500m^3 or when material source is changed*
	Sieve Analysis	AASHTO T27	Once a month
Course Aggregate	Physical Property Test	AASHTO M80	Once before trail mix; thence once in every 500m^3 or when material source is changed*
	Sieve Analysis	AASHTO T27	Once a month
Water	Quality Test	AASHTO T26	Once before trail mix
Concrete	Slump Test	AASHTO T119	Twice a day
	Air Content Test	AASHTO T121	Twice a day
	Compressive Strength Test	AASHTO T22	6 specimens in each concreting. In case of large amount in each concreting, 6 specimens in every 75 m^3 (3 for 7-day strength and 3 for 28-day strength)
	Temperature Test	—	Twice a day
	Salinity Test	—	Twice a day

Table 2-2-37 Quality Control Plan for Earth & Pavement Works

Item	Test Item	Test Method (Specification)	Frequency of Tests
Embankment	Field Density Test	AASHTO T191	Once every 500 m^3
Subgrade & Base Course	Filed Compaction Test	AASHTO T180	Before trial execution, and when material is changed
	Modified CBR	AASHTO T193	Once before trial execution, and when material is changed
	Field Density Test	AASHTO T191	Twice every 1,000 m^2
Asphalt Concrete (Surface & Binder Course)	Sieve Analysis of Aggregate	AASHTO T27	Once before trial execution, and when material is changed
	Abrasion Test of Aggregate	AASHTO T96	Once before trial execution, and when material is changed
	Density Test of Asphalt Mixture	AASHTO T166	Once every 1,000 m^2
	Temperature of Asphalt Mixture	Temperatures while Carrying, Coating and Rolling	Once every 1 Truck

2) Concrete Considering Winter Condition

The temperature in the project target area is below freezing point from November to March, wherein the period from December to February is set as a severe winter season during which concrete works cannot be done. Although it is considered possible to conduct concrete works on

November and March. In case that average temperature is 4°C or less, concrete works shall use winter concrete. Moreover, it is considered that concrete structures in this area are under severe climate condition after construction, so it is necessary for concrete to have enough bearing ability.

The important points for winter concrete and improvement of bearing ability are outlined as follows;

i) Winter Concrete

- Air-entrained (AE) concrete shall be used as a standard.
- The temperature of concrete shall range between 5°C and 20°C above zero.
- Air-entrained concrete contains billions of microscopic air cells per cubic foot. These air pockets relieve internal pressure on the concrete by providing tiny chambers for water to expand into when it freezes. Air-entrained concrete is produced using air-entraining portland cement, or by the introduction of air-entraining agents, under careful engineering supervision, as the concrete is mixed on the job. The amount of entrained air is usually between four and seven percent of the volume of the concrete, but may be varied as required by special conditions.
- For winter concrete curing, concrete temperature shall be kept at more than 5°C above zero until the moment when its compression strength becomes 12 N/mm^2 to prevent initial freezing damage. Moreover, it shall be kept at 0°C as a standard for two days after that.
- The two types of concrete curing are insulated curing and heat curing. Insulated curing is done to keep temperature until the moment that concrete has a certain strength by covering the surrounding concrete and using the heat from hydration heat of cement. Heat curing is done to heat concrete in case that the temperature of concrete cannot be kept only by means of insulated curing and concrete might be damaged by freezing damage. The standard indication of concrete curing duration of high early strength Portland cement is 5 days.
- As quality control of winter concrete, the temperature of concrete and air temperature inside and outside the room are observed at the moment when mixing, placing, curing of concrete are taking place. The temperature when mixing and placing concrete shall be observed at each agitator- body truck as a standard. The temperature of concrete under curing and air temperature inside and outside the room shall be observed at an interval, which is set as short as possible.

ii) Improvement of Bearing Ability of Concrete for Snowy Clod Region

According to the study "Improving the Durability of Concrete in Cold, Snowy Regions (Civil Engineering Research Laboratory)", high early strength Portland cement with blast furnace slag is the effective cement for snowy clod region, but only high early strength Portland cement has the bearing ability to salt and freezing damage. Therefore, considering procurement of the materials and costs, high early strength Portland cement is adopted with using AE water reducing agent and enough quality control, and the concrete structure which is strong against salt and freezing damage shall be constructed.

2-2-4-6 Procurement Plan

1) Construction Materials Procurement Plan

All construction materials necessary for the Project such as asphalt mixtures, sands, aggregates, crushed stones and lumbers are usually available in Kyrgyz's markets either locally or through imports.

The procurement policies for major materials are as follows;

- Procurement in Kyrgyz when materials are available in domestic markets, and
- Procurement by importing from Japan and/or third countries when materials are not available in

Kyrgyz. The exporting countries will be decided by taking quality, price, availability and supply period into consideration.

Procurement plan for major materials is shown in Table 2-2-38.

Table 2-2-38 Procurement Plan for Major Materials

Item	Procured from			Remarks
	Kyrgyz	Japan	Third Country	
Materials for Structures				
Portland Cement	√			
Reinforcement bar, ~D32	√			
Aggregate for Concrete	√			
Prestressed Steel Materials		√		
Railing (Steel)		√		
Bearing (Rubber)		√		
Expansion Device		√		
Waterproofing Material on Deck Slab		√		
Hot Asphalt Mixture	√			
Subgrade Materials	√			
Admixture for Concrete		√		
Gabion Basket		√		
PVC Pipe	√			
RC Pipe	√			
Road Marking Material		√		
Materials for Temporary Works				
Diesel & Gasoline	√			
Concrete Form		√		
Sheet pile, H-Beam for Steel Coffer Dam		√		
Steel Form for PC Girder		√		

2) Equipment

Procurement policies for equipment are as follows;

- Equipment required for the Project will be available in Kyrgyz, and
- Equipment owned by local contractors will be hired or leased.
- Procurement plan for major equipment is shown in Table 2-2-39.

Table 2-2-39 Procurement Plan for Major Equipment

Equipment	Size	Lease / Procurement	Procured from			Reason of Procurement	Transport Route
			Kyrgyz	Japan	Third Country		
Backhoe	0.28-0.8m^3	Lease	√				
Dump Truck	4t, 10t	Lease	√				
Bulldozer	15t, 21t	Lease	√				
Tire Roller	8-20t	Lease	√				
Road Roller	10-12t	Lease	√				
Motor Grader	3.7m	Lease	√				
Wheel Loader	2.4、3.1m^3	Lease	√				
Vibration Roller	0.8-5t	Lease	√				
Truck Crane	4.8-50t	Lease	√				
Crawler Crane	60-65t	Lease		√			
Dump Truck with Crane	10t, 2.9t	Lease		√			
Trailer Truck	20-40t	Lease	√				
Asphalt Finisher	2.4-6.0m	Lease	√				
Tampa	60-80kg	Lease	√				
Line Marker	Hand Guide Type	Procurement		√			
Sprinkler Truck	6.0kl	Procurement		√			
Pile Driver	All Casing	Procurement		√			
Vibrohammer	60kW	Procurement		√			
Generator	25-250kVA	Lease	√				
Submersible Pump	100-150mm	Lease	√				
Giant Breaker	600-800kg	Procurement		√			
PC Works Equipment	PC Jack, etc.	Procurement		√			
Girder Erection Works Equipment	Erection Girder, etc.	Procurement		√			
Concrete Becher Plant	30m^3/hr	Procurement		√			

2-2-4-7 Operational Guidance Plan

This project has no operational guidance plan

2-2-4-8 Soft Component (Technical Assistance) Plan

This project has no soft component plan.

2-2-4-9 Implementation Schedule

Implementation schedule for detailed design, tender arrangement, and execution of the Project is shown in Table 2-2-40 and Table 2-2-41.

Table 2-2-40 Implementation Schedule(1/2)

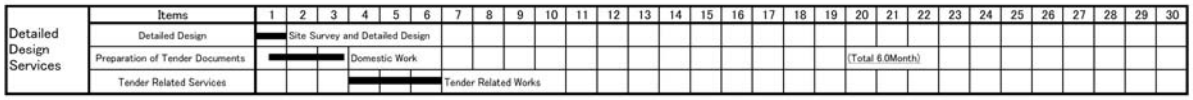
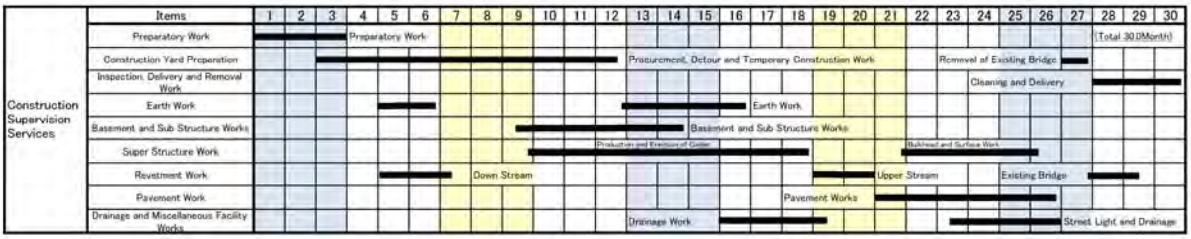


Table 2-2-41 Implementation Schedule(2/2)



2-3 Obligations of Recipient Country

The Government of Kyrgyz will undertake the following measures on condition that the Grant Aid by the Government of Japan is extended to the Project;

- ✓ To provide data and information necessary for the Project

  (Including necessary things for incidents happened during the construction)
- ✓ To secure the land necessary for the execution of the Project, such as the land for construction works, stock yards, work shops, field offices, and others
- ✓ To provide borrow pits, quarry sites and waste disposal areas
- ✓ To bear commissions to the bank in Japan for its banking service in connection with the Project
- ✓ To ensure prompt tax exemption, customs clearance, and effective inland transportations of materials and equipment
- ✓ To exempt Japanese nationals engaged in the Project from any customs duties for the supply of products and services necessary for the project.
- ✓ To accord Japanese nationals necessary legal rights for their entry and stay in Kyrgyz Republic
- ✓ To provide all necessary permission, licenses and certificates in connection with environmental issues and earthwork for the Project (EIA approval, construction permission, traffic control permission, detour permission, construction permission in river, earthwork permission etc.)
- ✓ To relocate all obstruction structures such as electric poles & wires, telephone poles & cables, water pipes, sewer pipes, optical fibre cables, billboards & signboards, etc. in the project road
- ✓ To provide the land until construction begins.
- ✓ To arrange proper use and effective maintenance of the road after the completion of the project
- ✓ To coordinate and solve any issues related to the Project that may be raised from residents and/or third parties
- ✓ To bear all the expenses, other than covered by the Japanese Grant Aid, agreed and necessary for the Project
- ✓ To secure safety of the construction site
- ✓ To conduct the environmental monitoring
- ✓ To set adequate schedule about related above undertaking items of the Government of Kyrgyz, keep and conduct them definitely on schedule.

2-4 Project Operation Plan

2-4-1 Operation and Maintenance Plan

(1) Organization for Road Management and Maintenance

Ministry of Transportation and Roads (MOTR) of No.47-DEU is responsible for the management and maintenance of the Project road. Their structural, technical and financial capabilities have being developed through the past JICA projects " The Project for the capacity building of road maintenance in the Kyrgyz Republic" and " The Project for Capacity Development for Maintenance Management of Bridges and Tunnels". The budget for road maintenance is indicated to being increased.

(2) Road Maintenance Plan

Necessary road maintenance works are as follows;

Periodical Maintenance

Routine inspection and cleaning of side ditches, culverts, supplemental facilities, etc.

Ad-hoc Maintenance

Repair for damaged parts, such as ceiling & patching pavement, repainting pavement marking, and any other damaged parts

(3) Present Road Maintenance Conditions and Recommendations

To take and keep the project effective sufficiently, it is important to manage and maintain road facilities adequately by keeping in good condition of the pavement and other supplemental facilities and extending their life spans, so the following recommendations are proposed;

- To check facilities regularly for controlling their conditions
- To clean facilities up, especially drainage
- To secure necessary budget for maintenance

Table 2-4-1 Examples of Regular Cleaning Frequency of Drainage Facilities

Type	Frequency
Side Ditch	At least once a year
Catch basin	At least once a year
Drain pipe	At least once 1 or 2 years

Source：Road Earthwork Guideline（2009.6、Japan Road Association）

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Cost borne by the Government of the Republic of Kyrgyz

Total Cost	:	73,700 United States Dollar (Approx. 8.1 Million Yen)
Utility Relocation Cost	:	20,000 US$ (Approx. 2.2 M. Yen)
Environmental Monitoring Cost	:	45,500 US$ (Approx. 5.0 M. Yen)
Bank Commission	:	8,200 US$ (Approx. 0.9M. Yen)

(2) Conditions in Cost Estimate

Base year and month for Cost Estimate	: October 2017
Exchange Rate	: 1 United States Dollar = 111.99 Yen
Construction Period	: As shown in the Implementation Schedule
Other Conditions	: Cost estimate is implemented in accordance with the guideline of Japan's Grant Aid

2-5-2 Operation and Maintenance Cost

Routine inspection, daily maintenance works and repair works on the site of this project are conducted by DEU No.47 under MOTR. Annual maintenance cost is estimated around 3,720 USD (0.42million JPY). The breakdown of this estimation is shown in Table 2-5-1. This annual maintenance cost equals 1.8% of the annual budget of DEU No.47 and DEU No.47 can conduct maintenance work of this project site.

Table 2-5-1 Main Maintenance Items and Year Costs

(1) Routine Inspections

Facility	Inspection Item	Frequency	No. of Staff	Equipment	Quantity	Cost
Bridge						
Pavement	Crack, deformation, pothole, etc.	6 times a year	2 persons	Scoop, hammer, sickle, barricade, pick-up truck	12 man-day/ year	240
Drainage	Rainwater erosion & collapse, etc.					
Road marking	Damage, stain, splitting					
Bridge main structure	Damage of girder, abutment, pier etc.	1 day each time				
Revetment	Damage and obstruction					180
Bridge facility	Damage to handrails etc				6 veh-day/ year	
Approach Road						
Pavement	Cracks, unexploded, pot holes, etc.					
Drainage	Rainwater erosion, partial collapse etc.					
Road marking	Damage, stain, splitting					
Shoulder& Slope	Damage, deformation, stain, splitting					
					Sub-total	420

(2) Daily Maintenance Works

Facility	Inspection Item	Frequency	No. of Staff	Equipment	Quantity	Cost
Cleaning						
Drainage	Cleaning soil, removal of obstacles	4 times a year	4 persons	Scoop, hammer, sickle, barricade, Pick-up truck	16 man-day/ year	480
Pavement	Cleaning					
Shoulder	Cutting grass, cleaning	1 day each time			4 veh-day/ year	120
Road marking	Cleaning					
Bridge	Cleaning soil, removal of obstacles					
Joint	Cleaning soil, removal of obstacles					
					Sub-total	600

(3) Repair Works

Facility	Inspection Item	Frequency	No. of Staff	Equipment	Quantity	Cost
Bridge						
Bridge main structure	Repair damaged part	2 times a year	4 persons	Patching asphalt	16 man-day/ year	480
Pavement	Seal Crack, patching pot hole				4 veh-day/ year	300
Drainage	Repair damaged parts			Pick-up truck	$10m^2$/year	120
Revetment	Repair damaged parts					
Bridge facility	Repair railings, repainting etc.	2 day each time				
Approach Road				Pavement works		
Pavement	Seal Crack, patching pot hole				10m2/year	300
Road marking	Repainting					
Shoulder& Slope	Repair damaged parts			Road Marking	20m/year	300
					Sub-total	1,500

(4) Replacement of Bridge Joint 30,000US$/25years ⇒ 1,200US$/year

Total Cost of Routine Inspection, Daily maintenance and Repair works : 3,720US$

CHAPTER 3 PROJECT EVALUTION

3-1 Preconditions

Undertakings of the Kyrgyz Republic for the project must be carried out on schedule.
Undertakings of the Kyrgyz Republic are show in Chapter 2-3.

3-2 Necessary Inputs by Recipient Country

To take and maintain the effect of the project, the tasks which the Kyrgyz Republic have to conduct are shown below.

- ✓ Conduct maintenance work adequately
- ✓ Secure the budget for maintenance with following maintenance plan

3-3 Important Assumptions

When adjacent roads planned by IsDB fund are constructed, Talas-Taraz road will have a function as National Highway Network.

3-4 Project Evaluation

3-4-1 Relevance

1) Talas Taraz Road is one of the international road in Kyrgyz and it is necessary for residents' life. Reconstruction of Urmaral River Bridge which was aging in progress, and the improvement of the approach road are planned in this project. The improvement of a safe and stable bridge and road contribute to the goal 8 of the SDGs.
2) The project corresponds to the principal development goals of National Sustainable Development Strategy which includes rehabilitation of international arterial roads.
3) Installation of sidewalk and traffic safety facilities is planned as sufficient traffic safety measures.
4) Operation and maintenance of this project bridge and road will be conducted by Kyrgyzstan budget, manpower, equipment and engineering skill without special equipment and technology.
5) It is expected that this project will be implemented without difficulties by the Japanese Grant Aid scheme.

3-4-2 Effectiveness

(1) Quantitative Effect

Expected effect	Basic Value (Present, 2017)	Target Value (3 years after implementation, 2024)
Transport Volume (vehicles/day)	3,600	4,600
Number of Passengers (persons/year)	3,434,000	4,387,000
Freight volume (tons/year)	696,000	907,000

(2) Qualitative Effect

- ✓ Secure traffic safety of Non-Motorized Transportation
- ✓ Facilitate traffic smoothness and traffic safety by improving road linearity