ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Project Number: 42399-02

Loan Number: 2755

July 17, 2013

CAREC Transport Corridor -1

(Bishkek – Torugart road) Project 3 km 479-539.

This EIA is an update of the EIA report disclosed on ABD and MOTC website in November 2010. The update is based on the results of seasonal baseline monitoring conducted during 2011-2013 as requested by ADB.

Prepared By the Ministry of Transport and Communications of the Kyrgyz Republic for ADB

Environmental Impact Assessment report is a document of Borrower.

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ABBREVIATIONS

EPA	**US Environmental Protection Agency**
TERA International	**Consultant**
ADB	**Asian Development Bank**
BNT	**Bishkek-Naryn-Torugart Road**
ISB NASKR	**Institute of Soil and Biology, KR National Academy of Sciences**
SAEPF KR	**State Agency for Environmental Protection and Forestry of Kyrgyz Republic**
TAEPF	**Territorial Administration fro Envirenmental Protection and Forestry**
GRM	**Grievance Redress Mechanism**
IPIG MOTC	**Investment Projects Implemantation Group under Ministry of Transport and Communications**
SER	**State Environmental Review (Ecological Expertise)**
KJSR	**Karatal Japyryk State Reserve**
MOTC	**Maximum One Time Concentration**
MOTC KR	**Ministry of Transport and Communications of Kyrgyz Republic**
EIA	**Environmental Impact Assessment**
SPA	**Specially Protected Area**
E	**Environment**
MPC	**Maximum Permissible Concentration**
MPC_{motc}	**$\text{Maximum Permissible Concentration}_{\text{maximum one time Concentration}}$**
MPC_{DAC}	**$\text{Maximum Permissible Concentration}_{\text{Daily Average concentration}}$**
EMMP	**Environmental Management and Monitoring Plan**
EMP	**Environmental Management Plan**
UNFCCC	**UN framework Convention on Climate change**
SSEMP	**Site Specific Environmental Management Plan**
CP	**Customs Point**
CAREC	**Cental Asia Regional Economic Cooperation**

1. Executive Summary

1.1. Introduction

1. The 540 kilometer (km) Bishkek-Torugart road is part of the Central Asia Regional Economic Cooperation (CAREC) Transport Corridor 1 linking the Kyrgyz Republic (KR) with other central Asian countries, the People's Republic of China (PRC), and Russia. The proposed Project 3 (the Project) comprises rehabilitation of the existing road from the checkpoint at Km 479 to the PRC border at Km 539.

2. Various parts of Corridor 1 have been under development since the late 1990s with the initial concept for transport sector development in the context of regional cooperation. The KR Government, Asian Development Bank (ADB), and other development partners have been discussing the Bishkek-Torugart road since 2005. The Bishkek-Torugart Road Rehabilitation Project was included in the ADB Country Strategy and Program Update for 2006 - 2008 (published in November 2005) as a proposed loan project for approval in 2008. The Joint Country Support Strategy for 2007 – 2010 (published in August 2007) also included the Bishkek-Torugart road project. The proposed Project was included in the ADB Country Operations Business Plan for 2009 – 2011, published in January 2009.

3. This Environmental Impact Assessment (EIA) report was prepared on behalf of the Ministry of Transport and Communications (MOTC), the Executing Agency (EA) for the project, beginning in 2009 by Japan Overseas Consulting Company, Ltd. (JOC) in association with Kyrgyz TREC International, Ltd. (KTI). A draft final version of the EIA, dated December 2009, received government endorsement. ADB determined that the assessment should cover additional aspects in order to comply with its *Safeguard Policy Statement 2009*, in particular the sections pertaining to natural and critical habitats. In September 2010, ADB engaged a staff consultant to assist MOTC in completing the assessment and disclosing the findings and recommendations (EIA Report) to the public. The updated EIA was finalized in November 2010 and published on the ADB and IPIG websites.

4. In 2012, the EIA Report of 2010 incorporated recommendations received from ADB by the Consultant, TERA International Ltd., and a group of environmental experts from the research institutions of the Kyrgyz Republic. This group carried out environmental baseline studies for further environmental monitoring in Chatyr-Kul Lake area. This group consisted of 7 specialists, including their Team Leader and was formed in June 2011. Terms of Reference for this group of experts were designed in June 2011 by the IPIG MoTC KR and included baseline studies in the following areas: ornithology, zoology, flora, hydrobiology, soils, entomology and environmental monitoring. This Terms of Reference also included drafting of the Work Plan: (1) study of literature and archives, (2) current situation analysis in the Project area, (3) mapping of sampling locations and field routes, (4) analysis of impact of the existing, emerging and expected ecological factors (post-Project period), (5) mitigation measures for environmental impact, and (6) design of environmental monitoring system in the study area.

5. These field studies for Environmental Monitoring Baseline Survey in the area of the Karatal-Zhapyryk State Reserve and Chatyr-Kul Lake were carried out in different seasons of 2011, 2012 and 2013. As a result an environmental monitoring system was designed, which includes monitoring parameters and indicators, methods of measurement, time frames, database formation, methods of analysis etc.

6. The Consultant has offered mitigation measures for the impacts during period of construction, resulted from earth work, traffic intensity, exhaust gases and their impact on soil and water resources. The Consultant also offered effective measures to prevent probable erosion processes

and effective measures to neutralize negative impacts by the motor road on the environment. In addition, the EMP includes two-track monitoring for pollution source control and ecological receptors protection, a comprehensive program for enhancing protection of the Chatyr-Kul lake reserve ecology and environmental public awareness in the area.

7. Three public consultation meetings were organized during 2009-2010. After the loan approval more public consultations are planned for the purpose of updating this EIA report. The fourth public consultation was conducted in April 2013 and one more will be held after the final draft of this update EIA report receives no objection from ADB.

1.2. Summary Findings of the Environmental Impact Assessment

8. The assessment of alternatives revealed that the CAREC Transport Corridor 1, Bishkek-Torugart Road, including Project 3, is the most economically and environmentally sustainable option for meeting national development goals. The Project will reduce transit time and cost, improve traffic safety and reduce accident risk. The “no action” alternative has a higher risk of environmental deterioration and negative impact on the Chatyr-Kul ecosystem.

9. There will be some negative impacts on the environment during implementation of the proposed project but if managed well, they should not be more than the environmental impacts cause by the existing road which is currently in very bad conditions. In the construction period the impact will be primarily short-term and manageable. In the operation period the impact, most likely, will appear as cumulative and could be even irreversible if emergency response measure will not be implemented. The highest risk is associated with spills of hazardous pollutants, primarily motor fuel, oil and lubricants, toxic and heavy metals from the exhaust fumes and gases. Potential impacts during the design lifetime of 20+ years will increase as the pollutants entering the Chatyr Kul aquatic ecosystem will accumulate because the lake has no outlet. Therefore, the perspective of irreversibility of degradation process within ecosystems requires some radical measures to neutralize the main channels for pollutants delivery into ecosystems.

10. The updated and approved EIA is the basis for the Contractor to design its Environmental Management Pan (EMP). Due implementation of the EMP will ensure reduction of both short and long-term mitigation of the negative impact down to acceptable level and gain net environmental benefit. The construction Contractor will be fully responsible for prepration of the SSEMP, which will be coordinated with the Consultant and for its further submission to IPIG. The SSEMP implementation oversight is vested onto the Consultant and IPIG. The IPIG has designed its grievance complaint mechanism so that any potential flaws in the course of the SSEMP implementation were brought to the attention of the responsible parties for immediate correction actions. A grievance redress mechanism has been established to enable any potential lapses in the EMP implementation to be brought to the attention of the responsible parties for immediate corrective action. ADB will assure quality through the routine communication with MOTC and periodic review missions.

1.3. Report Organization

11. This report focuses on the section passing west and south of the Chatyr Kul Lake from the Tuz-Bel pass at KM 501 to the Torugart Customs post at Km 531. The following sections include:

- Section 2 describes the policy, legal, and administrative framework for the project including the environmental assessment process.
- Section 3 describes the need for the project, proposed design solutions, analysis of alternatives, and expected benefits.
- Section 4 provides a description of the environment with emphasis on the Chatyr Kul lake catchment basin which is considered to be a critical habitat. This section has been expanded with input from the Environmental Baseline Survey Report of March 2012.

- Section 5 describes analysis of current socioeconomic conditions

- Section 6 discusses potential environmental impacts, detailed separate aspects of impact, and mitigation measures.
- Section 7 describes developed Environment Monitoring System.
- Section 8 is the Site Specific Environmental Management Plan (SSEMP)
- Section 9 describes public participation and consultation activities, information disclosure, and grievance redress mechanism.
- Section 10 presents conclusions and recommendations of the report.
- Appendices provide supporting data, used for taking analysis, and photos of the site and others.

12. For this EIA report, English Russian and Kyrgyz versions are available and, if there is any discrepancy between them, the English version will prevail.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1. Environmental Protection Law and Policy

13. The legal basis for environmental assessments in the Kyrgyz Republic is formed by the Law on Environmental Protection (1999), Law on Ecological Expertise (State Environmental Review (1999), Instruction on Procedures of State Environmental Expertise for Pre-Project, Project and other Materials in Kyrgyz Republic (1997), and Instruction on Environmental Impact Assessment Performance Procedures in the Kyrgyz Republic (1997) and other normative documents. The Kyrgyz Republic acceded to the Aarhus Convention on Public Participation and the Espoo Convention on EIA in a Transboundary Context.

14. The relevant environmental legislation of the Kyrgyz Republic is summarized in Table 2.1. In addition to the list in Table 2.1, there are special parts of the Administrative and Criminal Code which have strengthened the liability for illegal hunting, illegal harvesting of eggs from nests, destruction of nests, illegal enterprises in ecologically sensitive areas, and pollution of wetlands and sensitive habitats.

15. The State Agency for Environmental Protection and Forestry (SAEPF) is the key authorized institution responsible for the establishment and implementation of environmental policy in Kyrgyz Republic. The Department of the State Environmental Review under the SAEPF is responsible for reviewing environmental assessment documents for projects of national significance.

16. Other major stakeholders – state and municipal organs, responsible for environmental assessment, are:

i. Ministry of Health (safety and health, drinking water quality, noise and vibrations);
ii. Ministry of Emergency Situations (natural hazards), and its subsidiary agency Kyrgyz Hydromet (KHM, or Hydromet), responsible for ambient air and water quality monitoring;
iii. Ministry of Agriculture and Amelioration (land us of agricultural lands and pastures);
iv. State Agency on Geology and Mineral Resources under the KR Government (certificates and licenses to inert materials reserves);
v. State Inspection on Ecological and Technical Safety under the KR Government (state environmental control);
vi. Rayon State Administrations (RSA) on the issues of resettlement and land acquisition, public hearings, information disclosure etc.).
vii. Organs of Local Self-Governance (OLSG) – Aiyl Okmotu (social issues, allocation of lands for stockpiles, asphalt plants, construction camps etc).

17. The EA system in KR is based on two subsystems: (i) OVOS (the Russian acronym for “Assessment of Environmental Impacts”), and (ii) Ecological Expertise (State Environmental Review, SER). A screening procedure based on screening lists identifies whether a project is the subject to environmental assessment. In case if it is required, an OVOS is conducted by an OVOS Developer hired by a Project Proponent. After presentation of an Environmental Impact Statement (EIS) for public consultations, the EIS is revised based on the feedback from the public. Then the OVOS report and a Statement of Environmental Consequences along with other supporting documentation is submitted to a state expert commission for the State Environmental Review (SER). The project may be approved, rejected or sent for re-examination.

18. Public consultation should occur at stage of the OVOS and may be also initiated in parallel to the SER as Public Environmental Review (PER). The implementation of any project is permitted only in case

of its approval by the SER. The PER is a supplement to the SER of a recommendatory nature. The SER duration depends on the complexity of the project, but should not exceed 3 months after submission of all the OVOS documents and making payment for the SER by the Project Proponent.

Table 2.1: Major legislation on environmental protection

Legislation	Year Passed (Amended)	Purpose / Content
Constitution of Kyrgyz Republic	2010	Land, subsoil, air waters, forest, wildlife and other natural resources shall be utilized and, at same time, protection shall be give
Law on Environmental Protection	1999 (2002, 2003, 2004, 2005, 2009)	The general legal framework for comprehensive environmental protection and for the use of them, including environmental standards setting, legal regime of specially protected area, rules and procedures for the use etc.
Law on Specially Protected Areas and Biosphere Territories	1999	It establishes legal requirement of for the protection and use of all natural objects within the protected areas.
Law on the Protection of Ambient Air	1999 (2003, 2005)	Ambient air standard and air quality management
Law on waters	1994 (1995)	Regulate the use and protection of waters
Forest Code	1999	Regulates the use and protection of forest resources
Law on the Radioactive Safety of the Population	1999	To manage the use of radioactive material by specifying permit procedure, security measures, etc.
Law on Ecological Expertise (State Environmental Review)	1999 (2003, 2007)	About the use of public ecological expertise and environmental assessment procedures
Law on Wildlife	2002 (2003)	About protection of wildlife habitats
Law on Fisheries	1997	About regulation of commercial fishing an protection of water bodies.
Law on Subsoil	1997	About safe exploitation of subsoil and recovery of land for mining
Law on Protection and Use of Flora	2001 (2003, 2007)	About protection, use, and reproduction of flora
Law on Mountain Areas in Kyrgyz Republic	2002 (2003)	About sustainable development of mountain areas, conservation and management of natural resources, historical, cultural and architectural heritage
Law on Waste of Production and Consumption	2001	About waste management.
Law on Rates for Pollution of the Environment (emission, pollutant discharge, and waste disposal)	2002	The law fixes the rate for pollution of the environment in the amount of 1.2 Kyrgyz Som per specific value (ton) of pollutant

Legislation	Year Passed (Amended)	Purpose / Content
KR Law “Technical Regulation of Environmental Safety”	2005	Applied to protect environment, defines main parameters of technical regulation in the sphere of environmental safety; introduces general requirements to environmental safety during design and operation of economic facilities for process of production, storage, transportation and utilization of produce. These requirements are mandatory to all legal entities and individuals involved in the above mentioned activity.
Methodological Guidelines to Identify Payments for Environment Pollution	2004 (2006)	This instruction is for implementation by the users of natural resources, territorial environment protection agencies and executive power of KR
KR Land Code	1999 (2000-2012)	The Code regulates land relationships in KR; grounds to emerge, exercise and terminate right to land and their registration, and aimed at introduction of land market relations for state, municipal and private property and rational land use and its protection.
KR Law on Water Resources	1994	The priority objective of water law is to regulate relations in the sphere of water resources use, protection, prevention of negative impact on water resources and water-related facilities, their improvement and improvement of water-distribution relations.
KR Law on Drinking Water	1999	Regulates drinking water availability and its quality.
KR Law On Industrial Safety of Hazardous Facilities	2001 (2009, 2012)	Defines legal, economic and social grounds to operate potentially dangerous facilities and aimed at emergencies prevention and preparedness of their operators to localize and liquidate their consequences.
KR Law General Technical Regulation “On Safe Operation and Utilization of Machinery and Equipment”	2008	Introduces technical regulation and special rules to identify potential technogenic threats; mandatory requirements to ensure safe operation and utilization of machinery and equipment
KR Law on the KR ascension to KP of the UNEECE Convention on Access to Information, Public Participation and Access to Justice on Environmental Matters (Aarhus Convention)	2001	Provides for legal basis for public participation in decision-making related to environment.
KR Law on Protection of Population and Territories from Natural and Technogenic Disasters	2000	Objectives of this Law: 1) emergencies prevention; 2) reduce the size of loss and damage; 3) emergencies liquidation. The term “emergency” defines “hazardous natural or technogenic event, disaster or catastrophe which may result in casualties, damage to public health or environment, gross material loss and disruption of functions”.

2.2. Operational Difficulties and Challenges

19. As is often the case for developing countries, although the legislations seem to be sufficient, operational difficulties are abundant. The main challenges in the KR are lack of financing for research, monitoring, compliance assistance, and enforcement of existing regulations and standards.

2.3. Other Legislation and Standards

2.3.1. Air Quality and Vehicle Emissions

20. Air pollution levels in KR are a concern mainly in urban areas. In Bishkek, 90% of all emissions are related to road transport. The air quality at locations away from the towns is expected to be much better. Ambient air quality regulatory responsibility and monitoring of air quality in KR rests with the Kyrgyz Hydromet (KHM) under the Ministry of Emergencies. Air quality monitoring stations are largely located in populated areas close to sources of pollution: Bishkek, Osh, Tokmak, Kara-Balta, and Cholpon-Ata. Ambient air quality standards are shown in Table 2.2. Impact monitoring for atmospheric pollution is carried out by the Department of Ecological Monitoring under SAEPF.

Table 2.2: Ambient Air Quality Standards (in mg/m^{3}except as noted)

Pollutant	Maximum Permissible Concentration	Average Daily Concentratio n	Hazard Class
Total suspended particulate (TSP)	0.15	0.05	3
Sulfur dioxide (SO2)	0.5	0.05	3
Carbon monoxide (CO)	5	3	4
Nitrogen dioxide (NO2)	0.085	0.04	2
Nitrogen Oxide (NO)	0.40	0.06	3
Tetraethyl Lead	0.0001	0.00004	1

Source: Hygiene norms ГН 2.1.б.1338-03 Of the Kyrgyz Republic

21. The norms of emission in exhaust gases of motor vehicles are in the Table 2.3.

Table2.3: Norms for exhaust gases emissions of motor vehicles

Rpm	MPCforCOcontent	MPC for carbons, 1/1.000.000 of volume^{-1}for engines (number of cylinders)	
		less than 4	More than 4
Nmin X.X	1.5	1200	3000
NincrX.X 0.8Nnom X.X	2.0	600	1000

Source: *Instruction for the state control of air emissions of polluting substances by automobile facilities in the Kyrgyz Republic.* (Data as of November 12, 2010, at the site:
http://www.nature.kg/lawbase/acts/18_ins_polutant_emissions_air.xml)

National standards for emission measurements:

- GOST 17.2.2.03-87 defines the contents of carbon oxide (CO), hydrocarbons in burnt gases of vehicles with gasoline engines, “Safety Requirements”
- GOST 21393-75 covers black smoke of burnt gases of vehicles with diesel engines. Norms and methods of measurements. Safety Requirements.

22. GOST 17.2.2.03-87 determines the content of carbon monoxide (CO) and hydrocarbons in the exhaust gases of viehicles with gasoline engines, and GOST 21393-75 –the opacity of exhaust gases of diesel cars.

23. According to information published by the United Nations Environment Program, leaded gasoline was phased out by 2002 (information accessed on 12 November 2010: http://www.unep.org/pcfv/PDF/MatrixCEE_FuelsApril_2010.pdf).

2.3.2. Water quality

24. Norms of water quality identified for 3 качестваводыопрgeneral categories: fishery, drinking water and waste water discharge. Water quality standards in the Kyrgyz Republic include:

(i) Hygienic norms GN 2.1.5.1315-03MPC for chemical substances in water of water bodies designated for economic, drinking and household use(the full list of chemical substances):

http://www.nature.kg/lawbase/acts/36_rgs_pdk_water.xml)

(ii)Hygienic norms GN 2.1.5.1316-03 Approximately permissible levels (APL) of chemical substances in water bodies designated for economic, drinking and household use (the full list of chemical substances):

http://www.nature.kg/lawbase/acts/37_rgs_odu_water.xml)

25. For Chatyr-Kul Lake basin, there do not exist any specific norms of water quality based on the requirements to protect the indicator species. In this regard, it does not seem feasible to design mitigation measures specific to this Project by using the approach MPC measurements or aggregate pollutants load.

2.3.3. Noise

26. Levels of acceptable noise levels are consistent with ADB guidelines. Kyrgyz noise standards are in Table2.4.

Table 2.4: Acceptable noise levels

Description of Activity / Category	Leq	Lmax
Areas immediately adjacent to hospitals and sanatoriums	Day=45 Night =35	Day=60 Night =50
Areas immediately adjaceet to dwellings, polyclinics, dispensaries, rest homes, holiday hotels, libraries, schools, etc.	Day =55 Night =45	Day=70 Night =60
Areas immediately adjacent to hotels and dormitories	Day =60 Night =50	Day =75 Night =65
Recreational areas in hospitals and sanitariums	35	50
Rest areas at the territories of micro-districts and building estates, rest houses, sanatoriums, schools, homes for the aged, etc.	45	60

Source: Collection of important official materials on sanitary and antiepidemique issues, Volume 2, Part 1, Informative publishing centre of State Epidemiological Surveillance Committee, Russian Federation 1994

2.4. International Conventions

27. The Kyrgyz Republic has ratified the following international Conventions related to environmental management:

i. Basel Conventions on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal, 1996
ii. Convention of Biological Diversity (CBD), 1996
iii. Convention of Long Range Transboundary Air Pollution, 2000
iv. UN framework Convention on Climate change (UNFCCC), 2000
v. Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 2000
vi. Vienna Convention of the Protection of Ozone Layer, 2000
vii. Montreal Protocol on Ozone Depleting Substances, 2000
viii. Stockholm Convention on Persistent Organic Pollutants, 2002
ix. Espoo Convention on Environmental Impact Assessment in a Transboundary Context, 2001
x. Ramsar Convention on Wetlands, 2003
xi. The UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, acceded in 2001
xii. United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, acceded in 1999
xiii. Convention on International Trade in Endangered Species of Wild Fauna and Flora, acceded in 2006.
xiv. Cartagena Protocol on Biosafety, acceded in 2005
xv. Convention Concerning the Protection of World Cultural and Natural Heritage, acceded in 1995.

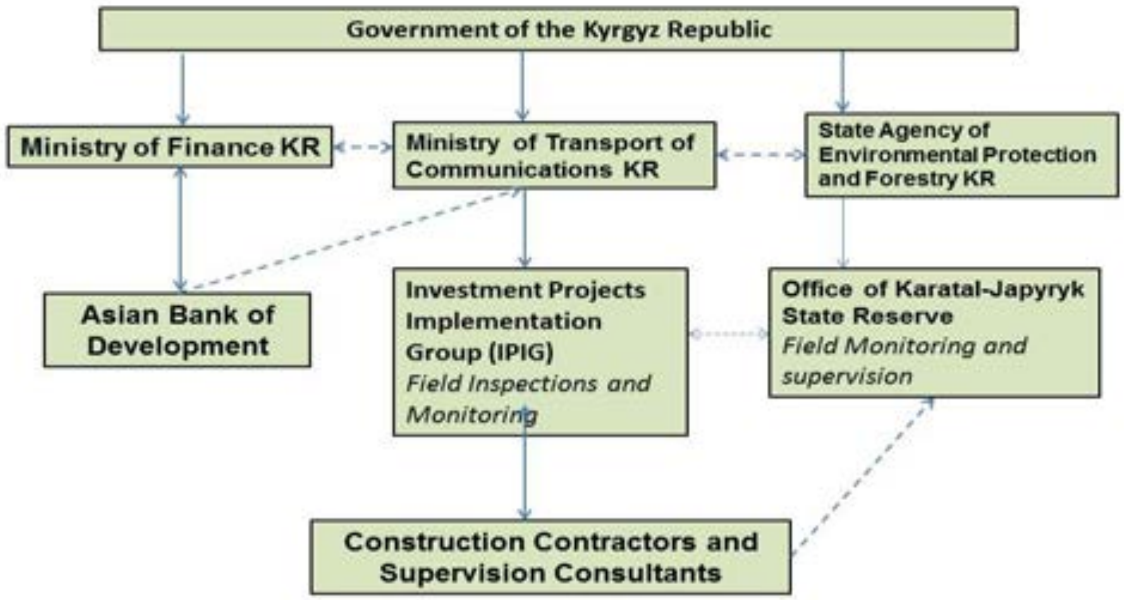
28. The Ramsar Covention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat – A convention on wetlands of international importance primarily as habitats for water fowls) was adopted in February 1971 in the Iranian city of Ramsar, and is the first international global agreement dedicated to one type of ecosystems. The wetlands are the areas of marshes, fens and water bodies, natural or artificial, permanent or temporary, stale or run-through, fresh-water, salinated or salty including the aquatories of seas with depth at low tide less than 6 meters. The water fowls are the birds ecologically dependent on wetlands (Article 1 of the Convention). As per April 7, 2011 there are 160 countries-participants of this Convention on the territories of which found some 1926 wetland sites of international importance with the total area of 187.984.550 ha. KR acceded this Convention in 2003 (ru.wikipedia.org).

29. Thus the Karatal-Zhapyryk State Reserve (KZSR) area traversed by the Project road gains another ecological aspect – the Ramsar site. Due to this the KZSR was awarded the status of special protection. This was the reason for the detailed study of the Chatyr-Kul Lake during 2011-2013 by the group of scientists from the Institute of Biology and Soils of the Kyrgyz National Academy of Science to register the baseline level of fragile ecological system of Chatyr-Kul Lake and to develop environmental monitoring program for this area.

2.5. Responsible Organizations

30. Figure 2.1 shows the relevant organizational arrangements for the Project, including the Government of the Kyrgyz Republic, Ministry of Finance (MOF), MOTC (the EA), the State environmental license, subsidiary organizations under SAEPF, and ADB.

Figure 2.1: Project Organization



Source: Consultant TERA International.

2.5.1. Central Government Agencies

31. MoF is the responsible government body for coordination with ADB and other donors for foreign assistance. MOTC is responsible for transport sector development and is the EA for the Project. MOTC has overall responsibility for planning, design, and implementation of the project.

32. SAEPF is responsible for the environment protection policy, regulation and coordination, expertise and issuance of licenses and permits. It's functions are:

i. Administrative activity, coordination of subordinated structures – regional and territorial offices;
ii. Ecological policy drafting and its implementation;
iii. Services on ecological information;
iv. Drafting policy to develop forestry and gaming activity;
v. Environmental monitoring;
vi. State environmental expertise;
vii. Issuance of ecological licenses;
viii. International cooperation.

33. A new state organ was established in January 2012 – State Inspection on Ecological and Technical Safety (as mentioned above in para 16). This Inspection incorporates inspection and oversight functions of some state organs and their agencies, with the most important among them:

(i) – functions of environmental control and oversight of the SAEPF;
(ii) – functions of State Inspection and Safety in Mining Industry of the former KR Ministry of Natural Resources (MNR);
(iii) – functions of Land Inspection and State Control in the land use and protection under the former MNR KR.

2.5.2. Territorial Organs

34. SAEPF has its territorial agency in Naryn city with the same specific functions as the head agency. The Lakes Chatyr-Kul and Son-Kul are the parts of and under the supervision of the KZSR with 30 staff; it's office located in Naryn city. The KZSR has two departments: (i) scientific, and (ii) protection and control.

35. The scientific department is responsible for the bird-related studies, animals, flora and aquatic fauna of the lakes. Annually, beginning with 1994 together with National Academy of Science 5 field groups during 10 days implement monitoring of migratory birds at Chatyr-Kul Lake and prepare reports. When implementing this task they are facing several problems:

i. Absence of vehicles to travel to the Lake (a vehicle will be allocated by Contractor for the KZSR needs for the period of 3 years).
ii. Absence of ecological laboratory equipment or field equipment for monitoring;
iii. There are no housing facilities in the Chatyr-Kul area.

36. The Department of Protection and Control implements protection of Chatyr-Kul ecosystem from illegal hunting. Three teams of 3-4 people each patrolling the Lake's shores from April until October. Their main task is to prevent people without the due permits from getting in to the Chatyr-Kul protected area. The main difficulties are as follows:

i. (i) this Department is under-staffed with lack of auxiliary means for effective protection (e.g. eggs and hens with nests on ground are vunerable) not only from poachers, but also from cattle and shepherds;
ii. (ii) the shepherds' dogs are wooing the birds and other fauna.

37. As the KZSR staff believes, for effective control and observations it is required to install new roadside boards and, as minimum, 2 watch towers 10 meters tall each. However, the Project budget is not enough to cover such expenses.

2.6. ADB Safeguards

38. Following the ADB's Safeguard Policies (2009) and ADB Methodological Guidelines on Environmental Assessment (2003) this Project is classified as the Project of category "A". This requires full-fledge environmental impact assessment. As for the resettlement part of this Project it is classified as category "B". The Project will require allocation of land to build a parking area for HDDV trucks before Torugart customs point (KM 532), and to re-settle the temporarily residing people, - those involved in the roadside business (7 households) who have converted the former construction travelling wagons into dining sites and hotels (relocation of private property). By April 2013 the matter of allocation of 1.47 ha of land to the Project was positively resolved by transforming the agricultural lands into the lands designed for transport needs. Also in March 2013 ADB has approved the Final Resettlement Plan.

39. ADB's main concern is that the project not result in degradation of the Chatyr Kul protected area, which is considered to be a critical habitat due to its designation under the Convention on Wetlands of International Importance, also known as the Ramsar Convention, (hence it is referred to as a "Ramsar site"). According to the ADB *Safeguard Policy Statement (2009)*, Appendix 1, paragraph 27, "*the project mitigation measures should be designed to achieve at least no net loss of biodiversity*," which could be achieved by post-project restoration of habitats or "*through the creation or effective conservation of ecologically comparable areas,*" i.e. an ecological "offset".

40. This section of the ADB policy covers instances where a project will directly impinge on a natural or critical habitat; for example, an electric power transmission line or natural gas pipeline that crosses protected wetlands. The proposed Project will be constructed outside of the protected area buffer zone.

The "post-project period" is not clearly defined, but for purposes of this report, it is assumed that it refers to the construction phase as well as the design lifetime of the project.

41. As discussed in this report, the Project is designed to avoid, minimize, and mitigate negative impacts and is expected to have net benefits to the area. The road is expected to operate into the indefinite future (at least 20 years), and the potential impacts during the operational period are expected to be greater than during the construction period.

42. The potential impacts to the Chatyr Kul ecosystem cannot be fully quantified at present, as the baseline environmental data on ecology and water quality are still insufficient for overall and comprehensive analysis, even despite the accomplished BLS studies, - the results of this study are used in this report to their outmost. In this regard, in order to implement measures allowing to avoid, minimize and mitigate potential long-term negative impact the common sense "No Regret" approach is recommended.

43. The offered mitigating measures designed to minimize the volumes of potential pollutants which are getting into the Lake. To update the EMP the data from the BLS can be used, however, in the future the mitigation strategy will be focused on the pollution prevention (see Chapters 6, 7 and 8).

3. Description of the Project

44. The proposed project is the third and final phase of the Bishkek-Torugart road rehabilitation program (see Figure 3.1). The project will rehabilitate the road from the Checkpoint at Km 478 to Km 539.

3.1. Project Location

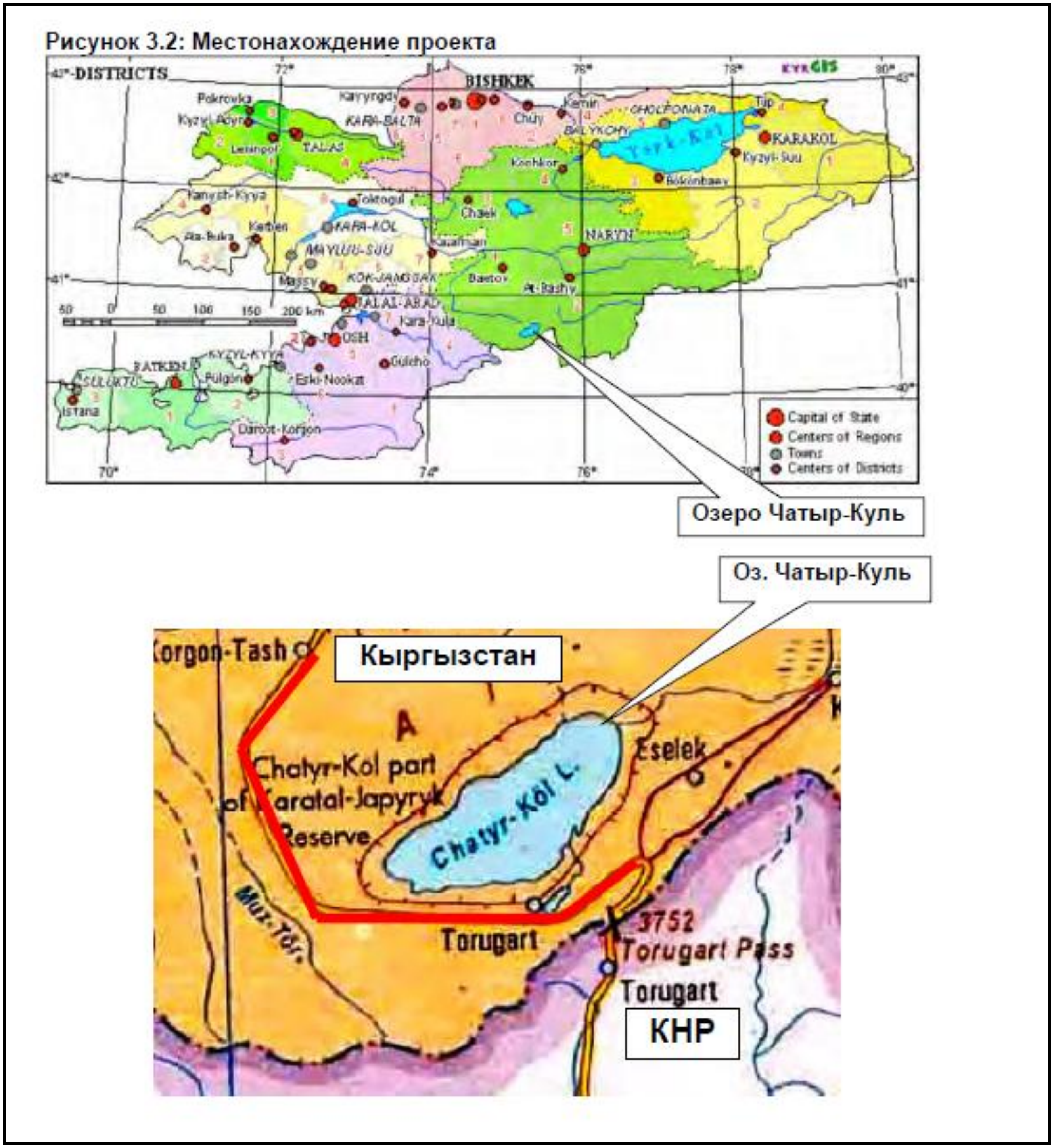
Figure 3.1: Project location

45. The Kyrgyz Republic is divided into seven oblasts (provinces). The oblasts are further subdivided into *rayons*, and the *rayons* are subdivided into *ayil okmotus*. Administratively, the Bishkek-Torugart Project is located within Chuy, Issyk-Kul and Naryn oblasts of the Kyrgyz Republic. The current Section is entirely located within At-Bashi, Naryn oblast. The directly-affected *rayons* within the Section are as follows:

- Naryn oblast
- At-Bashy rayon.

46. Figure 3.2 shows the general project area within Kyrgyz Republic and the route alignment in the project area (the red line in the lower figure). Figure 3.3 shows a satellite image of the area with the road highlighted. The area between the Checkpoint at Km 478 and the Torugart Customs post at Km 531 is restricted and there are no permanent residents, except for people assigned to road maintenance facilities, and the customs and border security checkpoints. Some nomadic shepherds are observed in the area in summer months, but only a few families have actually been observed in the area during preparation of the initial EIA (2009-2010).

Figure 3.2: Project location



Source: JOC, draft EIA report, December 2009. Taken from The Naval Postgraduate School's Program for Culture and Conflict Studies, "Central Asia Executive Summary Series, Kyrgyzstan Country Profile, 2009

Source: Google Earth image.

Figure 3.3: Project Area Showing Route from Km 478 to Km 539

Source: JOC, draft EIA report, December 2009

3.2. Need for the Project

47. For the last decade, since the launch of the ADB-sponsored CAREC Program in 1997, regional cooperation in Central Asia has centered on transport, energy, and trade facilitation. Endorsed under the CAREC Transport and Trade Facilities Strategy, the Bishkek-Torugart road forms part of the CAREC Transport Corridor 1.

48. The Bishkek-Torugart road plays two important roles. It is one of the two thoroughfares connecting the Kyrgyz Republic and the People's Republic of China (PRC); and the main arterial from Bishkek to the rapidly growing tourist destinations around Lake Issyk Kul. The road is also the only north-south trunk road in central Kyrgyz Republic and the province of Naryn, and the city of Naryn, in particular, depends heavily on it for connecting to the rest of the country. Additionally, it is a link in the Central Asia Regional Economic Cooperation (CAREC) Transport Corridor 1(c), which extends from Troitsk in the Russian Federation to Hexi in the PRC.

49. In 2008 and 2009, Asian Development Bank (ADB) provided financing to improve 114 km (km 365-km 479) of this road. The PRC government committed financing in 2009 to improve about 272 km. Works under these projects are in progress. A consortium of Arab funds is negotiating with the government at present on a financing package for improving about 115 km. Although, these improvements would reduce transport costs and help achieve the economic and social goals set out in

the government's Country Development Strategy (2007-2010), the last leg of the road from Km 479 to Km 539 must be improved before the investments could have the full impact.

50. The road section from Km 479 to Km 539 currently is unpaved, often water logged, and is unusable on certain winter days. Annual maintenance is required which is achieved in part by uncontrolled excavation along the road side. Due to the poor condition of the road, vehicle speeds are low and transit times between the PRC border and Naryn, a distance of 200 km, are now measured in days rather than hours.

51. Upgrading to an engineered, paved surface will reduce transit times to one day or less and facilitate expanded trade. At the same time, paving the road surface will reduce noise and vibration. Improved transit times are expected to reduce the intensity of vehicle emissions. Improved road foundation and drainage control will reduce annual maintenance requirements. It will allow year-round, reliable flow of local traffic between Bishkek and Torugart, and international through-traffic from PRC to Central Asia and beyond.

3.3. Executing Agency

52. The Ministry of Transport and Communications (MOTC), which is the executing agency for ongoing ADB-financed projects, will be the Executing Agency (EA) for the Project. Its administration will be delegated to the Investment Project Implementation Group (IPIG), the project implementation unit which administers all donor-funded projects. The current team is familiar with international best practices, and ADB policies and procedures. The IPIG includes 4 safeguards specialists. The IPIG will recruit additional specialists for specific tasks, if and when necessary. Since 2013 an international environmental consultant works for IPIG.

3.4. Proposed Design

53. The project will rehabilitate the existing unpaved road from the checkpoint at Km 478 to Km 539. The present elevation profile of the road is shown in Figure 3.4. The section between Km 501 and Km 531 is in the Chatyr Kul Lake watershed, which will require environmental management measures to avoid and minimize potential negative impacts on the Chatyr Kul ecosystem.

54. The design includes rehabilitation and upgrade of foundation, installation of an asphalt surface, rehabilitation and upgrade of drainage (run-on/run-off controls), and installation of silt traps and run-off water retention basins for containment of potentially contaminated run-off water and potential fuel and hazardous material spills. Potential environmental impacts and mitigation measures are discussed in Sections 6, 7 and 8. A summary of design and construction aspects is presented in Table 3.1.

Table 3.1: General information on the Project

Parameter	Quantity	Notes
Total length	60 kilometers	31 kilometers in Chatyr Kul protection area watershed
Estimated Cost	$60 million	Estimated total construction cost including contingencies and interest during construction
Construction Period	55 months	Construction is limited to April – September
Asphalt / cement	180,000 tons	Construction activities will require about 80 truckloads of materials per day
Earth moved	480,000 m3	
Heavy equipment	82 vehicles	
Manpower	220 persons / months	

Source: MOTC

Figure 3.4: Elevation Profile of Existing Road and Project Area

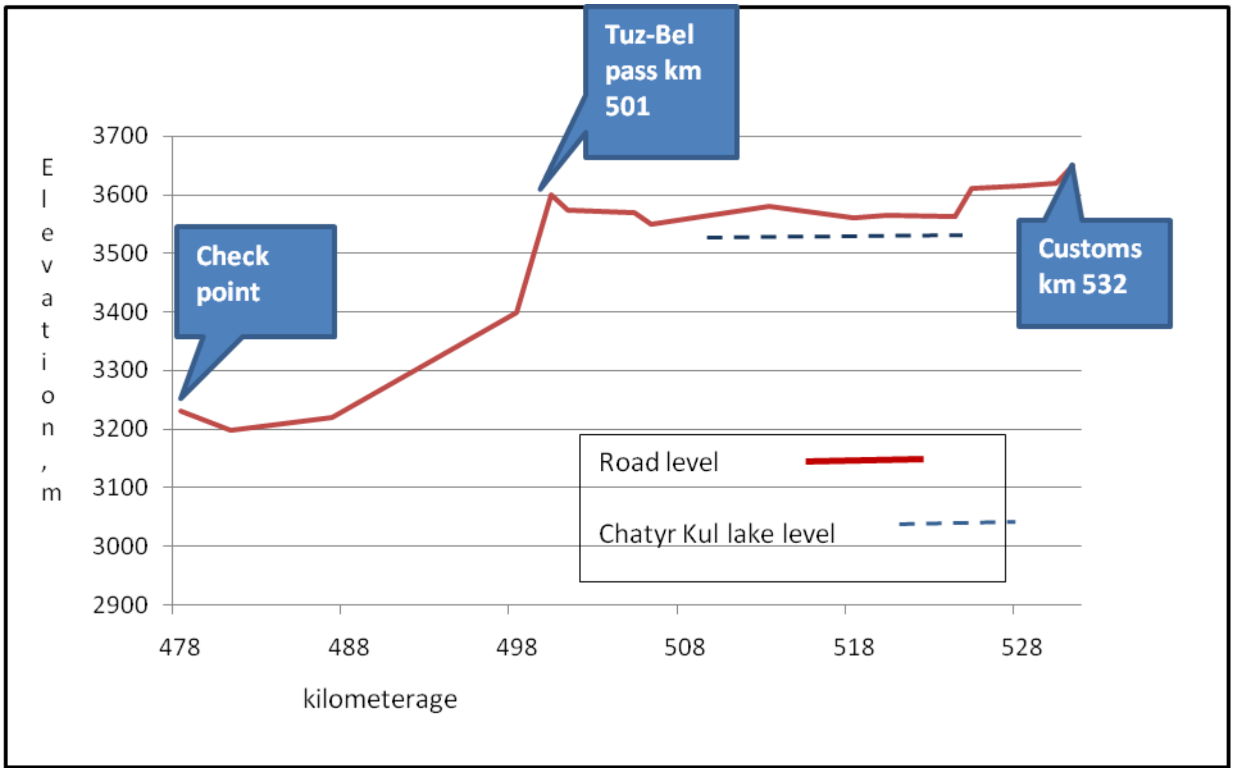


Image by TERA International

3.5. Project Benefits

55. By improving the existing road, the Project will substantially reduce the existing transport bottleneck to trade and will foster regional economic cooperation. The entire region will benefit from the Project, while the project area will gain through economic development and increased access to markets and social services. Improving the project road will reduce transport cost and will contribute to commercial and industrial development opportunities. The overall economic internal rate of return of the Bishkek-Naryn-Torugart Project is 14.7%, and the net present value is about $37.8 million. The project is expected to help boost trade between the Kyrgyz Republic and the PRC. The total volume of bilateral trade is expected to grow from 0.5 million tons in 2007 to 3 million tons in 2015, of which the Kyrgyz Republic-PRC border at Torugart Customs point is expected to contribute more than a half.

56. The following performance targets and indicators are expected to be met:

- Kyrgyz Republic - PRC trade increases from 540,174 tons in 2007 to 3,000,000 tons in 2015
- Cost of transported goods from Kashi in the PRC to the Kyrgyz Republic reduces from $2,000 to $1,500 per ton
- Number of tourists from the PRC to the Kyrgyz Republic increases from a few to 3,000 in 2015
- Daily international freight traffic crossing the border increases from about 80 trucks in 2008 to 200 trucks in 2015
- Travelling and transit time between Bishkek and Kashi in the PRC decreases from 3-4 days in 2008 to 2 days in 2015
- Average number of trips from Naryn oblast (province) to Bishkek increases 50% by 2015.

57. The Project will indirectly benefit 2.3 million people living along the project road, 51% of whom are women dominant in intra- and inter-oblast (province) trade and commercial activities in the Kyrgyz Republic.

58. In the Chatyr Kul section, the Project is expected to have positive environmental impacts in addition to the economic benefit. Such positive environmental impacts include:

a. Reduction of present levels of noise, dust, and vibration to the Chatyr Kul Preservation Area by smoother and non-stop running of heavy vehicles;

b. Securing safer habitats by enhancing surveillance ability to prevent illegal poaching and intrusion of livestock grazing into sensitive breeding areas, and;

c. Improving the monitoring system of Chatyr Kul ecosystem of Karatal-Japyryk State Preservation Office (KJSPO) via training and procurement of new equipment for environmental monitoring, and vehicles (see Chapter 7 of this Report).

59. The Project will induce certain unfavorable environmental impact during the period of construction and operation. Impacts during the construction are of mainly temporal and reversible nature, whereas potential impact during operation period can be avoided or minimized at the expense of appropriate solutions in design documentation and facilities of control in the operation process. (They are under consideration at the Sections 6 and 7).

3.6. Analysis of Alternatives

60. Several alternatives have been considered including “no action,” alternate alignments, and alternate transport modes, as discussed below. Considering only economic and financial factors, there are no practical alternatives to the proposed project. The “no action” alternative is not attractive based on environmental and economic factors. Alternate transport modes are not viable based on economic and social development objectives. The proposed Project is preferred based on economic, environmental, financial, and social factors.

3.6.1. No Action

61. The “no action” option is not recommended on environmental and economic considerations. Although no direct cost would be incurred, the demerits of the no-action option are:

(1) Economic factors including traveling time and transportation cost from the PRC will increase as the road deteriorates further.

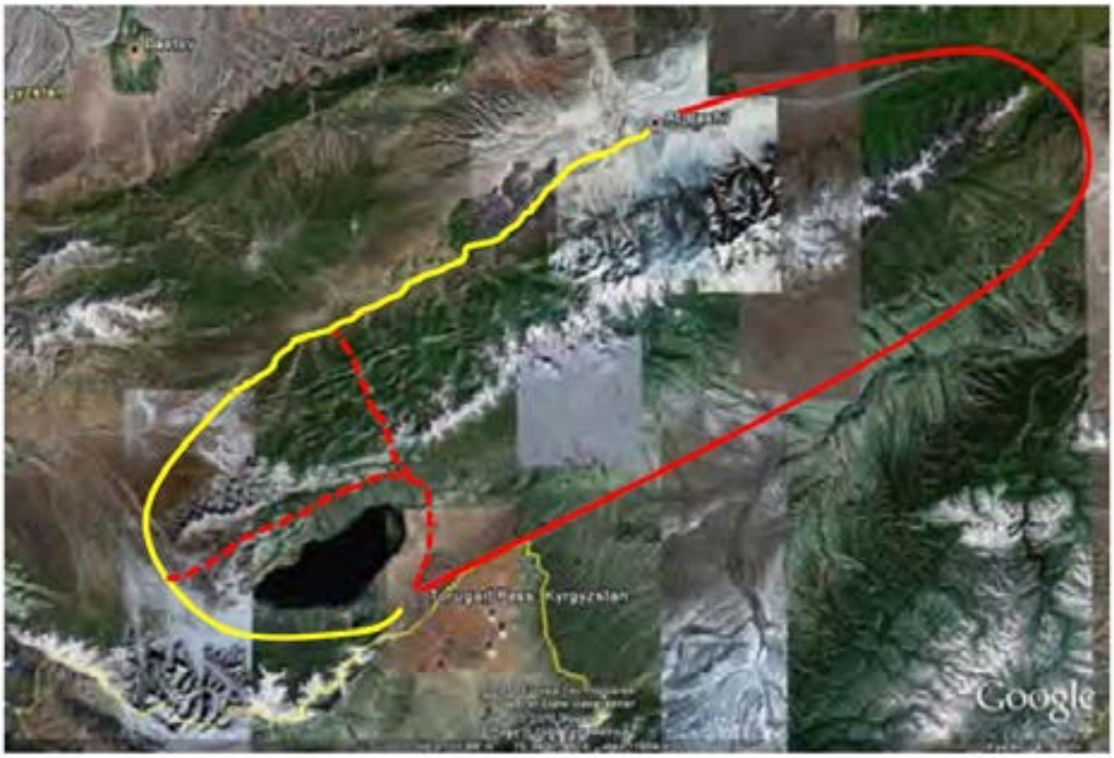
(2) The ecosystem of the Chatyr Kul protected area will be threatened by increased risk of traffic accidents.

(3) Chatyr Kul water may be contaminated by fuel and other hazardous materials spills resulting damage to vulnerable fauna and flora.

3.6.2. Alternative Routes

62. There is a theoretically available route from the Torugart Customs post to the northeast, detouring around the At-Bashi mountain ridge to At-Bashi town, which is about 3 times longer than the section proposed for rehabilitation shown in (see solid red line in Figure 3.5). This route was considered early in the planning phase of the Bishkek-Torugart road, but was rejected as it will not contribute to the economic and social development of the communities in the existing road corridor. This alternative route would have effectively abandoned the existing road linking the town of At-Bashi and villages to the southwest, which would then not benefit from economic development related to trade and transport growth along the new road.

Figure 3.5: Alternative Alignments



63. The alternative alignment is actually a non-engineered track which is in very poor condition and is reported to be passable only by 4-wheel drive vehicles. It would require much larger volume of cut and fill than using the existing alignment, and would entail much higher construction and maintenance costs to be made into a Class II road. This alternative would occupy a greater part of the catchment area of Chatyr Kul, thus increasing the potential pollutant load entering the lake basin from vehicle emissions and contaminated runoff. Hence, it is not attractive on economic, environmental, financial, or social bases.

64. There are 2 other theoretically possible routes within the Chatyr Kul watershed (dashed red lines shown in Figure 3.5). Routing around the north side of Chatyr-Kul from the Torugart Customs post along the south flank of the At Bashi ridge to the Tuz-bel pass is theoretically possible as there is sufficient space for the alignment between the protected area and the ridge. However, this route crosses the argali sheep habitat and would impinge on the Chatyr Kul protected area. The other possible route is along a track which crosses the At-Bashi ridge from the north side of Chatyr Kul to the existing road northeast of the Checkpoint at Km 478. This route is marked on Soviet-era maps as a secondary road, but it is not considered a viable alternative as it would traverse part of the Chatyr Kul protected area. These routes are not economically, environmentally, and financially viable options.

3.6.3. Alternative Transport Modes

65. **Air Transport.** The KR has 11 operational airfields, of which 4 are designated as international airports, and 7 are designated as domestic. International airports are located at Bishkek (Manas), Osh, Karakol and Issyk Kul (Tamchy). Domestic airports are located at Batken, Isfana, Jalalabad, Kazarman, Kerben, Naryn, and Talas. The airport at Naryn would be the directly analogous option to the proposed project for air passenger and freight services.

66. Commercial air freight services are generally limited to small volume, high-value, and time-sensitive cargoes. The cargoes transported on the existing Bishkek-Torugart road are generally high volume, low to medium-value, and non time-sensitive. Air freight services would have to be expanded along with cost reductions in order to be competitive with road or other surface transport modes. Air travel is not an obvious option to the proposed project, as it does not deliver the transport and trade services in the At-Bashi valley, which are key to the overall Bishkek-Torugart road rehabilitation program.

67. **Rail Transport.** The governments of the KR, the Peoples Republic of China (PRC), and Uzbekistan have been discussing and studying a regional rail line since 1997. A feasibility study for a rail line linking Uzbekistan and the PRC via the KR has been conducted with support from the European Union TACIS program. The study considered growth in freight traffic based on possible future trade scenarios, and rail construction cost assumptions consistent with recent experience in the PRC and Uzbekistan. The rail line could be justifiable with a freight volume of 10 to 15 million tons per year, which is several times higher than the predicted freight traffic on the Bishkek-Torugart road.

68. As of September 2010, the 3 countries had agreed in principal to proceed with the rail line, although technical specifications (rail gauge) have to be agreed on. The proposed financing arrangement is a “resources exchange for investment” with the PRC providing construction funds to be repaid by mineral resources. PRC-based firms would be granted development licenses for the "Terekkan" and "Perevalnoe" gold prospects in the Jalal-Abad region); the "Chechekty" aluminum prospects at the Sandyk area in the Naryn region; and the "Dangy" iron ore prospects in the "Jetim too" area, also in the Naryn region.

69. Given the nature of this financing arrangement, a rail line is clearly not a straightforward alternative to the proposed road Project. It could be an independent and complementary transport system, and in the future could provide a viable alternative to widening the road depending on transport growth. The economic benefits would arguably be much greater than the proposed road Project, and railways are considered to be environmentally friendly compared to roads based on relative fuel efficiency per passenger-kilometer or ton-kilometer. However, a rail line would have a much greater environmental “footprint” during construction due to large volumes of waste generated during tunnel construction. A rail line could also have much greater potential cumulative and induced impacts, as the proposed rail line would facilitate access to other mineral resources, including several coal deposits which have been identified in the Jalalabad, Naryn, and Torugart pass region (see further discussion of cumulative and induced impacts in Section 6. More importantly, unless the route were approximately parallel to the existing road, a rail line would not serve the social and economic development needs of the local communities.

3.6.4. Abandonment of the Naryn-Torugart Corridor

70. Considering the narrow context of potential negative ecological impacts, elimination of transport activities is the only “guaranteed” alternative to prevent negative transport-related impacts to the Chatyr Kul area. This alternative would require abandoning the existing road completely, which would eliminate cross border trade on the Naryn-Kashi corridor. This alternative would be an academic option to demonstrate compliance with the *ADB Safeguard Policy Statement (2009)*, Appendix 1, paragraph 27, provision for no net loss of biodiversity (discussed in Section 2). However, such an action is at odds with economic development plans for the KR. This would result in only 1 border crossing with the PRC (at Irkeshtam), and would effectively eliminate future trade-related economic growth in the Naryn-Torugart area. Given the government’s development plans, which include expansion of cross-border trade, this is not considered to be a realistic alternative.

3.6.5. Construction of New Alignment Parallel to the Existing Road

71. **Above Grade Road.** It is theoretically possible to construct a new road on new alignment roughly parallel to the existing road, but farther away from the Chatyr Kul protected area. This would be considerably more expensive than the proposed rehabilitation-in-place alternative, as it would require much more earthwork and import of construction material. The existing road could be modified in some areas for catchment of potentially contaminated runoff. The high cost of this option is not justified based on current level of traffic. Any environmental improvements would be negligible, and anticipated mitigation requirements would not be appreciably different from the proposed Project.

72. **Reconstruction of Road Below Grade (Depression).** Although this method can effectively reduce noise and would theoretically prevent spilled contaminants from entering into the lake, control of numerous numbers of surface water and groundwater streams crossing the road will be difficult, in addition to the higher cost and longer construction period. This design approach could also require excavation and considerable disturbance of permafrost. This method is not recommended based on engineering, maintenance, and environmental considerations.

73. **Tunneling.** This is a theoretically perfect method to avoid any impact to the Chatyr Kul ecosystem. In the developed countries, this is very practical method to avoid impacts to not only natural environment but also human settlements. However, the cost can be more than $10,000,000/km and is not considered to be feasible.

3.6.6. The Preferred Alternative: Rehabilitation of the Existing Road at Grade.

74. Rehabilitation of the existing road at grade is considered to be the most feasible method with respect to minimizing construction impacts and costs, delivering economic benefits, and minimizing potential negative environmental impacts. Potential environmental impacts can be mitigated by provision of spill control countermeasures, enforcement of speed limits, installation of new warning signs, and other measures (discussed in more detail in sections 6,7,8). Figure 3.6 illustrates the current poor condition of the road in the project area.

75. The present route has been used for many years although it is in proximity to the Chatyr Kul protected area. Impacts to the Chatyr-Kul ecosystem can be minimized with proper mitigation measures. The estimated cost is also minimal compared to construction of new alternative routes as discussed above.

Figure 3.6: Road Condition at KM 525 (on September 21, 2010)

4. DESCRIPTION OF ENVIRONMENT

76. The project area is in the south-west part of Naryn Province. Some photos, taken during project site inspection, are presented in Appendix 1.

4.1. Geography, Geology and Soils

77. The KR is mountainous and contains some of the highest parts of the Tien-Shan and the Pamir-Alay Ranges. The mountains form a natural geographic boundary between central Asia and the PRC. The severe topography of much of the country is a major factor in its settlement patterns and development, with the project area being sparsely populated. The project area has naturally high erosion rates. Landslides, rock falls, and avalanches are common. The Bishkek – Torugart road corridor lies entirely within the mountain systems of the North and Internal Tien-Shan.

78. The major orographic features of the project area are:

- At-Bashi Ridge (item number 38 in Figure 4.1)is located in the south part of the Internal Tien-Shan. Its length is about 140 km and width – up to 30 km. Its average altitude is 4300 m. For about 100 km the Bishkek – Torugart Road runs parallel to the ridge and traverses it at its west end.
- Torugart Too (No 78 in Figure 4.1) is a ridge in the Internal Tien-Shan which serves a border between Kyrgyzstan and China. The length of the ridge is 64 km and width of up to 20 km.
- Arpa Valley (No 35 in Figure 4.1) is a high-altitude valley located in south-west part of the Internal Tien-Shan (Naryn oblast). On south-west it borders with Fergana ridge, south – Torugart ridge, east – At-Bashi ridge and north and north-east – Ortok-Too and Jaman-Too ridges. The length of the valley is 60 km, width 32 km, altitudes 2700 – 3600 m above
- Chatyr Kul Valley (No 51 in Figure 4.1) is a high altitude depression located between ridges Torugart Too and At-Bashi. The length of the valley is 48 km and width of up to 18 km. Chatyr-Kul Lake occupies part of the valley.

Fig4.1: Major Orographic Features of the Project Area

Source: *Atlas of Kyrgyz SSR* (Central Directorate for Geodesy and Cartography at the Council of Ministers of the USSR, 1987. Note: see text for explanation of symbol

4.1.1. Seismology

79. The region is seismically active. Earthquakes with magnitudes of 6 to 7 on the Richter scale are not unusual and there are records of catastrophic earthquakes in the recent past. The most severe earthquakes in the area occurred in Kemin (1911, M=8.2), Chilik (1889, M=8.4), Vernyi (1887, M=7.3), and more recently at Suusamyr (1992, M=7.3), Kyrgyzstan – Xinjiang Border (2002, M=5.5), and Southern Xinjiang (2003, M=6.4). However, the project area proper has little historical seismic activity. MOTC design guidelines do not include special earthquake resistance criteria.

4.1.2. Soils and Permafrost

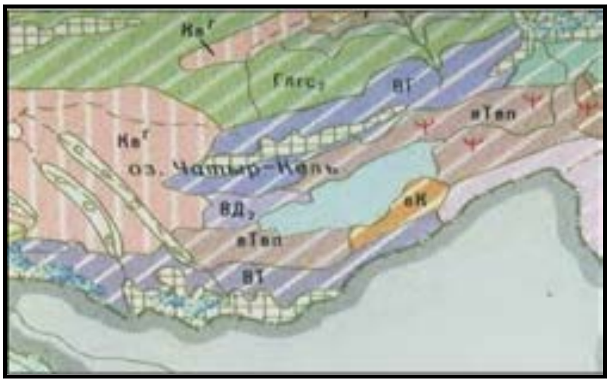
80. Complex orographic relief and interrelation of numerous natural factors determine the occurrence in Kyrgyzstan of the numerous types of soils; some of them are unique. Soils occupy about 80% of the country's area. The most common are two groups: mountain valley soils and mountain soils. The extensive studies of the soil cover in the KR have culminated in preparing the Map of Soils of the KR that presents 51 soil types and sub-types. References to soil types described below are those provided by the *Atlas of Kyrgyz SSR* (Central Directorate for Geodesy and Cartography at the Council of Ministers of the USSR, 1987) based on the above Map.

81. Soils in the project area are mainly classified as mountainous-valley chestnut, high-altitude dry-type playa, high-altitude mountainous steppe, and high-altitude tundra peat polygonal soils. In Arpa Valley (km 478 – km 501) soils are mountainous-valley chestnut soils and high-altitude dry-type playa. High-altitude dry-type playa is also located in the western part of the Chatyr-Kul depression, whereas high-altitude mountainous steppe soils dominate the eastern part of the depression. High-altitude tundra peat polygonal soils are typical for areas around Torugart Pass. The major characteristics of the soils in the project area are as follows.

82. Mountainous-valley chestnut soil (Квгin Figure 4.2) is being formed under conditions of sharply continental climate under sheep fescue including wheatgrass, feather grass, and different species of wormwood.

83. High-altitude dry-type playa (вТвп in Figure 4.2) is being formed in cold and extremely arid climate on loam soils and sabulous clays under saltwort, wormwood and other xerophytes. Among morphologic peculiarities of soil are fractured, light pale, pressed, fine-porous crusted layer covered on surface with grayish and white deposit of salt. Soil contains 1-2% of humus with a maximum at the depth of 5-20 cm, and 0.2-0.3% of total nitrogen. Soils are highly carbonaceous on surface with 8-12% of CO_2 carbonates. The pH variation is within 8 - 8.8. Soil is very low in cation exchange capacity: 5-9 MEQ/100 g of soil.

Figure 4.2: Soils in the Project Area



Source: A*tlas of Kyrgyz SSR* (Central Directorate for Geodesy and Cartography at the Council of Ministers of the USSR, 1987.

84. High-altitude mountainous steppe soil (вК in Figure 4.2) is being formed under conditions of huge temperature swings and a result of permafrost in sheep-fescue and sheep fescue – ptilagrostis steppe. Morphology of soils is characterized by clear turfness of topsoil, gray with reddish tone color lumpy structure, and fractures. High-altitude tundra peat polygonal soil occurs as isolated areas at the altitudes of 3700-4000 m. It is being developed under cushions of Dryadanthe that together with moss form polygons.

85. **Permafrost** is defined as a layer of soil with permanently negative temperature and not subject of seasonal thawing for at least 2 years. The thickness of permafrost layer can range from several meters to several hundred meters. The soil above the permafrost (known as active layer) thaws and freezes seasonally. Severe climatic conditions of high altitude areas cause forming permafrost not only in mountains but also within elevated valleys. The Map of Engineering and Geocryological Zoning of KR distinguishes the following geocryological belts:

- Belt A: island distribution of permafrost;
- Belt B: discontinuous distribution of permafrost
- Belt C: continuous distribution of permafrost.

86. For the Internal Tien-Shan these belts are commonly associated with the following altitude ranges: Belt A (3000-3300 m), Belt B (3300 -4100 m), and Belt C (4100 m and higher). Soils in the project area, which topographically fall into Belts B and C, are dominated by alluvial deposits formed by erosion of the high mountains. The distribution of soils in mountainous areas fulfills the vertical zoning rule, i.e. soils change more or less systematically with the altitude. It can be explained by substantial dependence of the climatic conditions at which soils are being formed of the orographic relief. In the Chatyr Kul area, alluvial fans are common, as well as intermittent stream channel and flood deposits. Soil porosity and permeability are highly variable.

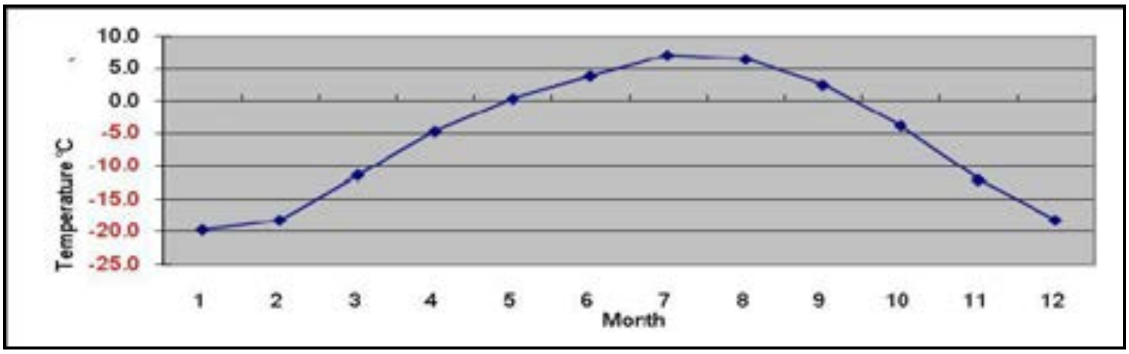
4.1.3. Climatic and Meteorological Conditions

87. Climatic conditions are rather diverse in different parts of the area and this is explained by high altitude gradient, direction and steepness of slopes, wind velocity and vector. The climate here is the extreme-continental with severe and snow-abundant winter. The warmest months are July and August when the air warms up to+15+18ºC, yet with frosts at night. The average annual temperature is -5,6°C, in winter temperature may drop down as low as -50°C, while maximal summer temperature can rise up to +24°C. Even in summer precipitation can be in the form of snow, hail or snow pellets.

88. The maximum monthly temperature at Chatyr Kul is less than 10° C in July, while the minimum reaches to -20° C in January. The monthly average temperature is higher than 0° C only in the period from May to September (see Figure 4.3). Total yearly rainfall is less than 300mm and the maximum observed snow thickness is 400 mm in March (see Figures 4.4 and 4.5). Only the season from July to September is the seasons when no snow lays. The wind blows mostly from the south-west with a wind speed of 2 – 4 m/s as a monthly average (see Figure 4.6).

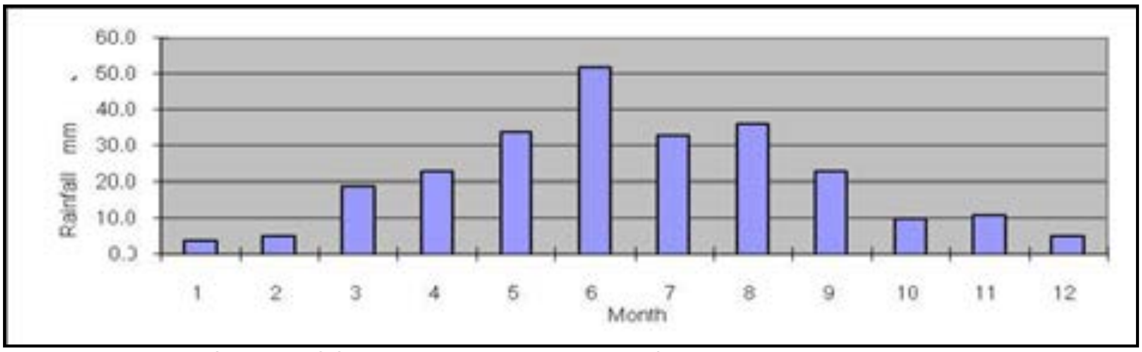
89. An important climatic element is wind, primarily of western direction. It’s velocity is different with the average 1,5- 3,9 m/sec. In summer high daytime temperatures in combination with strong wind cause rapid evaporation of moisture from the ground and this is catastrophic for pastures. In winter the wind velocities are at their minimum.

Figure 4.3: Monthly temperatures



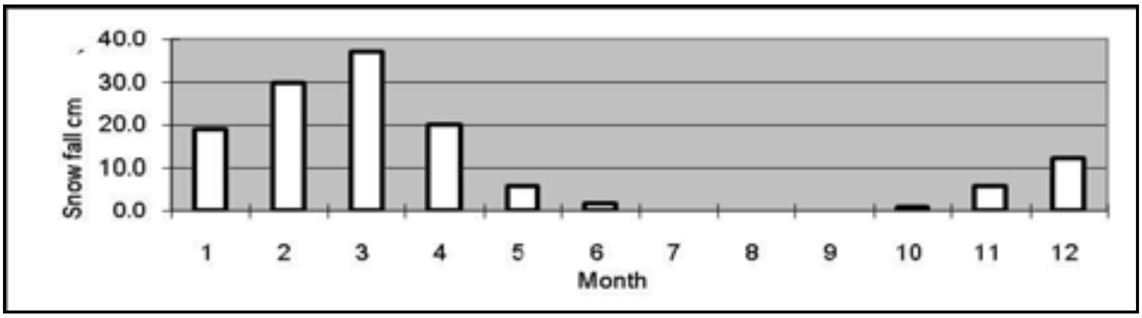
Note: month 1 = January Source: JOC, working EIA document as of December 2009.

Figure 4.4: Monthly precipitation norms



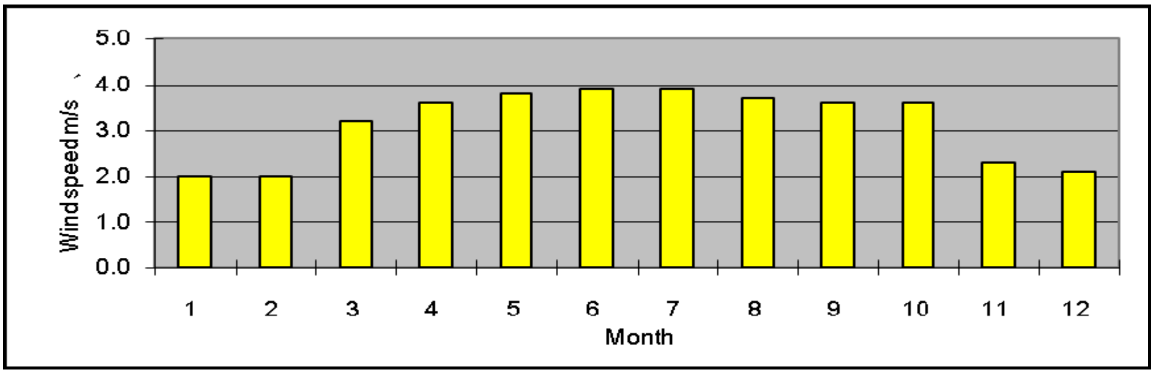
Note: month 1 = January Source: JOC, working EIA document as of December 2009.

Figure 4.5: Monthly norms of snow



Note: month 1 = January Source: JOC, working EIA document as of December 2009.

Figure 4.6: Monthly wind velocities



Note: month 1 = January Source: JOC, working EIA document as of December 2009

4.1.4. Ambient air

90. There are no large sources of industrial pollution in the project area, resulting in air quality that is generally good, but is affected by dust generated by vehicles. The closest ambient air quality monitoring stations are located quite far from the Project Area - in Tokmok (Chuy Valley) and Cholpon – Ata (Issyk-Kul Lake). There are no air quality monitoring stations located in Naryn. Neither the KHM office in Naryn, nor the KJSPO (also located in Naryn), have any air monitoring equipment.

91. The road section is located in a valley surrounded by mountains on the perimeter; the height of terrain is between 3578-3615 meters above sea level. In the territory there are dominated wetlands with sparse vegetation. In the valley there are no villages and homes. There is no economic activity in the valley, except for animal husbandry and the trailers at KM 531.

92. Measurements of dust, noise and vibration were carried out in 2012 (see Appendix 11) in the site of the Tuz-Bel pass up to the Torugart Border Crossing point. Works were carried out in accordance with national standards, recommendations and guidelines of the Kyrgyz Republic, and based on the ISO 14000 on the background of inorganic dust, sulfur dioxide and nitrogen.

93. The single source of dust, noise and vibration is road transport. During working days a movement is delivered in both directions. On weekends and holidays the border custom is closed and as result there are a significant number of accumulated heavy vehicles accumulating in the BCP.

94. Sampling and analysis in order to reveal a nitrogen oxides and sulfur was conducted by the photometric method with a sensitivity of 0.3 mg in the analyzed volume. Determination of sulfur dioxide was measured by the photometric method of aspiration sensitivity of 5 mg in the analyzed volume. Analysis of dust samples was carried out according to GOST 17.2.4.05-83.

95. MPC_{motc} of nitric oxide substance within 1.53 MPC is recorded only in the point 3 where a maximum congestion and traffic movement is registered.

96. Exceeding of the maximum single concentration of SO_2 in the range of 1.04-11.08 of MPC_{motc} has been recorded in the sampling point 1 simultaneously with the increase of the vehicles traffic. Excess of the average daily SO_2 concentration is within 8.2-70.2 MPC_{ac}. Currently, the traffic in the testing project area is within 80 units of heavy vehicles in both sides.

97. The content of inorganic dust in the air is related with both climatic conditions of the region and vehicles movements. Excess of MPC_{motc} (11.0) and MPC_{ac} (13.0) on the content of the dust is observed in the sampling point № 3, where there is a fixed maximum congestion and traffic movement. In the sampling points 2, 4 and 5 on the excess of dust MPC_{motc} are 1,27-2,0 and on MPC_{ac} 1,48-3,10. Summary table with results determination of polluting substance in the ambient air are given in the Table 4.1.

Table 4.1. Sumary Table with results determinating air polluting substances

Substance	$MPC_{mr/cc}$	Substance content (C), mg/м^3			Hazard class	Pollution index
		Average	Min	Max		
Inorganic dust	0,3/0,1	0,392	0,048	3,288	3	**1,307**
NO_2	0,085/0,04	0,0488	0,0094	0,1313	2	0,61
SO_2	0,5/0,05	1,542	0,1731	5,536	3	10,28

98. As the table demonstrates the main contribution to air pollution is delivered by sulfur dioxide (10.28) and inorganic dust (1.307). Taking into account the local climate conditions (wind, dispersal of pollutants) the degree of environmental stress on nitrogen dioxide doesn't exceed

the permissible limits; the dust level is a little above the permissible concentrations, but for sulfur dioxide it's critical.

99. The air quality monitoring, carried out in June 2013, showed that in some sections maximum permissible concentration of SO2 and CO2 excedes three times, and at two sampling points they reach maximum permissible concentration. This above limit value of SO2 and CO2 is the result of direct impact of road traffic, as discussed earlier. However, it is necessary to continue air quality monitoring in future to get more comleted picture of the situation (see Appendix 11).

100. The air quality monitoring program shall be carried out in the six identified sampling points. However, since the only and major air polluter are vehicles and construction equipment the monitoring program shall be expanded. This is explained by intensive burning of petroleum products (gasoline, diesel fuel, additives) and their incomplete combustion in highland areas.

101. Analysis of the BLS results in 2013 indicates that in addition to the standard monitoring parameters (inorganic dust, sulfur and nitrogen dioxide) the air quality monitoring program shall also include concentrations of fuel soot, benz(a)pirene, lead and cadmium

102. The air quality monitoring program in the Project area shall be done in the following order: a) before the construction works (end of April-beginning of May), b) twice a month during the construction period (May-September), c) upon the completion of all the construction works (end of September), d) one week following the completion of all the construction works.

103. The air quality monitoring program shall be combined with water quality monitoring program with the purpose to obtain a representative picture of integrated environmental impact. It is not excluded that the results of environmental monitoring during the first year of construction works may lead to EMP updates.

104. The short construction season and specific climatic conditions in the Project area require to using standard equipment and approaches. It is advised for Subcontractor to procure services from the state agencies, or eligible accredited organizations in the frames of requirements for such services procurement.

4.1.5. Noise

105. Noise is not the major problem in the Project area since there are no permanent residents in the vicinity. The noise modeling implemented by the JOC group in 2009 demonstrates that noise levels decrease rapidly at a distance from the road: at 500 m distance the forecasted noise level will drop down to less than 60 dBa, i.e. to the recommended limits for the nighttime for residential areas (see Table 4.2.).

106. The monitoring program according to the ToR was done just once. Main objective is to scan the location to identify sources of noise and noise background peculiar to this locality. The program included localized instrumental system of measurements at different distances from the road and traffic intensity (GoST 12.1.050-86, GoST 23337-78, ISO 1996). According to GoST P 41.51-99 the limits of eternal noise loads from motor transport equal to 80 dBA for the vehicles of 150 kWT power, or higher.

107. In the course of the noise measurement program were also measured it is necessary to also measure the wind velocity, air temperature, baric pressure, elevation and time of the day (day or nighttime). The Table 4.2 provides for the main measurement results for 2012.

108. The noise parameters were measured in 6 points. The time of the measurement program coincided either with minimal or single passage of heavy duty trucks (HDDV). On Mondays evening (8:30 pm) the first batch of trucks (about 10) begin crossing the PRC-KR border, at about 9:50 pm they begin their climb to Tuz-Bel Pass, then single trucks follow.

Table 4.2: Road section from Tuz-Bel Pass to Torugart checkpoint

№	Description of monitoring site	Date	Noise source factors	1. Wind velocity	Wind vector		Equiv. noise degree, dB	
					degree	bearing	A	C
1	Point №1, 478 m from the road towards Chatyr-Kul lake, near the Narzan Water spring	10.09. 2012	Wind gusts	6.5-8,3 Wind gusts to 10,3 m/s	340-360	NW-N	76	86
			-//-	5,9-8,5	340-360	NW-N	74	84
			-//-	7,6-9	360	N	78	85
2	Point №2, 10 km from Tuz-Bel Pass, moving from the Pass towards the Torugart Pass	10.09. 2012	3m from the road, wind gusts	3.3-6.8 gusts up to 9,6 m/s	340-360	NW-N	58	80
			3m from Point 1, HDDV	2,7-3.5	330-315	N	78	77
			3m, 1 HDDV	4,4-5,9	320-340	NW-N	72	82
			3 m, wind gust	4,1-4,6	320-340	NW-N	77	87
3	Point №3, Customs check point	10.09. 2012	10 m from the road, idle HDDV	1,8-2,4 gusts up to 4,0 m/s	40-240	NE-NW	57	60
			10 m from the road, 2 HDDVs	3,5-5,9 gusts up to 7,5 m/s	0-20	NE	78	86
			10 m from the road, wind gusts	1,6-2,5 gusts up to 5,9 m/s	20-45	NE	76	80
			20 m from the road, wind gusts	3,1-3,0 gusts up to 9,0 m/s	330-350	NE	77	80
			10 m from the road, moving vehicles, wind gust	2,3-3,5	20-85	NE	76	82
			10 m from the road	4,4-7,0	40-90	NE	66	86
			20 m from the road, noise of wind	2,3-4,2	340-20	NW-NE	56	63

109. As seen from the Table 4.2 above noise appears as a significant disturbance factor to living organisms. During the wind blows the noise load exceeds acceptable noise load limits (80 DBa) even at a distance of almost 500 meters from the road (86 DBa). The main source of noise in the studied territory is the noise of motors working at their maximum capacity, trucks moving on the unpaved road at low speeds. The noise of the motors subdues the noise of tires friction against the road surface. After the rehabilitation and at the increased traffic intensity and their speed, the noise level of tires will increase, adding up to the noise of motors. Another noise measurement program will be required to identify actual sources of noise and to review the mitigating measures program.

110. It is required to monitor noise pollution during construction period generated by construction equipment. Below is the Table of standard noise impact by construction equipment according to the EPA classification (Table 4.3.).

Table 4.3: Noise levels (in dBA), distance +/- 18 meters

Equipment	Noise level
Bulldozer	80
Frontloader	72-84
Rock breaker	81-98
Dump truck	83-94
Scraper	80-93
Roller	73-75
Asphalt paver	86-88
Welding generator	71-82
Concrete mixer	74-88
Air compressor	74-87
Pneumatic instruments	81-98
Cement and dump trucks	83-94

111. Noise and vibration monitoring, carried out in June 2013, did not reveal any exceeding of noise and vibration impacts on environment. Noise and vibration measurement results are reflected in Appendix 11.

4.1.6. Vibration

112. Vibration represents threat for human health and environment in the areas subjected to vibration. The sources of vibration can be transport, construction equipment and other sources.

113. The most effective vibration protection can be achieved at the stage of project design. The vibration parameters are regulated by the following norms - sanitary-hygienic and technical. Vibration requirements oversight is done by the Sanitary and Epidemiological Department of KR MoH.

114. The acceptable vibration levels include values of total vibration in their gross (cm/s) and relative (dB) values of speed through the most developed in practice frequency spectrum (> 355 Hz), which includes 6 octaves of frequency bands. Each octave band has their own permissible values of the average-squared wave velocity or amplitude induced by the operating mechanisms and machinery.

115. As a rule, as vibration protection means, there are used noise-protection barrier or fencing of different height. The simplest and most effective can also be an earth berm planted with shrubs, which at one and the same time performs as noise reducer, and the plant root reinforce the earth embankment.

116. Measurement of vibration level, carried out in 2012 and June 2013, did not reveal any exceeding of limit value. During the construction season of 2013 a measurement program will be carried out to define the vibration levels from construction equipment and its impact onto environment, and development of recommendations to reduce vibration with account to the specifics of the project area.

4.2. Water Resources

117. The Project area is characterized by numerous creeks, small water bodies and the Chatyr-Kul Lake; the latter will be discussed in more details below. The social and economic

study of the Project area demonstrates that the majority of people get water for drinking purposes from surface water sources, or from springs.

118. Due to the fact that in summer time water sources, which were used for water sampling in spring time, dried up completely, and sampling points did not coincide with the sampling locations in May 2012 did not coincide with the sampling points in August 2012, no representative picture was received on water quality in the project area. These aspects were taken into consideration in the course of the last site visit by the group of scientists in June 2013.

119. In order to receive true data on water quality in 2013 it was planned to carry out a complex water quality analysis in the rivers, Big and Small Chatyr-Kul Lakes in the following sequence: a) following the mass snow melt at the end of April – beginning of May, b) one months following the beginning of construction works (May-June), c) at the end of construction season (end of September). All three stages of analysis will include detailed analysis of water samples for probable availability of heavy metals, BOD, coli bacteria and other pollutants. Such an approach modified by the BLS data analysis with special attention to be paid to probable waterborne disease vectors, heavy metals and toxic elements content in water.

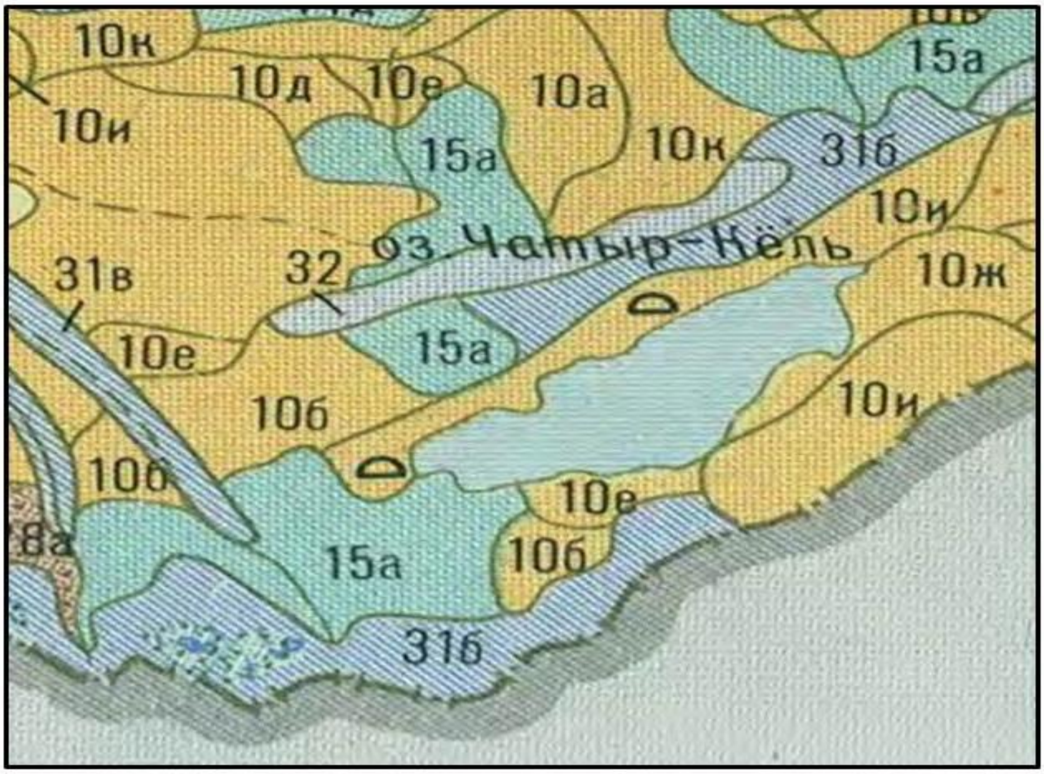
120. The most recent water samples were taken in early April and in June 2013 (see Annex 11) to determine the background level and to support the progress of construction work. According to the protocol of water quality analysis in the lake Chater-Kul, carried out on April 5 2013 and June 21 2013 by the Office of Environmental Monitoring of SAEPF under Government of Kyrgyz Republic, excess of sulfates concentration was found at 4 points out of six, and excess of chloride at the same sampling points. Thus, at the remaining two sampling points there is no exceedance of MPC. According to the laboratory conclusion the registered maximum permissible concentration at the 4 points are classified as background, i.e. they are natural to such a pH-environment due to the natural salinity of water. The obtained results of water sample analyzes at this stage can serve as an indirect confirmation of the fact that, due to high natural salinity of water, Chater-Kul lake, at certain parts, is not a habitat for native species of fish. The data on water quality, taken in the lake Chater-Kul, should be compared with the historical data for the study of mineral waters of Kyrgyzstan (including narzans source) and it is necessary to conduct a comparative analysis of SAEPF laboratory data for 2013. To draw final conclusions about the origin of sources of the maximum permissible concentration (natural or anthropogenic) on sulfates and chlorides for fish-ponds it is necessary to continue to monitor the water quality monitoring in the Big and Small Lakes.

121. The second water sample (July-August 2013) will be taken to identify the construction works impact onto environment. The third water sample (end of September 2013) will be taken to identify cumulative construction works impact onto environment and water bodies. All these data will be timely included into the updated EIA, and will serve as appropriate adjustments to the environmental impact monitoring system, water bodies and mitigation measures.

4.3. Biological Resources

122. The project area is classified largely as steppe and meadow ecosystem. Fescue grass steppe (Festuca kryloviana, 10b in Figure 4.7) and sedge meadow (Kobresia capilliformis, 15a) are characteristic of the project section located in Arpa Valley and western part of Chatyr-Kul Valley. Barley steppe (Hordeum turkestanikum, 10e) covers the middle part of Chatyr-Kul Valley, and Festuca olgae steppe cover the eastern part of the Chatyr-Kul. Chatyr-Kul is discussed further below.

Figure 4.7: Flora distribution in the Project Area



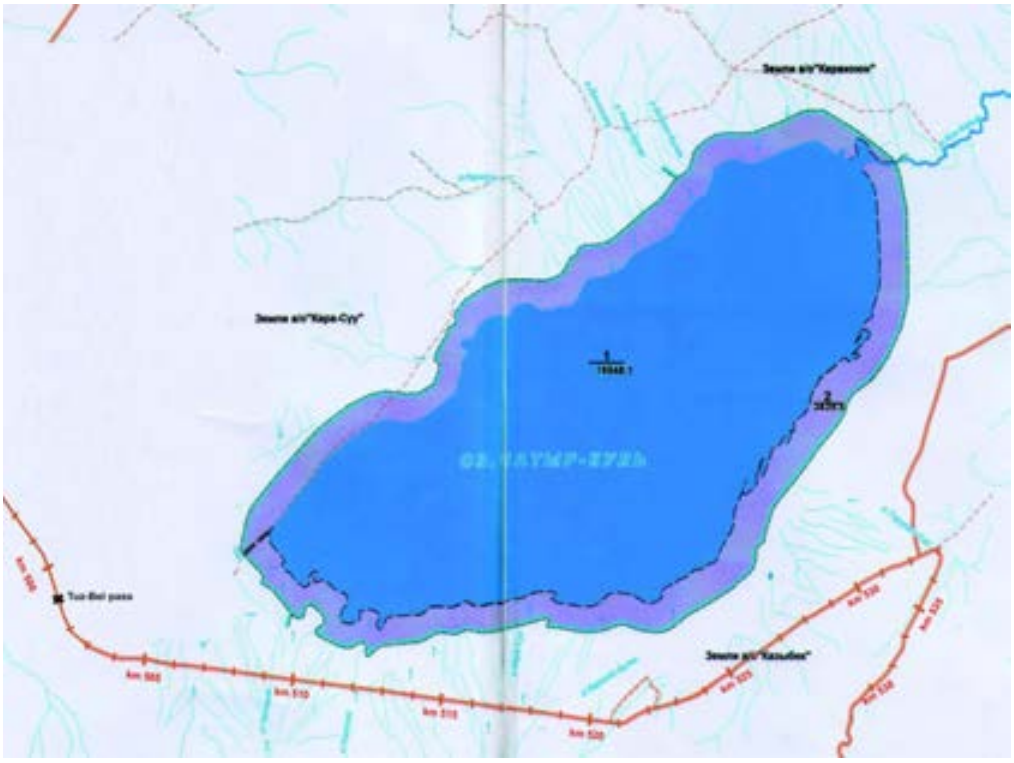
Source: *Atlas of Kyrgyz SSR* (Central Directorate for Geodesy and Cartography at the Council of Ministers of the USSR, 1987.) Note: see text for explanation of symbols

4.4. Critical Habitat: The Chatyr-Kul Area of the Karatal Japyryk State Nature Reserve

123. The Chatyr Kul wildlife refuge was established in 1971 covering 190 km^2 and was classified as IUCN Category IV (Habitat and species management area). Later, it became a part of Issyk-Kul State Nature Reserve. Karatal-Japyryk State Nature Reserve was established on March 1, 1994 with the purpose of conservation of unique natural complexes, rare and endangered flora and fauna of the Central Tien-Shan. On May 5, 1998 Chatyr-Kul Area was transferred from the Issyk-Kul State Nature Reserve to Karatal-Japyryk State Nature Reserve. In November 2003, the lake was excluded from the list of specially protected territories and gained the status of state fishery; however, this Decree was annulled in 2005. Decree of the Government No.310 of July 25, 2005 made provisions to designate Chatyr-Kul Lake for inclusion in the Ramsar List and in November 2005, it was formally registered as a Ramsar Convention Site for the following key reasons (Figure 4.7. “a”).

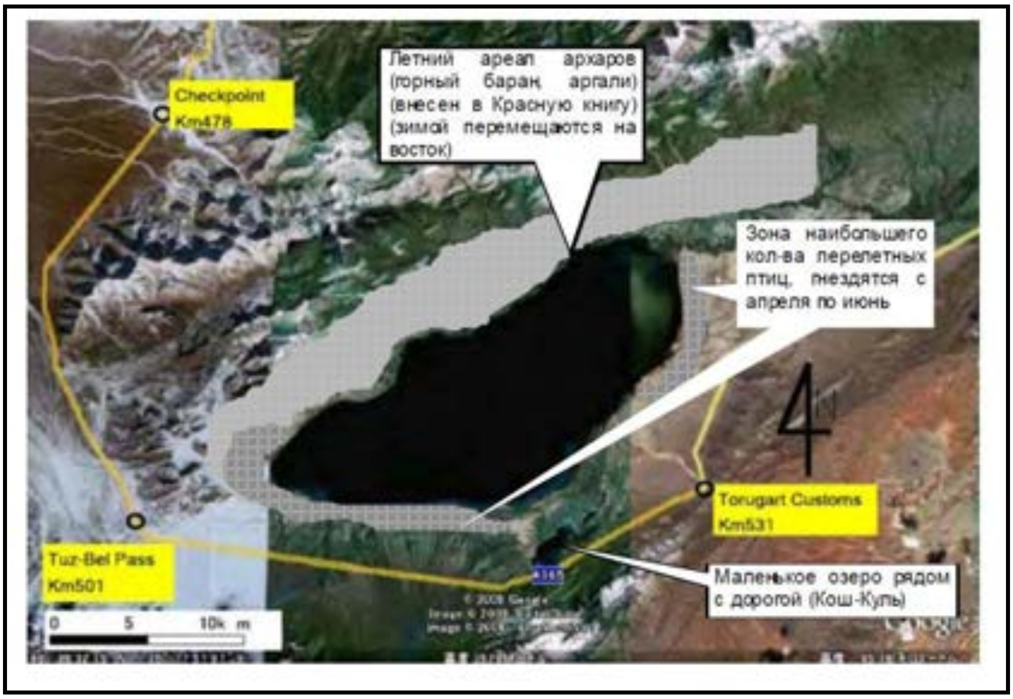
124. It is one of the few habitats for Pamir Brown-headed Gulls, a breeding area for Bar-headed geese, and crucial for nine species of moulting ducks, especially Tadorna ferruginea, representing about 40% of the global population. A significant population of IUCN Redlisted Argali Sheep (Ovis ammon) is also found grazing at the plateau. The absence of ichthyofauna,high transparency and shallowness of the lake support luxuriant growth of submerged macrophytes like Potamogeton and high population of rare invertebrates like Gammarus shrimps).

Figer 4.7 “a”. Map Chatyr-Kul lake with an adjoining neighborhood and showing the coastal protection zone



125. The protected area includes a 2 km boundary on land from the shoreline, comprising a 1 km wide prohibited area with an additional 1 km wide buffer zone. There are a few guards to prevent anyone entering this prohibited zone. Figure 4.8 presents the Chatyr-Kul protected area highlighting habitat of the key fauna.

Figure 4.8: Chatyr-Kul Reserve showing key habitats



Source: working EIA document as of December 2009 (KM478—Border check point, KM501—Tuz-Bel Pass, KM531—Customs point)

126. Area of land of Chatyr-Kul lake within the 1 kilometer coastline zone is 5,982 ha. Table 4.4 below provides land data by land use types – pastures, marshes, water, roads and other lands.

Table 4.4: Classification of lands of Chatyr-Kul (1 kilometer coastline zone)

Total area	Land use types (ha)				
	Pastures	Marshes	Under water	Under roads	Other lands
5982	580	1297	260	5	3840

127. The existing road runs beyond the boundaries of the protected area and does not traverse main habitats. As seen from Figure 4.8 the maximum of the potential negative impact by the Project can be expected along the southern end of Chatyr-Kul Lake during spring-summer-autumn period from May until September.

4.4.1. Water Characteristic of Chatyr-Kul Lake

128. Chatyr-Kul is the second largest endorheic (non-outflow) mountain lakes in the Kyrgyz Republic (after Issyk-Kul). This slightly salty lake lies at an altitude of 3530 m between the At-Bashi and Kokshaal-Too ranges near the border with China. The At-Bashy ridge has peak elevation of approximately 4700 meters above sea level, and the Kokshaal-Too range has peak elevating almost 5500 meters above sea level. The lake is elongated from south-west to north-east. The lake's area is 170.6 km^2 and the catchment area is about 1050 km^2. The maximum Lake's length is 23 km, width 10 km, and the maximum depth is 16.5 m; the average depth is 3.8 m. The water surface area is 153.5^2 km, volume of water – 610 million m^3. In the south-east part of the lake, as some researches state, there is a 21m deep trough, yet the prevailing depths are 12-13 m.

129. The shores of the Lake are of low gradient, primarily marshy areas with developed process of soil bulging due to the permafrost thawing. The main permanent influx is from the Ak-Say River to the northeast (north of the Torugart Customs post). There are 3 minor inflows: the Muz-Tor, Tuz-Bel, and Tash-Bulak Rivers. There are about 50 culverts crossing the road to let surface water flow towards the lake from the mountain to the south of the road. Also there are many groundwater flows into the lake with some observed as surface springs. Springs are observed mainly between the Kosh-Kul Lake and the Torugart customs post; there is road access to the Narzan springs. Flood conditions can occur around the lake due to snow thawing in warmer months.

130. A feature of the lake's western part is transformation of the ionic composition of inshore waters and accumulation of mobile ions of chlorine and sodium. Here, the mineral content rises and the composition of the water changes from magnesium-chlorate to calcium chloride. In the southeastern part of the lake, the shore is low and swampy. Here, small lakes can be found with ionic composition waters. The benthic sediments have a strong characteristic odor of hydrogen sulphide.

131. The aquatory of the lakes (Chatyr-Kul and the Small Lake) is covered with 1.5 meter thick ice from October until May, which means that significant volume of water is frozen during almost 9-10 moths per year. The temperature regime of the Lake is low; in summer the surface water warms up to +10 - 15°C, at depth the water temperature remains stable within c.a. +4,4°C. This modifies the constant deficit O_2 in water.

132. There is scarce hydro-chemical data on the Lake's basin. The content of dissolved oxygen in daytime in summer period is in the range of 40-60%, yet at night time in the coastal area it drops down to 18%. The active reaction of water is close to neutral and is in the range of pH= 7,42 – 7,58. There is abundance of sulfur at larger depths. The Lake is peculiar to the outcrops of carbonated permafrost water. In the eastern end of the Lake (Climatology, 1981) the

water is fresh (mineralization 0,24 ppm), while in the western end it is weakly saline (1.06 – 1,15 ppm). Water in the north-east part of the Lake abundant in calcium carbonate that forms white tinted incrustations on plants and soil.

133. The water mirror is flexible, but the changes of the shoreline are not regular. For instance, in the south-west end of the Lake there appeared small bays. This topographic "squeezing-out', as scholars claim, occurs due to the permanent water evaporation from the Lake' s surface and permafrost thawing.

134. Dissolved Oxygen (DO) levels in the Chatyr-Kul Lake are around 40-60% of saturation values during the summer and the pH is slightly alkaline (5.8 – 6.0). Water transparency is high, with submerged plants growing down to a depth of at least 3 m. The lake has a comparatively low degree of mineralization, with about 0.5-1.0 grams per liter (chloride, hydrocarbonate, sodium and magnesium type of mineralization). The water color is yellowish-green. Chemistry of sediment is magnesium carbonate and calcium carbonate, clay, and ferruginous clay. Water analyses by the Institute of Biology of the National Academy of Sciences are presented in Table 4.5. Lake bathymetry and location of sampling stations are shown in Figure 4.9.

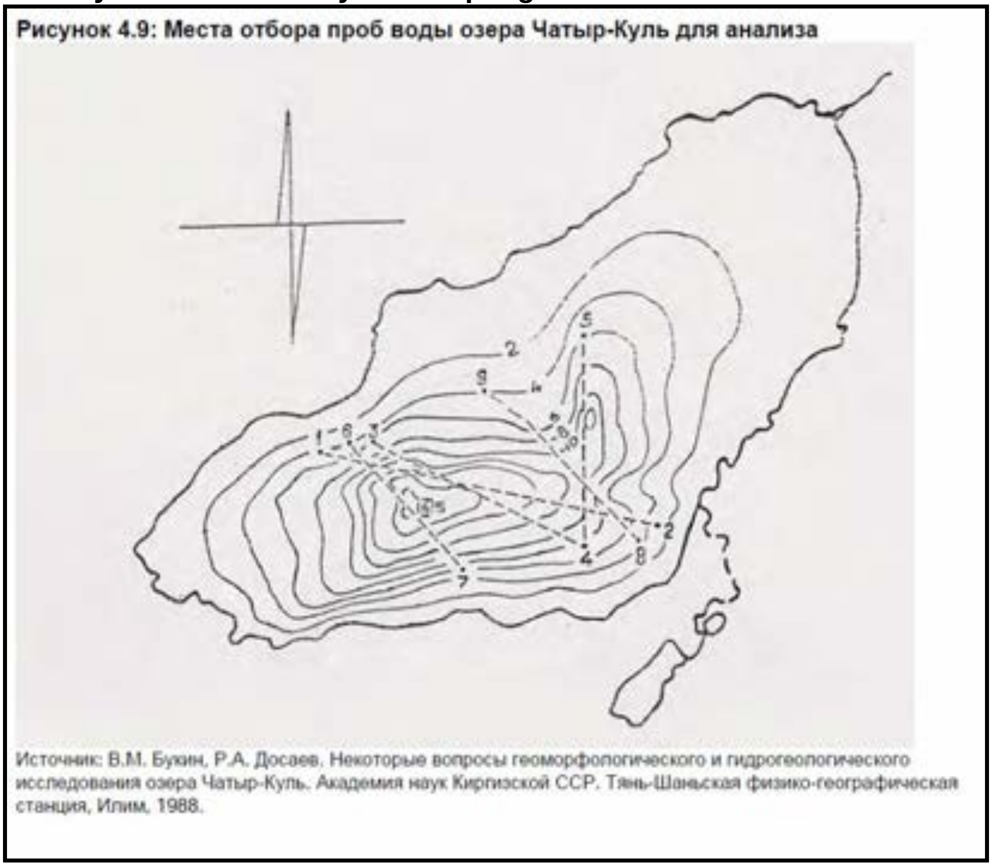
Table4.5: Analyses of the Institute of Biology of the National Academy of Sciences

Station	Depth	Dissolved Oxygen (mL/L)[a]	Oxygen % Saturation	Water Temperature	Air Temperature	pH
Date: 31 August 1977						
1	4,5	3,56	50,97	13,2		
2	0,0	3,14	45,55	13,8		
3	10,5	2,84	39,74	12,1		
4	0,0	4,06	57,65	12,8		
5	0,0	3,21	45,33	12,5		
6	0,0	3,06	42,74	12,0		
7	15,5	2,97	41,22	11,7		
8	0,0	4,16	58,58	12,4		
Date: 24 April 1978						
1	0,0	4,02	42,55	0,5	0,5	**7,58**
2	7,5	2,56	28,98	3,0	0,5	**7,58**
3	**1,5**	**1,70**	**17,84**	**0,25**	**0,5**	**7,42**

Source: [V.M. Bukin, R.A. Dosaev. Some Issues of Geomorphologic and Hydrogeologic Study of Chatyr-Kul Lake. In: Physical and Geographical Studies of Issyk-Kul Lake and its Shore. Academy of Sciences of Kyrgyz SSR. Tien-Shan Physical and Geographical Station, Ilim, 1988.

Note: [a] 1 milliliter (mL) oxygen = 1.43 milligram (mg) oxygen [1 mole = 22.4 L oxygen = 32 grams oxygen]

Figure 4.9: Chatyr Kul Water Analysis Sampling Locations



Note: bathymetric contours show depth in meters; other numbers denote sampling locations Table 4.5

135. Ionic composition of Chatyr-Kul Lake depends on a variety of processes occurring in the lake and its basin. The lake's ionic composition is being formed during spring and summer flood flows, when the lake receives most of water and salts including low-salt snow melt and glacier water from mountains, and hydrocarbonate calcium water largely from shoreland.

136. Scientific research carried out by Institute of Limnology in the 1970s allowed to make a hydrologic zoning of the Chatyr-Kul Lake area. Figure 4.10 shows the major zones that contribute to the ionic composition of the lake. They can be classified as follows:

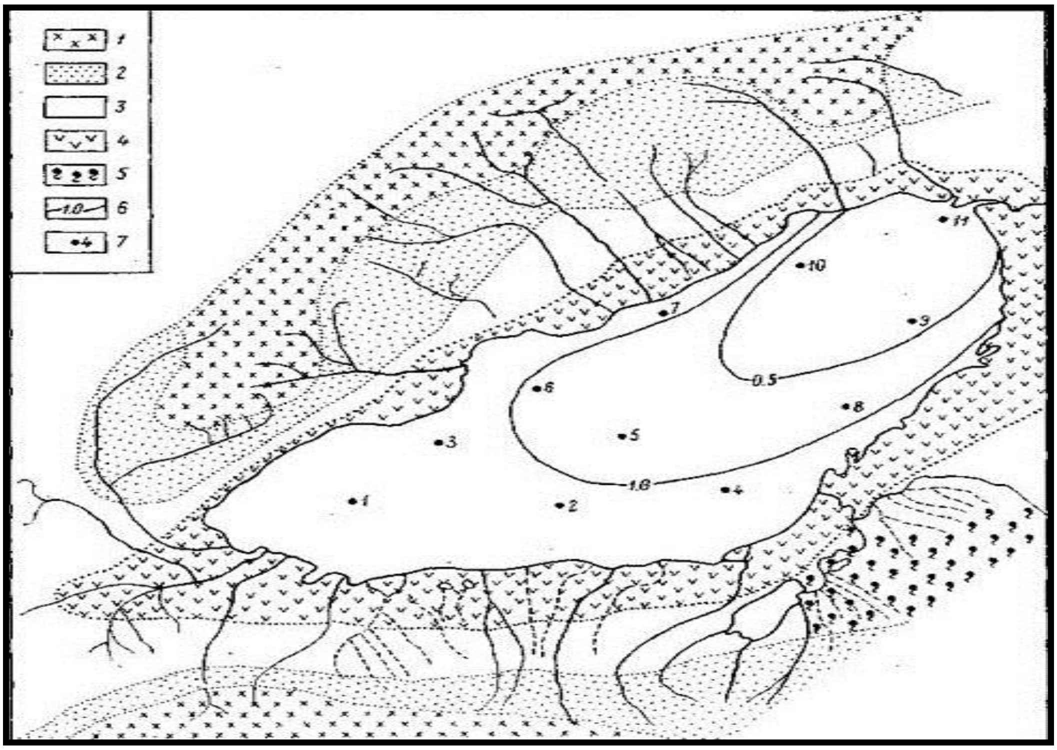
- **Upper-belt of mountain zone**. The zone occupying valley heads, stream and river's outlets is distinguished by very homogeneous composition of low-salt hydrocarbonate calcium water (0.12 – 0.15 g/l, 90 % equivalent HCO_3^-, and 80% equivalent Ca^{2+}).
- **Lower-belt of mountain zone**. The zone is located in the lower belt of mountains. The mineralization of water increases to 0.15 – 0.35 g/l, and composition changes. The concentration of HCO_3^- ions decreases to 70% equivalent, and Ca^{2+} to 50% equivalent, and ions of Mg^{2+} and SO_4^{2-} with concentrations of correspondingly 30% equivalent and 50% equivalent emerge with fracture groundwater, and water of proluvial – deluvial fragmental rock.
- **Foothill zone.** There is practically no surface water in this zone. This is an area of submersion and transit of infrabed water and dry riverbeds which fill with water only during snowmelt.
- **Inshore zone.** This is a belt of groundwater decrement and shallow underflows. The width of this belt is 0.5 – 1 km at the north side of the lake, and up to 8 km – at the west and south sides. Composition of inshore belt is completely different from the one of other belts. It can be characterized as zone of high mineralization (sometimes up to 5.8 g/l). Inshore zone can be one of the reasons of low salt content in Chatyr-Kul Lake as in case

of some other lakes in Central Asia (Balkhash in Kazakhstan, or Kara-Kul in Tajikistan). Saline areas have being formed on shore areas to capture salts by “shore barrier”, and as a result of deflation salts being removed from the lake area.

- **Azonal spot.** This is an area, approximately 1 by 2 km of young tectonic faults and outcrop of acidulous water from calm and bubble springs (also known as “Narzan swamp” or Chatyr-Kul Deposit of Carbonic Acid Mineral Water).

137. Table 4.6 and concentration contours in Figure 4.10 show the ionic composition of the Chatyr-Kul Lake. As can be seen from these data the flow of Kek-Aygyr river influences south – east part of the lake where mineralization is comparatively low, and mineralization is more “lake type” in the north-west part. The ionic composition of the water in the Lake depends on a number of factors taking place in the lake itself, and in the lake’s basin. It forms up during spring and summertime floods when the Lake receives the largest portion of water and salts, including snow and glacial-melt water with low salt content from the mountains, and hydrocarbonate-calcium water from the shoreline area.

Fig 4.10: Hydrological Zoning of Chatyr-Kul Lake



Legend: 1 – Low-salt hydrocabonate - calcium water (0.12 – 0.15 g/l) of upper belt mountains; 2 – hydrocabonate - calcium water (0.16 – 0.35 g/l) of low belt mountains; 3 - foothill belt – area of submersion and transit of infrabed water; 4 – high-salt water (up to 6 g/l) of inshore belt; 5 – azonal area – tectonic deformations and discharge of acidulous water; 6 – contour lines of total mineralization of lake water; 7 – sampling points .

Source: Climatology, hydrology, and hydrophysics of lakes of Internal Tien-Shan. Trends of natural development, Collected works, Institute of Limnology of Academy of Science of USSR, Nauka, 1981.

Table 4.6: Ionic Composition of Chatyr-Kul Lake (g/l)

Point in Figure 4.9	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	HCO_3^{-}	SO_4^{2-}	Cl^{-}	Sum of ions
1	0,0200	0,0600	0,2600	0,0200	0,3600	0,0800	0,3500	**1,1500**
2	0,0200	0,0600	0,2500	0,0200	0,3600	0,0700	0,3400	**1,1200**
3	0,0200	0,0500	0,2400	0,0200	0,3600	0,0600	0,3200	**1,0700**
4	0,0200	0,0500	0,2300	0,0200	0,3700	0,0600	0,3100	**1,0600**
5	0,0200	0,0370	0,1630	0,0152	0,2260	0,0890	0,2130	**0,7632**
6	0,0162	0,0322	0,1430	0,0094	0,1590	0,0912	0,1910	**0,6420**
7	0,0158	0,0334	0,1440	0,0109	0,2380	0,0298	0,1960	**0,6679**
8	0,0200	0,0600	0,2800	0,0200	0,4200	0,0900	0,3800	**1,2700**
9	0,0205	0,0131	0,0582	0,0030	0,1220	0,0216	0,0808	**0,3192**
10	0,0181	0,0178	0,0849	0,0062	0,1650	0,0207	0,117	**0,4297**
11	**0,0179**	**0,0091**	**0,0448**	**0,0031**	**0,0915**	**0,0144**	**0,0631**	**0,2439**

Source: Adapted from: Climatology, hydrology, and hydrophysics of lakes of Internal Tien-Shan. Trends of natural development, Collected works, Institute of Limnology of Academy of Science of USSR, Nauka, 1981.

138. The origin of the Kosh-Kul is caused largely by thermokarst. It captures the flow from Torugart Range, and its mineralization and composition is largely depended on the characteristics of the flows, and springs (Narzan swamp) located to the east.

139. The system Chatyr-Kul Lake – Narzan swamp – Kosh-Kul is under the condition of unsteady balance and transforms with the time. An illustration of this fact is alteration of the total mineralization of the Kosh-Kul from 0.14 to 0.23 g/l during 1971 - 1976. Increase in mineralization was also observed for the smaller channels ("girt") between Chatyr-Kul and Kosh-Kul lakes. These channels are rather of lake than river type. The surface water flow is weak, and can be observed in vicinity of "narzan swamp" only. While approaching to Chatyr-Kul Lake the flow becomes even weaker, and reverses during wind pile-up.

140. **Limitations of Water Quality Data.** As discussed above, the water chemistry of Chatyr Kul is complex and dynamic. There has been little or no research conducted on the lake in the post-Soviet era. The KHM office in Naryn and the KJSPO do not have any water monitoring or laboratory equipment. According to officers at the KJSPO, there have been no systematic water quality analyses done since the early 1990s. There has been no recent water sampling and analyses for possible pollutants originating from the existing road (e.g., petroleum hydrocarbons, suspended solids, organic carbon, and heavy metals).

141. The sensitivity of various species to different types of pollutant loads has not been quantified. Different species exhibit different dose-response behavior, e.g., sheep may have a higher tolerance for heavy metal contamination than birds. Extensive research would be required to determine critical pollutant concentrations for the various species in the ecosystem. Based on extensive research conducted on road networks in North America, these data limitations may be the norm rather than the exception [see Richard Forman, et al. 2003. *Road Ecology: Science and Solutions*. Island Press (www.islandpress.com)].

142. Although this information deficit precludes detailed quantification of potential impacts on the various sensitive species in the lake, the Project is being designed to avoid, minimize, and mitigate potential impacts. A common-sense approach will include engineered drainage controls which will minimize potentially contaminated runoff water from entering the lake ecosystem.

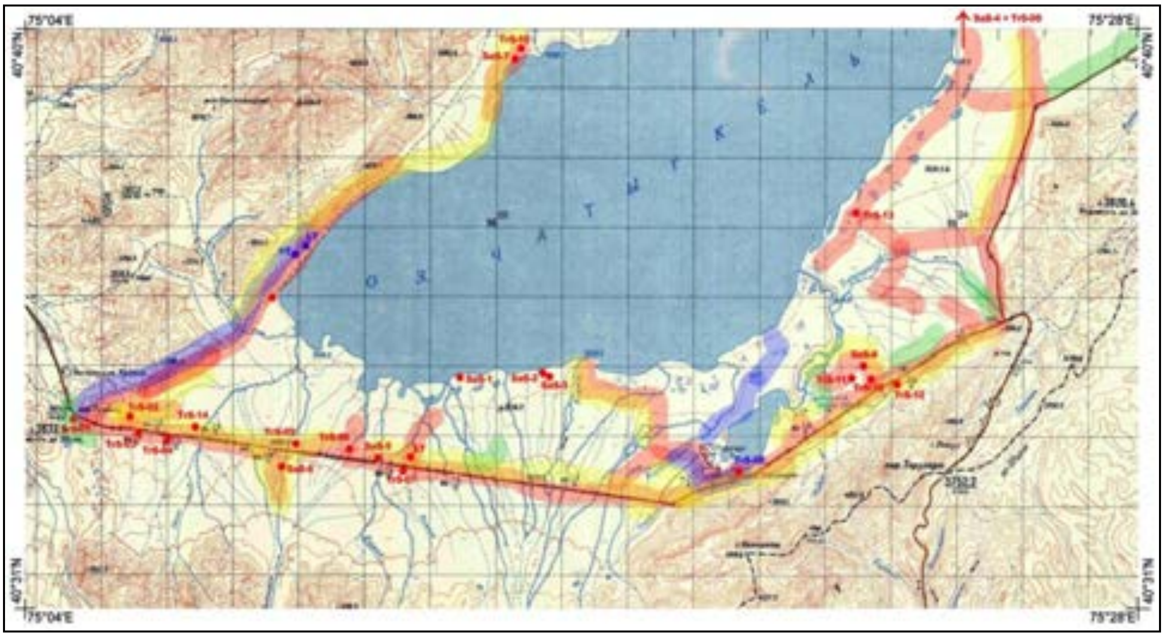
Mitigation measures are identified and discussed in Section 6. As discussed in Sections 6 and 7 the recommended mitigation measures were improved on the basis of the updated baseline data and new information. New data collection and regular monitoring will be implemented before the commencement of the construction works and in the frames of the Environmental Management Program (EMP).

4.4.2. Soil and erosion process

143. Studies and assessment of soil content and the level of contamination by heavy metals is a major focus of this research. To do this, wind direction and velocities along the road were taken into account (within the influence zone of road traffic), and were taken 34 soil samples in 9 locations. Additional soil surveys were carried out in accordance with the "Regulations on Soil Surveys and Large-Scale Soil Maps of Land Use" 1973, and "Guidelines for Monitoring of Agricultural Land in the Kyrgyz Republic", 1999. To study the soil fertility there were laid 6 locations, while for heavy metals they specified 40 locations from which soil samples were taken.

144. The most important morphological features in the description of land sections are: soil structure, i.e. its differentiation into horizons A1, A2, V1 and others, the width of the soil horizons and their depth, color, texture, composition, structure, integration, distribution of the root system, nature of soil-moisture and soil formation land. Selection of soil samples by soil types from the genetic horizons was done by using the banded method, and for heavy metals - every 5 km along the motor-road.

Figure 4.11: Map of soil sampling locations



145. Analyses were conducted at the Soil Laboratory of National Soil Agrochemical Station and the Central Laboratory of the Ministry of Natural Resources of the Kyrgyz Republic (currently State Agency on Geology and Mineral Resources under the Government of the Kyrgyz Republic). The following methods were used for such chemical analyses:

- Definition of humus by the Turin method.
- Definition of mechanical composition by the Kachinski method.
- Definition of absorption capacity by the Bobko-Askinazi method.
- Total nitrogen - by the Mesheryakova method.
- Gross phosphorus - by the Mesheryakova method.
- Gross potassium – by the Mesheryakova method.

- Analysis of the water extraction by the generally accepted method according to GOST 26424 - 25 - 26 - 27 - 28 - 85.
- Definitions of CO2 carbonate using a calcimeter.
- Definition of absorbed sodium according to Antipov-Karataev in modification of Grabarov.
- Definition of pH on the pH meter by the CINAO method.
- Definition of gross forms of heavy metals by spectrometry (method OMG 6 - 01).
- Definition of mobile forms of heavy metals by inversion-volt-ampere meter (method ME 31-03/04).

146. The name of soil type assigned according to the "Republican soil taxonomy" and published papers on soils of Kyrgyzstan. There are the following main soil types in the Project area: high mountain takyr desert, high mountain chestnut, meadow boggy soil. The soils are formed under the desert, desert-steppe and steppe vegetation that is characterized by undersized issue; sparse, poorness of species composition and complexity. Therefore they are characterized by carbonate, low humus content, strong alkalinity, widespread salinity and alkalinity. Based on the results of field and laboratory studies there have been developed a map-scheme of ecosystem' soil resources of the reserved Chatyr-Kul Lake and the surrounding area (see Annex 8 to this report).

147. According to the research and laboratory analysis, takyr soils are salinized by the chloride type in moderate and strong level. The volume of the solid residue in these soils ranges from 0.271 to 0.493% (please, see Table 4.7). Except the total salt content there is a defined quantity of harmfulness for plants toxic salts and the so-called cumulative effect is taken into account for defining different toxicity levels of different ions.

Table 4.7: The aqueous extract composition of takyr desert soils

Number of sample section	**Depth of sampling, sm**	**Solid residue, %**	**Alkalinity**		CL^-	$SO4^{--}$	Ca^{++}	Mg^{++}	**On differen ceNa + K**	**Type of salinity**
			CO_3	HCO_3						
022	0- 19	0,493	-	0,018	0,279	0,023	0,040	0,026	0,103	Chloride
			-	0,30	7,87	0,48	2,0	2,14	4,51	
	19- 39	0,435	-	0,017	0,249	0,021	0,044	0,029	0,072	Chloride
			-	0,28	7,02	0,44	2,20	2,38	3,16	
	39- 69	0,418	-	0,017	0,245	0,012	0,046	0,029	0,063	Chloride
			-	0,28	6,91	0,24	2,30	2,36	2,75	
	69- 85	0,422	-	0,016	0,253	0,008	0,050	0,030	0,059	Chloride
			-	0,26	7,13	0,16	2,50	2,47	2,58	
043	0- 20	0,271	-	0,027	0,133	0,012	0,10	0,006	0,079	Chloride
			-	0,44	3,75	0,24	0,50	0,49	3,44	
048	0- 20	0,347	-	0,020	0,181	0,002	0,016	0,012	0,084	Chloride

148. The reaction of the topsoil of high mountain chestnut soils is neutral, the lower levels are alkaline, pH is within the profile that is equal to 7.90 - 8.05. The absorption capacity is 13.6 mg-equivalents per 100 grams of soil. Due to the presence of absorbed sodium (6.12 - 9.0% of the absorption capacity) the soil in average is solonetzic. Almost everywhere, soils are salinized by the readily soluble salts (please, see Table 4.7). The level of salinity is average but it increases up to the strong level down the profile. Type of salinity on anions is chloride. The quantity of solid residue within the profile varies from 0.289 to 0.422%.

149. The meadow boggy soil in the exploring area is medium-carbonate; CO_2 in the soil profile is ranged from 5.28 to 10.5%. The reaction of the soil environment is medium- alkaline, pH is 8,30-8,55. The absorption capacity is low and at the upper horizon is 16.0 mg - eq. per 100 g. of soil. Absorbed Sodium comparing with the absorption capacity is 5.0 - 10.8%, which

indicates a weak and average alkalinity. These soils are not saline, but the lower levels contain some amount of soluble salts (see Table 4.8). Volume of solid residue within the upper soil profile is not so high - 0.036 - 0.080%, and at the lower levels - 0.145%, with chloride type of salinity. Therefore, it’s necessary to take into account quantity of toxic salts required under the melioration development.

Table 4.8: Composition of the aqueous extract of meadow boggy soils

Number of sample section	**Depth of sampling, sm**	**Solid residue, %**	**Alkalinity**		**CL^-**	**$SO4^{--}$**	**Ca^{++}**	**Mg^{++}**	**On difference Na+ K**	**Level and type of salinity**
			CO_3	HCO_3						
033	0- 21	0,080	-	0,021	0,024	0,002	0,010	0,006	0,002	-
			-	0,34	0,68	0,04	0,50	0,49	0,07	
	21- 40	0,036	-	0,023	0,011	0,002	0,006	0,004	0,002	-
			-	0,38	0,31	0,04	0,30	0,33	0,10	
035	0-20	0,145	-	0,026	0,069	0,002	0,010	0,006	0,033	-
			-	**0,43**	**1,95**	**0,04**	**0,50**	**0,49**	**1,43**	**-**

150. According to hydro meteorological, geological and geomorphological conditions for mudflow formation, the soil conditions in the study area, in terms of water and wind erosion, relates to the formation of mixed type (snow-rain) of mudflows. The formation area for mixed mudflows ranges from heights of 3400 to 3600 meters above sea level, with no recent glaciation available. Here, same as in the glacial areas above 3,000 MaSL, identified developed permafrost areas with microform cryogenic origin and solifluction mud-streams. Over such surfaces with the excessive moisture mud flows can be developed, together with water and wind erosion.

151. The increased wind velocity is especially ruinous for soils. The soils developed in the project area contain scarce humus, while their mechanical composition is medium-loamy. These soils primarily contain coarse silty fractions, sized 0.05-0.01 mm, according to the laboratory data. Normally, it causes fast dusting, formation of surface crust, and high capillarity. Owing to this, these soils are prone to wind and water erosion. The most severe wind erosion in the project area occurs in springtime. This is due to the fact that in spring lands are dried out and have not yet re-covered with vegetation, while quite often the wind reaches its significant velocities. The degree of resistance of soil to wind depends on the size of aggregates making up the upper soil layer.

152. The wind-erosion of soil cannot occur in the presence of the only one factor congenial for this phenomenon. Development of erosion occurs under certain conditions as a combination of a number of major factors. For example, in case of soils with upper layers consisting of the aggregates capable of the popping motion under the influence of wind. The strength of wind, in turn, depends on the relief, obstacles, the area, temperature, air humidity, atmospheric pressure in different places of this or that area.

153. **Heavy Metals, their distribution and migration** within the soils profile. The main source of soil contamination in the project area Chatyr- Kul is automobile exhaust emissions and road dust. It should be taken into account that mainly the road transport in the Project area is represented by Heavy Duty Diesel Vehicle (HDDV), and to a lesser extent – by mini-buses (HDD buses) with diesel engines. The main hazardous pollutants in diesel exhaust are sulfur dioxide, nitrogen dioxide, soot, polycyclic aromatic hydrocarbons (PAH), as well as cadmium, lead and others.

154. In the Project area it’s advisable to consider a number of specific factors like incomplete combustion of diesel fuel in the rarefied atmosphere in high altitude, the engine work at high loads, and the use of different modifications of depressant additives and thickeners to diesel fuel

(depressor, antigels) and additives that increase cetane rating of diesel fuel in high mountains. Diesel exhaust gases may include molybdenum, tetraethyl lead, cadmium, copolymers, paraffin, etc. These factors are "enriching" the content of pollutants and hazardous substances in the diesel exhaust gases.

155. In these samples, with the help of spectral analysis, 38 kinds of heavy metals were analyzed. Of those, 12 elements were recognized as priority contaminants by their degree of toxicity, distribution, ability to accumulate in a human body, in animals, in soil and vegetation. Those are Lead (Pb), Cadmium (Cd), Arsenic (As), Copper (Cu), Vanadium (V), Stannum (Sn), Zinc (Zn), Antimony (Sb), Molybdenum (Mo), Cobalt (Co), Mercury (Hg), and Nickel (Ni).

156. The spectral analysis results have shown that some of the above heavy metals are present in the soil profile and accumulated in large quantities in their gross forms. Heavy metal concentrations can impact environment differently. In the non-carbonate soils, and by the means of neutral and acid reaction of soil solution, some heavy elements are in their flexible state and their small amounts have an adverse effect on the environment. Nevertheless, these elements in carbonate soils with alkaline properties are confined (weak mobility), and sometimes they form in soil tight bound combinations. In such soils, a certain quantity of heavy metals does not have an adverse effect on ecology.

157. As this research revealed, the soils in project zone are carbonate, and the reaction of soil medium is alkali. Table 4.9 below summarizes the results of those analyses, while the detailed results are included in the Annex 8 to this report.

158. Unfortunately, Kyrgyzstan has not fully developed its own MPC for heavy metals due to the fact that heavy metals have not been fully studied in terms of scientific and technical aspects. Among the worldwide recognized methods to determine the maximum permissible concentrations of heavy metals in the soil, works of Obukhov, Clark, Ilyin and Cloquet can be distinguished. Obukhov's and Clark's methods to determine the MPC apply to non-carbonate soils with neutral and acidic soil solution. As indicated above, the soil of project area, BNT-3, area are carbonate, and the average soil reaction is alkaline and therefore in the course of "Environmental Monitoring Baseline survey" for Chatyr-Kul catchment area, methods of V.A.Ilin and Klock (1982, 1992 and 2007) were used to determine MPC of heavy metals in soil (gross form), which is also widely used in the CIS countries. MPC of mobile forms of heavy metals based on works of Ilyin VA and Chuldzhiyan H.

159. The gross content of heavy metals are measured by special devices – spectrometers, which have certain range of performance in detecting heavy metals concentrations. Therefore, where the heavy metals content is below the MPC range, the analysis results are marked with the symbol "<" ("less than"), instead of the absolute value. As a rule, laboratory equipment is calibrated to identifying the most frequent or typical to the locality heavy metals and toxic elements due to the high cost to implement total abalysis of all the elements possible. In the given case the arsenic is neither frequently met, nor typical elements *per se* in the Project areas, therefore the used lab equipment is calibrated to identify the arsenic content in concentraations not less than 300 mg/kg, as seen from the Table 4.9. below. Moreover, such identified gross concentrations of arsenic in calcareous soils in natural conditions do not represent any environmental threat since arsenic combinations in this type of soil remain in their immobile forms, without any threat of migration via water carriers of trophic chains. However, concentrations of its water-soluble (aquaceous, or mobile) forms may represent a threat, and this is discussed below (see Table 4.9). Currently additional more accurate analysis is being carried out to determine gross and mobile forms of substances such as arsenic, lead, cadmium and strontium (Appendix 12).

.Table 4.9. Concentration of gross forms of toxic heavy metals in soil

№	Element	MPC (mg/kg)	Content of heavy metals in the project area
1	Lead	160	12- 30
2	Cadmium	3.5	<30

3	Arsenic	150	<300
4	Copper	150	12- 20
5	Vanadium	175	70- 120
6	Tin	320	<2
7	Zinc	35	30- 50
8	Antimony	10	<20
9	Molybdenum	50	1,5
10	Cobalt	120	5- 12
11	Nickel	100	30- 70
12	Chrome	160	30- 70

Source: Environmental Baseline Survey Report by group of scientists, February 2013, (see Annex 8)and results of soil samples analysis by Central Laborarory of the KR Ministry of Natural Resources, Bishkek, 2012.

160. In order to obtain precise data on gross and water-soluble forms of arsenic, cadmium, strontium and led in the Project area the Consultant will perform cross-analysis of the soil samples obtained during the last round of the baseline studies in June 2013. Such cross-analysis will be done by the laboratory with modern eqiopment cpable to identifying actual concentratons of these elements in soil. Results of analysis of heavy metals in soil are expected at the end of June 2013 (see Annex 12)

161. Lead (Pb) has the ability to be transmitted along the food chains accumulating in the tissues of plants, animals and humans. An especially toxic substance is lead tetraethyl that is usually added to gasoline to suppress detonation. In the Project area the gross forms of lead content is 12 - 30 mg / kg of soil, which doesn't exceed the maximum permissible concentration (MPC-160.0 mg / kg of soil, Table 9). Taking into account that the road construction in the future could increase the lead content, the method of inversion-volt-ammeter in order to determine the background content of lead and define its mobile forms. Based on the analysis results of the lead mobile forms in the upper layer (0 - 20 cm) is between 0.01 - 0.4 mg / kg (TLV-60.0 mg / kg soil) and in the lower (20 - 50 cm) horizons the amount of that element is in the range from <0.01 to 0.021 mg / kg of soil (Table 4.9). Due to its toxicity, the lead's mobile forms represent a threat to the environment.

162. Cadmium (Cd) is among the most toxic elements. Under certain conditions it is highly mobile. Its gross content in soil samples is 8 MPC. In light textured soils and soils with low humus content typical to the Project area, the migration processes of cadmium may be greater. According to the analysis of mobile cadmium (Table 4.10), it's visible that in the upper horizon (0 - 20 cm) of soil the concentrations are small and less than 0.0005 mg / kg (MPC-1.0 mg / kg of soil) of the soil. In the lower soil horizons (20 - 50 cm), the content of mobile forms of the element is also low (<0.0005 mg / kg). But it should be taken into account that cadmium is highly toxic in any concentrations.

163. Arsenic (As). Rate of arsenic migration due to the active adsorption by clay particles, hydroxides and organic substance is low. Arsenic is the second after the lead concerning hazards to human health. Arsenic is slightly mobile in neutral and alkaline soils, and since the studied soil is carbonate, the reaction of the soil solution is primarily alkaline. The analysis results show that mobile forms of arsenic do not exceed MPC (Table 4.10).

Table 4.10: Content of mobile forms of heavy metals in soils

№	Metal	**Sampling locations**									**MPC**
		I	II	III	IV	V	VI	VII	VIII	IX	
1	Lead, g/kg	0,106	0,107	0,0541	0,4	0,0664	0,098	0,0743	0,0878	**0,12**	32,0
2	Arsenic, mg/kg	<0,005	0,00526	<0,005	<0,005	<0,005	<0,005	<0,005	<0,005	**<0,005**	15,0
3	Cadmium mg/kg	**<0,0005**	**<0,0005**	**<0,0005**	**<0,0005**	**<0,0005**	**<0,0005**	**<0,0005**	**<0,0005**	**<0,0005**	**1,0**

Source: Environmental Baseline Survey Report by TERA Consulting Company, February 2013, and results of soil samples analysis by Central Laborarory of the KR Ministry of Natural Resources, Bishkek, 2012.

164. The water-soluble forms of arsenic in the Project area that are directly linked with the environment of soil, are in very low numbers, and in the upper accumulative (0 - 20 cm) horizon there is only 0.00526 and less than 0.005 mg / kg of soil (with MPC-15 0 mg / kg). The content of arsenic mobile forms in the lower soil horizons (20 - 50 cm) is also very low and in all points in the sampling it's less than 0,005 mg / kg of soil. Such low levels of arsenic don't affect the environment negatively.

165. Zinc (Zn) in comparison with copper and lead has a high intensity of migration in landscapes. It is slow-moving in a neutral or slightly alkaline reaction of the soil environment. Zinc content in the studied samples also doesn't exceed the maximum permissible concentrations (in the range of 30-50 mg / kg, with MPC-320.0 mg / kg).

166. In the Project area there is exceeding of the maximum permissible concentrations on certain heavy metals, such as barium (Ba) - 400 - 500 mg / kg (maximum permissible concentration of 470 mg / kg), strontium (Sr) -300 - 700 mg / kg (MPC-150, 0 mg / kg). These elements also are related to weakly mobile elements in neutral and alkaline soils. The content of radioactive heavy metal of thorium (Th) is less than 30 mg / kg of uranium (U) less than 500 mg / kg of soil. These elements are poorly studied, so there are no MPC standards for these elements in Kyrgyzstan.

167. Except for the meteorological factors distribution of pollutants and heavy metals and their distribution in the environment depend on the terrain, the type and composition of the soil. Specific terms of the Project road zone assumes the delivering of monitoring on concentrations of heavy metals in the form of mobile compounds in soil and water (sulfate ions). This will allow more precisely to define the extent of environmental impact of road on the environment, to identify in time the processes of soil alkalinity by sulfate type, and changes in water' objects salinity.

168. Soil contamination is possible by wastewater, household wastes from construction equipment maintenance and uncontrolled disposal of construction waste materials. Soil contamination can also take place due to spills of waste oils and fuel from construction equipment, and similar spills which could occur due to vehicle accidents on the road. As the road has a design lifetime of 20+ years, and the construction period is less than 5 years, the potential impacts from fuel spills are much greater in the operations period. Appropriate measures must be provided for emergency environmental situations.Fuel spills are much greater in the operations period. Appropriate measures must be provided for emergency environmental situations.

4.4.3. Fauna

4.4.3.1. Aquatic Fauna and Hydrobiology of Chatyr-Kul Lake

169. The unique climatic conditions and hydro-chemical composition of the water in the lake provides a rare plankton and amphibians biodiversity. Because of low oxygen concentration in the lake water, the fish there is almost not available. Zooplankton of Chatyr-Kul Lake is a typical for high mountain lakes with low temperature conditions: a relatively low diversity of zooplankton and the prevalence of common species. Two studies of zooplankton at Chatyr-Kul Lake found that the lake is inhabited by 34 species of the following groups: rotifers, copepods (copepods) and Cladocera or cladocerans. [Source: Kustareva LA, Ivanova L. Zooplankton of Chatyr-Kul Lake. In "Ichthyologic and hydro-biological research in Kyrgyzstan." The Academy of Sciences of the Kirgiz SSR: Institute of Biology. Ilim. Frunze, 1979.] In addition to the available data, specific research projects were carried out to determine the baseline for several seasons of 2011-2012 and will be completed in the coming season 2013.

170. Information obtained as a result of the TERA activities and engaged for this purpose a team of scientists from the National Academy of Sciences, allowed to clarify the situation at the Lake area and get appropriate understanding of the expected impacts and required mitigation measures for the fish fauna and Hydrobiology of the Chatyr-Kul Lake.

171. Watershed area of Chatyr Kol Lake is about 1000 km². Chatyr Kol Lake has no outlet and about 40 permanent and temporary channels flow into it. The biggest of these channels is Kok Aygir River, which starts from the southern mountainside of At Bashy ridge. To the east from Small Lake until the river mouth of Kok Aygyr the river bank is almost waterless. The rest of the channels flow into the lake during ice, snow melting and rainy seasons. Main source of water for these channels is snow melting. Lake shores – low coast, most part is waterlogged with expanded heaving process caused by perfarmost melting.

172. Active reaction of water (pH) is close to neutral, and varies within 7,42 – 7,58. There is hydrogen sulphide in natural layer of water, especially at depths. For the lake release of carbonated inffraperfarmost water is typical. In the eastern part of the Big Lake in 1975-1976 water was fresh: mineralization was 0,24 permille, in the western part 1.06 – 1,15 permille – slightly saltly (Climatology…,1981).

173. Bottom sediments, which are mainly represented by light gray and yellowish carbonate clays with extinct aquatic vegetation, have strong smell characteristic to hydrogen sulphide. In general terms, Chatyr Kol Lake is classified as a salty water reservoir. In the north-eastern part of the lake there is a big concentration of calcium carbonate, which precipitates and forms white settlings on plants and soil. Water salinity level of the Small Lake characterizes it as a basin with fresh water, which together with channel connecting it with the Big Chatyr Kol, a fresh water basin, which together with the channel, connecting it with the Big Chatyr-Kul, represents a complex of absolutely special biotopes populated by mollusks, which are absent in the Big Lake and in other water basins. Despite the environmental conditions and the fact that the lake is without an outflow, which theoretically should facilitate its salinization, it does not happen for the following reasons: (Climatology,1981):

(i) Due to outflow (drainage) of water from the lake into its banks and evaporation from the moistened coastal waters of basins;

(ii) Due to outflow through a continuous thaw zone into unconsolidated quaternary deposits.

174. In the first process (i) along the lakeshores, there is a coastal "barrier" shaped in the form of salinized areas where salts are concentrated and accumulated. This process is especially intensive along the low banks in the southeast, south and southwestern parts of the lake. In this manner, the salty water is sucked away, and the fresh water is replenished with melt water and runoff from the river Kok-Aigyr. In the second process (ii) there is an intensive exchange between the surface and fresh underground waters. The data collection on phytoplankton and sampling was done in 21 locations (Fig 4.12). In total, some 28 samples of phytoplankton were collected, 28 samples of zooplankton and 30 samples of zoobenthos. The Lake's depth and its water temperatures were also measured.

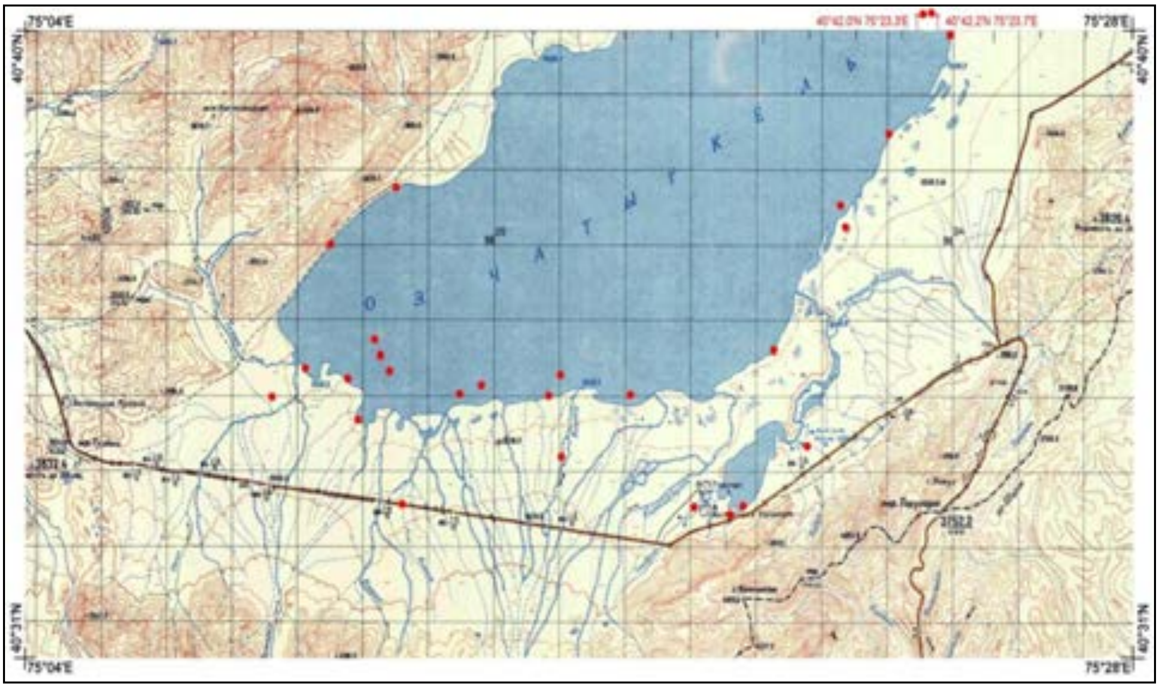
175. Additional collections of aquatic vegetation (higher aquatic plants and algae), zooplankton and benthos were carried out at the same points as in 2011. There were collected and processed 20 samples with phytoplankton and zooplankton, and zoobenthos with 22 samples. It should be noted that in the last days of August, mass formation of the latent eggs and oviposition of ephippiums at the representatives of the Daphniidae family, which is associated with cold weather. So the recommended time of sampling is July and August. By this time, in the Chatyr-Kul lake, there were 4 species of higher aquatic plants, 43 species of lower algae, 34 species of zooplankton, 5 species of chironomid larvae, 3 types of mermetid, 2 species of mollusks and 24 species of ostracods found. One of the found to date there are species of higher and lower algae, invertebrates and fish not listed in the Red Book KR. Interestingly, in the roadside pools with pondweed and hair algae, there were found nine

species that are tolerant to contamination of fuel combustion products. Of the nine species, only two reach large quantities - F.mosquensis and L.inopinata.

176. The analysis of the published data revealed that there is either no or insignificant population of fish in the Lake. There is no fish in the lake, since for typical fish species, in particular for scaleless osman Chatyr Kul lake is not permanent habitat due to the specific condition of the Lake and oxygen deficit. However. In the tributary rivers are the habitats for one or two fish species. The quantitative characteristics of water organisms, specifically of the bottom aquatic organisms, allows to classifying it as the water basin with high trophic level. The question about the presence of fish in the lake Chater-Kul is very controversial: Kyrgyz National Academy of Sciences has a different opinion. All previous attempts to make Chater-Kul lake source for fisheries failed. Thus, group opinion of the parties confirms that the fish in the lake - a temporary (seasonal) occurrence and the lake is not a permanent habitat for fish due to the natural limitations.

177. Laboratory processing was carried out in the laboratory of Ichthyology and Hydrobiology, National Academy of Sciences, BPI. Benthic organisms were chosen from the ground, and then viewed using microscopic equipment (binocular and microscope) and identified (up to group, class, order, family, genus and species) based on the keys of the series "Fauna of the USSR" and "Fauna of Russia and neighboring countries." After complete processing of the collected materials, they were analyzed for the presence of protected species of rare, endemic and economically significant species.

Fig.4.12: Map of hydrobiological (zoobentos and zooplankton) sampling points



4.4.3.2. Mammals

178. In Annex 8, information is provided on researched areas and description of framing borders. Along the corridor with length of 34.7 km, there were registered some 204 marmots in total. The average species population density is 5.3 - 21.2 specimens per 1 km2. In the territory of the Reserve the average marmots distribution is 5.7 - 25.2 specimen per 1 km2. The marmots' colonies in the assessment area were distributed with more or less regular intervals, and their regional distribution generally depended on the proximity of ground waters.

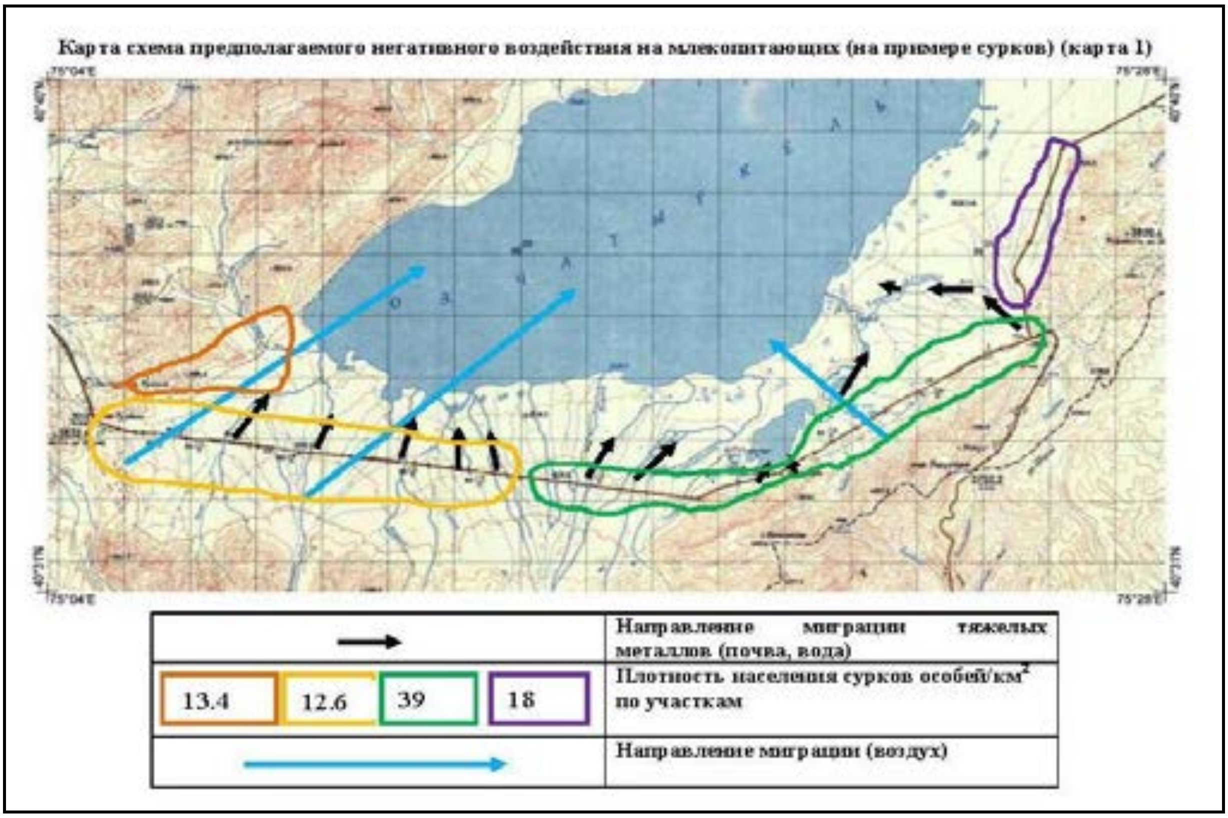
179. In total some 4 such colonies were observed. In addition, were found traces of activity of mole lemmings. Distribution of the mole lemmings is generally sporadic and associated with clay grounds. One population of Siberian jerboa was spotted in the vehicle headlights, not far

from the ranger’s cordon. It was not possible to assess the number of Siberian jerboas. In addition, one jackrabbit was encountered near the Tuz-Bel mountain pass. According to local residents, in the mountains to the south of the road, there are habitats of mountain goats - Capra ibex (Linnaeus, 1758) and argali - Ovis ammon (Linnaeus, 1758). Other mammals included wolves - Canis lupus (Linnaeus, 1758), and snow leopard - Uncia uncia (Schreber, 1776). In the recent past it was still possible to meet a brown bear - Ursus (U.) arctos (Linnaeus, 1758) since these mountains are also its habitat.

180. Due to the low representation of the Red Data Book species their use as indicator species does not seem expedient. Their protection is implemented under the effective law of the Kyrgyz Republic. The most notable representation of mammals inhabiting this area is the grey marmot badger (or Tien-Shan marmot) whose population density in some areas reaches up to 25.2 species per 1m².

181. One fox was observed in the vicinity of the Small Lake (one specimen). In the same area were also fund two dead corpses of young foxes. According to the officers of Karatal-Zhapyryk State Reserve this is already a third year in row in this area where they observe an epizootic epidemic of an unknown etiology. Thus, in the zone adjoining the highway and in the special protected zone of the Reserve, some 3 orders of mammals represented by 6 species have been established by visual inspection. Those are: foxes, rabbits, grey marmot badger, Siberian jerboa, narrow-skulled vole, and eastern mole lemming (Synaptomys).

Fig. 4.13. Vector of negative impacts onto mammals (marmot populations as an example)



182. In general, marmots live along all the territory adjecent to the road. The nearest holes of marmot badgers were found at distances of 20-25 meters from the road. On a strip of 500 meters along the road from the Tuz-Bel pass to the custom point, there are considered some 416 specimens. The population density in different areas is different. For example, on the 10 km area to the south from Tuz-Bel pass its density is 13 specimen per 1 km2, then further to the Custom point their density is 39 individuals per 1 km2.

183. Research of the area was conducted in four sites plots where marmot populations have been registered. Along the way, the record of the narrow-skulled voles held at a distance of 3.4 km along the road and away from it at 30 meters distance.

184. By estimates, on the northern shores of Chatyr-Kul Lake a population of 400-500 specimens of Argali (Ovis ammon), of the KR Red Data Book, can be observed there in summer time. They are wintering far to the east from the Lake and impact on this species during construction and operation in the future cannot be considered serious since their key habitat area is far to the north form the Lake. The only open threat to Argali can be hunting or poaching.

4.4.3.3. Avifauna

185. Studies conducted in 2011 and 2012 in the National Park area found that the total species composition of the studied area is 178 species of birds, covering 12 orders ((Podicipediformes, Ciconiiformes, Anseriformes, Falconiformes, Gruiformes, Charadriiformes, Columbiformes, Cuculiformes, Strigiformes, Apodiformes, Coraciiformes, Passeriformes) and 25 families (Podicipedidae, Ardeidae, Anatidae, Accipitridae Falconidae, Gruidae, Charadriidae, Laridae, Columbidae, Cuculidae, Strigidae, Apodidae, Upupidae, Alaudidae, Hirundinidae, Motacillidae, Laniidae, Cinclidae, Prunellidae, Turdidae, Emberizidae, Fringillidae, Ploceidae, Sturnidae, Corvidae) . Severe climatic conditions led to a small number of breeding birds (7 species) (Kydyraliev, 1990). In total 95 species of birds were collected during the study. They consisted of 12 orders and 25 families. Total number of birds over all studied sites was about 28,000 specimens.

186. In July and August in Chatyr-Kul there is shedding of many water fowl species, mainly geese, diving and dabbling ducks. They come in mid of June, mainly males and sometimes - females. The Lake plays a huge role in the Asian population of roody shelduck (accumulated over 10,000 specimens). The total number of birds in the summer for shedding and rest is more than 28,000 birds. About 50 species are found during the fall migration. The lake has an important role in this period in the life of river ducks Anas (about 15,000 specimens) and coots. Fewer numbers of diving ducks Aythya have been registered.

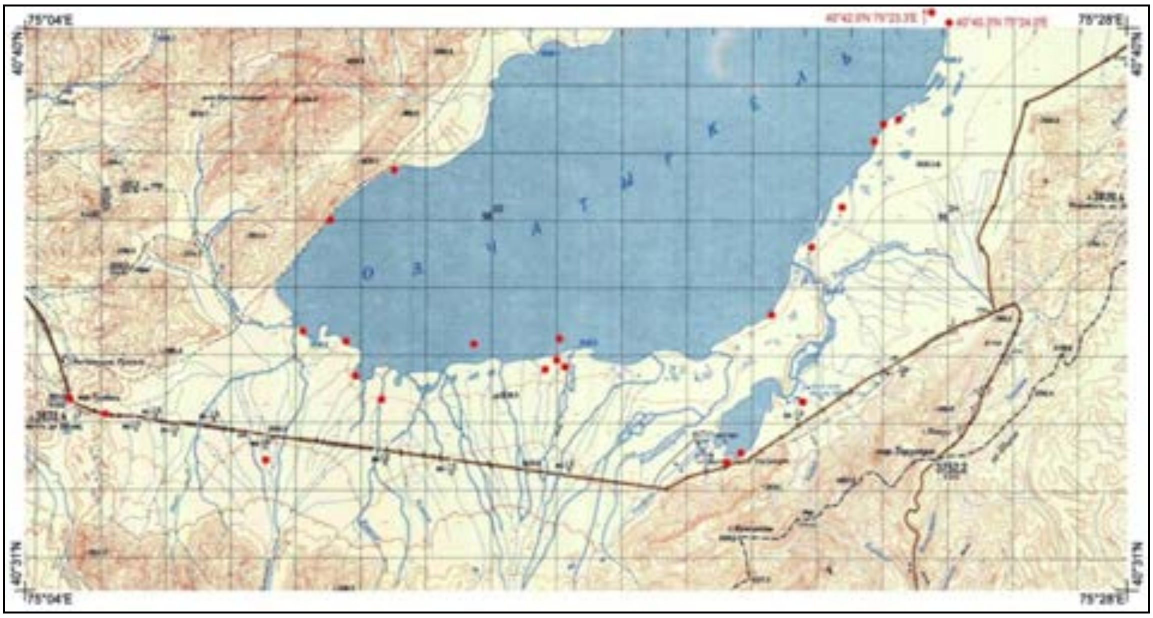
187. Chatyr-Kul is the single place in the country still serving as the key habitat for a viable population of mountain goose. The nestling population of the bar-headed geese consists of some 70-75 pairs and they are considered as in satisfactory condition. The list of birds inhabiting the area of Chatyr-Kul Lake, including the area of the Reserve, is provided in the Annex 8 to this Report.

188. The research included implementation of observation and sampling of almost all of the taxonomic groups of birds. Bird species were included in the list of the places where the birds were found. The route surveys methods have been used to monitor and register all of the bird species!

189. To register bird populations all the route surveys for all biotopes of the road section "Bishkek-Naryn-Torugart" and Chatyr-Kul area of the National Reserve Karatal-Japyryk State Reserve were implemented in the daytime. The registration was performed to determining the bird species by their singing, and by visual observation of birds in the alleged and the known feeding grounds. The birds were observed within the unlimited area by the first discovery, followed by recalculation to the average values of the detection of bird groups in accordance with the procedure for the route registration.

190. A total of 10 transects were laid, each of the transects was about 3 km long, located along the coastline and within the sight of the water surface of the lake. In addition, the transects were laid out along the road, with width of 200 meters on either side. These data included: beginning and the end of observation, indicative of light ("sun / rain" against the four-point subjective scale), and the direction and strength of the wind. All the studied habitats were documented by camera snapshots.

Fig. 4.14: Map indicating avifauna observation locations



191. The collected data processing was carried out in the Laboratory of Zoology of the National Academy of Sciences of the Kyrgyz Republic in line with the standard procedures. On the route from the mountain pass Tuz-Bel to the Customs Point the registration strip constituted a 200 meters strip along both sides of the road. The southern section of the Lake has been explored from the eastern to the western shores of the Lake. The transects were laid every 3 kilometers. Birds in the area were observed within the range of visibility. In addition, the birds were recorded along the 500 meters wide coastline strip.

192. The KR Red Data Book bird species includes the following bird species that can be found within the BNT road area and the adjoin KZSR area, as shown in the Table 4.11 below.

Table 4.11. Bird pecies registered in the Red Data Book of Kyrgzstan

Date	Name		
	Latin	**Russian**	**English**
1984	*Plataea leucorodia* Linnaeus, 1758	Колпица	Spoonbill
1985	*Ciconia nigra* (Linnaeus, 1758)	Черный аист	Black Stork
1985	*Anser indicus* Латем, 1790	Горный гусь	Bar-headed Goose
1985	*Cygnus cygnus* (Linnaeus, 1758)	Лебедь-кликун	Whooper Swan
2005	*Aythya nyroca* (Guldtnstadt, 1770)	Белоглазая чернеть	Ferrugineous Duck, Ferrugineous Scaup
2005	*Mergus serrator* Linnaeus, 1758	Крохаль средний, или длинноносый	Red-breasted Merganser
1985	*Aquila chrysaetos* (Linnaeus, 1758)	Беркут	Golden Eagle
1985	*Aquila nipalensis* Hodgson, 1833	Степной орел	Steppe Eagle
1984	*Haliaeetus leucoryphus* (Паллас, 1771)	Орлан-долгохвост	Pallas's Fish Eagle
1985	*Gypaetus barbatus* (Linnaeus, 1758)	Бородач	Bearded Vulture, Lammergeiger
2005	*Gyps fulvus* (Хаблицл, 1783)	Белоголовый сип	Griffon-Vulture
1985	*Gyps himalayensis* Hume, 1869	Снежный (гималайский) гриф	Himalayan Griffon
1985	*Falco cherrug* J. E. Gray, 1834	Балобан	Saker Falcon
1985	*Falco pelegrinoides* Темминк, 1829	Рыжеголовый сокол, или Шахин	Shaheen Falcon
1985	*Anthropoides virgo* (Linnaeus, 1758)	Журавль-красавка	Demoiselle Crane
1984	*Larus ichthyaetus* Паллас, 1773	Черноголовый хохотун	Great Black-headed Gull

2005	*Pterocles orientalis* (Linnaeus, 1758)	Чернобрюхий рябок	Black-bellied Sandgrouse

193. All the waterfowl arrive to Chatyr-Kul area at the end of April – beginning of May; nestling and breeding occurs until June. The birds are leaving Chatyr-Kul in October. Therefore, the period from April until June appears as the most sensitive period for the waterfowl. Their nestling areas are shown in Figure 4.14. During the nestling period the birds are primarily on the ground so there is always a risk for them to be disturbed by cattle, shepherds' dogs, poachers or the Contractor's personnel.

4.5. Vegetation

194. Harsh climatic conditions of the study area subdues rapid growth of vegetation and limits its diversity. The aspect of flora is poorly studied and there are no publications that list the flora species. Taking into account the experience of flora registration in similar areas, flora diversity in the Project area could be estimated at the level of not more than 200 species (the List of flora is provided in Annex 2). Documented, though, is the presence of plant communities of sedge, fescue, salt grass and albiflorous bluegrass. In this territory their communities are abundant and their mapping does not make expedient. Within this area there are no rare plant species.

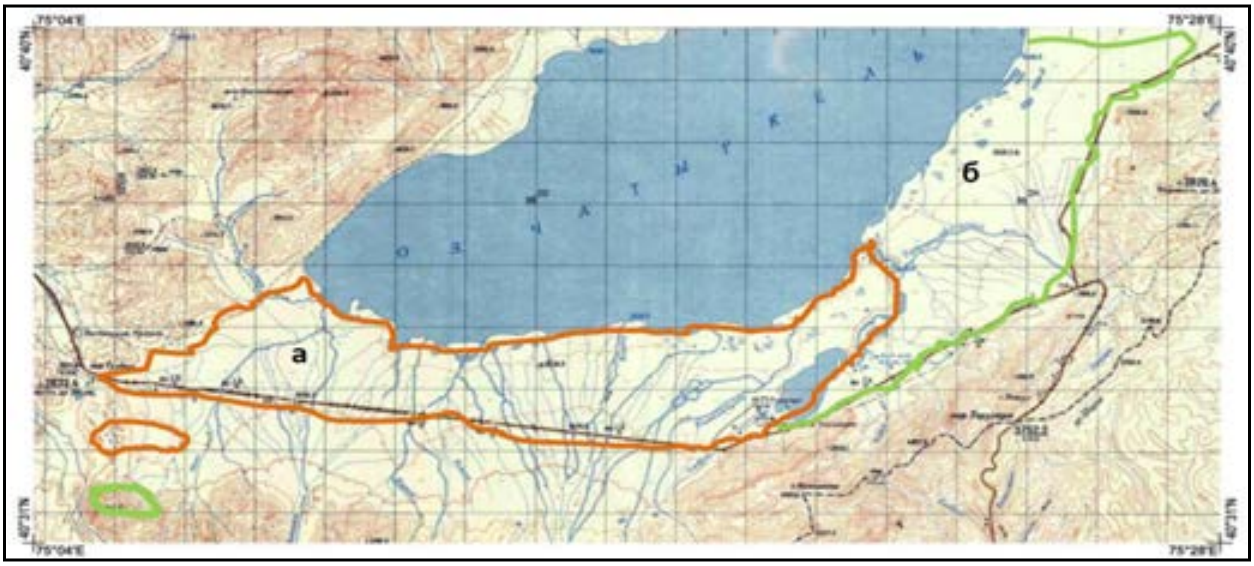
195. For this assessment some 7 sites (100 m2 each) were selected in the most representative localities of assemblages with the purpose of the detailed study. The dominating species were found in different locations and surroundings, the off-site species were also taken into consideration, thus general vegetation cover was defined. There were identified main negative factors, including anthropogenic, and locations to monitor potential impacts of the road construction onto flora and vegetation. Figure 4.15 shows the overall study areas with indication of the key areas designated for more detailed studies.

196. These sections were primarily selected on the basis of the comprehensive visual study of the inspected sites and review of the available maps with the samples of ground cover on the site. The objective of these sections' selection was to identify peculiarities and to represent the dominating ground cover in the samples and also to deliver survey works allowing for the future monitoring activities to be undertaken during the construction of the road. The research area has clear demarcation between the two areas under study (Fig 4.15).

197. The western part of the study area is the area of dominant kobrezievniks with the steppes-like spots, meadows and meadow-steppes (a), while the eastern part of the area is the zone of dominating albiflorous bluegrass communities (b).

198. The only endemic species for this area is the Taraxacum syrtorum Dshanaeva (Photo 1 in Annex 8). However, it should be considered to be a conventional endemic species (Map 1, Annex 8). Most probably it also grows in the neighboring Central Asian countries and in China.

Figure 4.15: Map indicating the study areas consisting of two zones



199. These are the following species among the sub-endemics category (species found in Kyrgyzstan and in the neighboring Central Asian countries):

(1) *Saussurea faminziniana* Krasn. - Sossyureya Famintsina

(2) *Oxytropis tianschanica* Bunge - Oxytropis Tien Shan

(3) *Schmalhausenianidulans* (Regel) Petrak - Schmalhausen gnezdistaya

(4) *Potentilla asiae-mediae* Ovcz. et Koczk. - Bloodroot of Central Asia

(5) *Puccinelliahackeliana* V.Krecz. - Beskilnitsa Gakkel

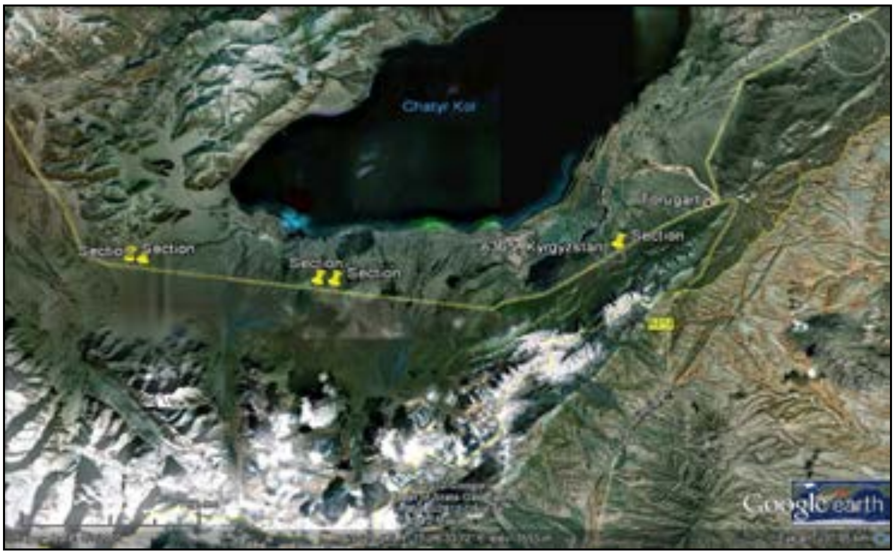
(6) *Calamagrostistianschanica* Rupr. - Tien-Shan Veinik

(7) *Suaedaolufsenii*Pauls. - Take Olufsen

(8) *Polygonumpamiricum*Korsh. - Highlander Pamir.

200. All these species are not rare species, some are dominant or subdominant plant communities, mainly their associations. Almost in of the all cases of negative impact the most significant is local cattle grazing within the protected area.

Figure 4.16: Map of flora studies



4.6. Insects

201. The data to describe the current state of entomofauna and the population of the ground insects was collected by using five methods. The quantitative information was obtained by performing:

a. Inventory inspections by sections

b. Inventory inspections at the sampling sites

c. Manual sampling and registration of all visible insects,

d. Survey of specific habitats (in water basins and on their shores, on flowers, inside the thick stems of plants, under stones, under excrements, in holes and minks), and

e. Night sampling with flashlight

202. A total of 15 sections and 8 sample sites were inventoried. Each section was surveyed at least twice with the following biotic conditions registered:

a) Time of the beginning and ending of the survey,

b) Approximate illumination intensity ("sun/overcast" by a four-point subjective scale),

c) Direction of wind and its force (by a four-point subjective scale),

d) Temperature of ground air, and

e) Other necessary data

203. Whenever possible, the biotopes were documented by photos and video footage (some examples are attached in separate files); this information can also be used for future monitoring activities.

204. It is estimated that there are some 850-1000 species related to the Insecta class in the Lake's basin (i.e. all hexapods, including semi-aquatic and ectozoon orders). The 1-kilometer coastline area (within the KZSR) is the habitat for less than 1/3-1/2 of the total species, and about the same number potentially represents the fauna diversity in the project area.

205. The details on the sampling sites can be found in the Annex 8. Generally, the biotopes of the area under study are related to the meadow-steppe type and bear the signs of anthropogenic degradation. The reason for this is the use of the areas under study for intensive local cattle grazing.

206. Of the pest insects registered there are Gomphocerus sibiricus (its Turkestanian subtype), Aeropus sibiricus (Linnaeus, 1767) ssp. turkestanicus (L.Mistshenko, 1951) and gadfly Gasterophilus nasalis (Linnaeus, 1758) (1♂ collected in 2011 г.). However, the number of economically and potentially meaningful harmful types (pests for agriculture, pastures, forests, food crops etc., and other reserves, pollinator pests, hemophagus as infectious disease vectors etc.) in Chatyr-Kul area is at least ten times more.

207. In the fauna of insect types the dominate species of Central Asia mountain and boreal-mountain are Palearctic complexes. The elementary entomocomplexes are very mosaic (even on flat landscapes), due to this, not less than 50% of the space they occupy shall be recognized as the territory of transfusion (intergradation of the elementary ecological communities).

208. There were identified five major local entomocomplexes: (1) entomocomplex of white-meadow grass steppe sites, (2) entomocomplex of sedge-kobresia steppe sites, (3) mesohygrophilous entomocomplex of the lake coast, (4) intrazonal entomocomplex of coastal areas of water courses and, and (5) a petrophilos entomocomplex on stony and rocky slopes. Their differentiation is explained by differing sets of microstates, or by the sets of elementary habitats. As a whole, this generalized layout reflects the pattern of distribution of, at least, the majority of the discovered and known ground insects by their habitats. It should be mentioned,

that with a view of subsequent entomological monitoring the use of similarly generalized patterns is complicated due to sheer data fluctuations.

209. The implemented analysis on the resemblance of entomocomplexes, biotopic preferences and presence of accessible habitats revealed that potentially in this area retains no conditions for none of the vulnerable species to exist (i.e. endangered species, across the country/territory). However, it does not testify that there are no populations of unique species in the area adjoining to the BNT road. From the material "The list of taxons of arthropods needing special attention to their condition", there are three species under the threat of extinction (unofficial data) of the family of Pieridae. Because the area is not fully explored, it is projected to discover some eight new rare and poorly known species from the list of Annex 8 to Chapter "Antropods" of Red Book of KR.

210. With the inability to provide quantitative analysis due to the lack of collected data, the general qualitative characteristics of insect populations and habitats under study area can be summarized as follows:

I. Comparative diversity of the local terraneous entomofauna – from low to very low in comparison with the territory of the Kyrgyz Republic and the normal as compared with the local fauna from similar height above sea level tracts (for example, tracts Kol-Suu, Kotur and Ak-Korum in Kokshaal-Too, Soek Range, in the Fergana Range, and Tuja - Mujun in Alai valley);
II. uniqueness of the local terraneous entomofauna – these indicators are above the average, even if compared to the local fauna of similar areas (data on rare species is not enough), compared with the territory of the Kyrgyz Republic - from above the average to moderately high;
III. relative density of population of ground insects – apparently (not investigated early-and mid-year aspects of the insect fauna), below the average, even if compared with the local faunas of similar areas, in comparison with the territory of the Kyrgyz Republic - from low to very low;
IV. comparative abundance of dominants in the population of terrestrial insects– apparently, medium (there is no data on the dominants in the early-and mid-summer aspects);
V. degree of differentiation of the local population of ground insects in correlation with the range of accessible habitats – is low in comparison with the terrain of the Kyrgyz Republic and below the average in comparison with similar areas and mountain valleys;
VI. degree of manifestation of anthropogenic changes in the frame of the local population of ground insects – is below the average in comparison with the terrain of the Kyrgyz Republic and above the average in comparison with the local fauna of similar areas; negative trends are expressed relatively strongly;
VII. potential vulnerability of the local population of ground insects – is above the average in comparison with local fauna of similar areas and is considerably above the average nationwide;
VIII. availability of species in the Red Data Book, and species protected by the state – the number of unique and endemic species, compared with the region (Inner Tien-Shan) above the average, rare species - more than 10% of the total composition of the insect fauna, species listed in the Red Data Book and protected by the state – are not present;
IX. availability in the local entomofauna of economically or potentially significant harmful species – is considerably lower in comparison with KR territory and above the average in comparison with local fauna in similar areas.

5. SOCIO-ECONOMIC CONDITIONS

211. There are no permanent residents in the Project area: the road is secured by the checkpoint at Km 478 and the Torugart Customs Post at Km 531. Customs and Border Security personnel are assigned to the Checkpoints at Km 478 and the Torugart Customs post. Some nomadic families are allowed to graze livestock around Chatyr Kul from April to October. A social-economic survey found that these families have a poor quality of life and waiting for the rehabilitation of the road for improved seasonal transportation. The results of survey are summarized in Appendix 2 and refer to EIA Report for 2010. These families set up temporary living accommodations about 400 - 500 meters from the existing road and are not directly impacted by traffic except when livestock are crossing the road.

5.1. Government Infrastructure

212. The customs facility is located at Km 531 to register vehicles transiting the border with the PRC. The buildings are old, and the communication system is old and technologically obsolete. There are plans to install new truck weighing scales in the near future; this is an important step in monitoring and controlling vehicle loads to be consistent with the road design. There is no proper drinking water system and sanitary facilities need to be upgraded.

213. There are 2 road maintenance facilities in the Chatyr Kul area, one located near the Tuz-bel Pass and one located near the Torugart customs post. These facilities are also old but functional. There is sufficient space at these facilities to pre-position equipment and materials to respond to vehicle accidents. In the vicinity of these two locations in the framework of the other components of the Project it is planned to build new residential and related structures with the systems of water supply and waste water treatment.

5.2. Other Facilities

214. Some informal facilities (“container houses”) are located near the customs post. These are privately operated, and provide basic food and lodging services for transiting drivers and passengers. Tourists are reportedly allowed to stay for 1-2 nights when transiting the border.

5.3. Gender

215. In Kyrgyz Republic, the female unemployment ratio is 53.3% of all citizens, nearly half of which live in rural areas. The female unemployment ratio is constantly increasing. Education levels of woman may be slightly higher than man. Comparison of education levels is shown in Table 5.1.

Table 5.1: Comparison of education levels

Region	Graduates of secondary school in 2013	
	Girls %	Boys %
Total of the Kyrgyz Republic	53,0	47,0
Naryn Oblast	5,6	5,7

Source: JICA Report on Gender Issues in KR, Ministry of Education and Science KR

5.4. HIV/AIDS

216. In the Kyrgyz Republic, as of April 1, 2013, there were registered 4726 morbid events of HIV infection, of which HIV was found among 4522 (men 3174, women 1348) citizens of the country. There were 731 persons with HIV died, including those with AIDS 252. HIV infection is registered in all the Provinces of the country. Majority of afflicted persons are those use injection narcotics (2677) and sex-workers. In Naryn Province, there were 50 HIV infected persons registered, that as a whole for the country is minimal. For the Chatyr-Kl zone, there are not any data on the number of persons AIDS ill and vehicle of HIV infection.

6. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MESAURES

217. As a result of the implemented environmental baseline study work and data interpretation in the Project area the Consultant has identified a series of negative natural and anthropogenic factors. Such impacts will inevitably result in the alteration of flora and fauna and disintegration of the fragile mountain Chatyr-Kul ecosystem. Gradual penetration and expansion of human presence in the Project area already bears traces in the species composition. Without employment of significant mitigation measures the expected impacts channeled via main impact vectors may lead to continued and significant influence, with cumulative effect. When different factors overlap, the resulting anthropogenic factors may surmount to their critical values, with the key factors among them:

1. **Natural:**
    - Wind erosion
    - Water erosion
    - Natural catastrophic vents.
2. **Anthropogenic:**
    - Exhaust gases from vehicles
    - Spills of petroleum and other hazardous materials
    - Products of tires and brake pads wear-off
    - Waste and contact water
    - Household wastes
    - Cattle grazing
    - Poaching and gaming.

218. Different aspects of environmental impact on different components are discussed in Chapters 6 and 7.

Figure 6.1: Sources of pollution, vectors and receptors

Note: not to scale.

219. As depicted in Figure 6.1, potential pollutants include vehicle emissions, fuel and other hazardous materials spills, contact water, dissolved fuel and other contaminants in ground and surface water. Contaminated runoff water is also a source of both inorganic and organic pollutants originating from eroded pavement material, tire rubber, trace quantities of lubricating oil, metal particles from vehicle brake linings, etc. Runoff water can carry these pollutants in solution as well as in the form of sludge. Sludge may be a small part of runoff in terms of mass and volume, but normally contains most of the aggressive contaminants. Capturing sludge with engineered drainage controls and geoecological barriers is thus a very important consideration in controlling pollutants at the source, and preventing long-range transport into the sensitive Chatyr-Kul ecosystem. Properly designed ecological protection means and structures will allow the sides of the road to capturing most of the pollutants.

6.1. Abiotic Environment

6.1.1. Air

220. As discussed in Section 4.1.4 measurements of dust, noise and vibration were conducted in the Project area. The results show that the only source of air pollution is motor transport. There is direc correlation between concentrations of particulates, nitrogen oxide and specifically of sulfur with the increased traffic.

221. The contents of sulfur oxides in the diesel exhaust require special attention. Their interaction with vapor and the sunlight SO_2 can tansofrm in the air into sulfuric acid H_2SO_4 ,will settle at the roadside, gets into soil, water and becomes a part of the trophic chain. The air quality measurement parameters before and during the construction works, in addition the standard (particulates, SO_x, NO_x), shall be expaned to include concentrations of benz(a)pirene, led and cadmium.

6.1.2. Water

222. To obtain reliable information on water quality, comprehensive studies of water quality in rivers, Small and Chatyr-Kul lakes will be conducted in the following sequence: a) after the mass loss of snow in late May - early June 2013, and b) one month after the start of construction work (June 2013), c) each year at the end of the construction season. All three trials will include a detailed analysis of water for the presence of heavy metals, BOD, the number of bacteria and other pollutants

6.1.3. Noise

223. During construction it is necessary to meaure noise levels produced by the construction equipment. Additional studies, carried out by research team, showed that the noise does not have a decisive impact on biodiversity. They suggested not to use noise barriers, so as not to aggravate the situation. This issue is addressed in the borrow pit management plan, particularly in relation to biodiversity in sensitive areas. After the roads rehabilitation, and due to increased speed, noise from the friction of tires on the road surface will decrease slightly. This will be measured and the noise level in the framework of the developed and implemented an environmental monitoring system. Thereby level of noise will be measured in accordance with developed and introduced environmental monitoring system.

6.2. Biotic Environment

6.2.1. Mammals

224. Mammals are the most prone to the negative impacts identified for the Project area. At that, some species adapt to negative factors (noise, vibration, dust, exhaust gases, disturbance factors etc.), and continue developing in the already complicated by the anthropogenic presence

environment. The most adaptive species are grey marmots. Grey marmots already "familiar" with vehicle traffic in its worst manifestation – bad road quality, noise from vehicles etc. The closest holes of grey marmots can be found at a distance of 20-25 meters from the road, and even occasional specimens can be seen right on the side of the road. Such a setting may result in their deaths under the wheels of the passing-by trucks in spring and summer period when these animals are the most active.

225. It is expected to find up to another eight populations of rather rare and poorly studied species. The most of them are already exposed to the risk of extinction. To protect and study the poorly studied and fragile flora on the Project Area it is necessary to bring legislation of the Kyrgyz Republic regarding the SPA Chatyr- Kul in compliance with national and international environment protection law and to establish "areas of total quiescence and non-disturbance". Negative factors affecting mammals are shown in Table 6.2

Table 6.2: Negative factors affecting mammals

Negative factors	Direct	Mitigation actions	Indirect actions	Mitigation actions
Disturbance or extermination	Extermination as a results of earth works, building berms, pits, ditches	Site selection in the presence of mamologist, identifying a 500-meter water-protection zone around the Great and Small Chatyr-Kul lakes	Noise, light and vibration by construction equipment	Standard procedures
	Road kills	Setting of road marks, tunnels for the passage of animals	Disrupted environment	Informing of construction workers
	Hunting by shepherd dogs	Limitations of cattle grazing in the SPA and auto-road	Exhaust gases, dust	Limitations of cattle gazing
	Noise, light and vibration by construction equipment	Standard mitigation procedures		Standard mitigation procedures
Environment pollution	Oil and wastewater spills	Standard procedures	Exhaust gases, dust	Standard procedures
Poaching by road workers	Illegal hunting and poaching	A complete ban on hunting and trapping; the system of penalties	-	Monitoring of Populations

6.2.2. Hydrobiology

226. Hydrobiological parameters of the Project Area, specifically around Lake Chatyr-Kul, lack actual and historical data. This fact, among the others, complicates analysis of negative factors affecting hydro biology. However, their general understanding is represented in the Table 6.3.

227. On the other hand, the facts stated in the previous paragraph regarding the hydrobiological component may serve as good grounds for the in-depth studies of the natural mechanisms of homeostasis of vulnerable ecosystems, in particular, the issue of neutralization of impact of salts on the weakly-salted water of the Lake. Despite the climatic conditions, the Lake being a closed shallow basin, in theory, the water salination process must progress, but not in the case of Chatyr-Kul Lake. Apparently, the researchers have identified a unique natural

self-protection mechanism of the Chatyr-Kul Lake system which by no means can be disturbed. This mechanisms pending its further studies and, most likely, updates of the EIA, if the case may be.

228. Apparent negative impact on hydrobiology in the Project Area, is the anthropogenic influence. These are, in particular, cattle grazing in the close proximity to the water, and this may lead to the increased nitrogen concentrations in the shallow coastal zone and its further eutrophication. This newly obtained information and interpretation of the results may serve as grounds for further additional studies in the Project area financially supported by ADB.

229. The mitigation measures shall also include institutional efforts by the Kyrgyz Government to duly institutionalize provisions of the Ramsar Convention at the oblast and local levels. One of such measures would be to introduce a 500-meter coastline zone of restricted access along Chatyr-Kul and Small Lakes (Kosh-Kul) to avoid nitrogen and sulfur-containing chemicals load in the coastline area. Negative factors for aquatic fauna are shown in the Table 6.3.

Table 6.3: Negative factors affecting aquatic fauna

Negative factors	Direct	Mitigation actions	Indirect actions	Mitigation actions
Disturbance or extermination	Disrupted habitat associated with direct impact during earthworks; construction of berms, pits and ditches	Site selection in the presence of hydrobiologist, identifying a 500-meter water-protection zone around the Big and Small Chatyr-Kul lakes	Noise, light and vibration by construction equipment	Standard procedures
Environment pollution	Oil spills, cattle overgrazing	Standard procedures to ban cattle grazing in protected areas	Exhaust gases, dust	Standard procedures, water quality monitoring
Poaching by road workers	N/A	N/A	N/A	N/A

6.2.3. Avifauna

230. The ornithological composition of the project area is characterized most representatively by its species diversity. There are the birds who first respond to any environmental changes such as climate change, changes in vegetation, reduced food supply, change of habitat, etc. The use of biological indicator species can help estimating environmental parameters of impact factors and predicting changes in the future.

231. To preserve and protect the little-known and vulnerable fauna of the Project area to change, legislation towards the Chatyr-Kul SPA that should be in line with national and international standards for the protection of Ramsar sites with the definition of "no disturbance area”. One of the most effective methods for determining the adverse environmental changes is bird monitoring. The most salient negative impacts on avifauna are given in Table 6.4.

Table 6.4. Negative factors affecting avifauna

Negative factors	Direct	Mitigation actions	Indirect	Mitigation actions
Disturbance or extermination	Extermination as a results of earth works, building berms, pits, ditches	Site selection in the presence of ornithologist	Noise, light and vibration by construction equipment	Standard procedures
	Road kills	Identifying a 500-meter water-protection zone around the Great and Small Chatyr-Kul lakes. Setting of road marks, speed limits		Setting of multifunctional protective screens along the Project road section
	Destruction of nests and chicks by dogs and construction workers	Ban on cattle grazing in protected areas, rules of conduct for workers (the system of penalties)		
Environment pollution	Contamination of water and soil	Standard procedures	Exhaust gases, dust, noise	Standard procedures
Poaching by road workers	Illegal hunting and poaching		N/A	

232. As mentioned above, scarcity of the study materials on environment complicates identification of interactions of negative batural and anthropogenic factors. As of today there are no scientific publications on the current condition of mammlas and insects in the are of Chatyr-Kul Lake. Despite the numerous expeditions to the site, the exhaustive lists of ground insects specific to this area, still not available in scientific literature.

6.2.4. Insects

233. The biotopes in the study area belong to the meadow-steppe type, while mixed flora formations bear traces of man-induced degeneration. This territory is the home for some three species of insects of the Pieridae family, which, according to unofficial sources, are under threat of extinction. The reason for this might be extensive use of these areas for grazing and habitat destruction.

234. As a result of the project implementation, during all its phases, such phenomena as dust, solid wastes, sewage, water and soil pollution, changes in hydrology, may cause potentially negative impacts on the class of insects in this area. Table 6.5 shows the most common factors of negative impact on this part of ecosystem.

Table 6.5: Negative factors affecting insects

Negative factors	Direct	Mitigation actions	Indirect	Mitigation actions
Disturbance or extermination	Extermination associated with earthworks; construction of berms, pits and ditches	Site selection in the presence of an entomologist	Noise, light and vibration by construction equipment	Standard procedures
	Road kills	Setting of road marks	Standard procedures	
	Extermination by cattle during grazing	Ban on cattle grazing in protected areas and roads		
Environment pollution	Heavy metals in soil	Standard procedures, monitoring	Exhaust gases, dust, noise, oil spills	Standard procedures
Poaching by road workers	Catching for fun or collection	Rules of conduct for workers (the system of penalties)	-	

6.2.5. Flora

235. The studies in the Project area revealed that flora species are scarce - only some 200 species. Such low representation level indicates to its fragility and susceptibility to alterations both impacted both by natural and anthropogenic factors.

236. The most prominent negative factor affecting flora is the excessive cattle grazing. The other major negative factor is dust, considered as short-term and reversible, sine the improved road will result in the reduced dust impact to minimum levels.

237. Mitigtion measures shall also include institutional efforts of the Kyrgyz Republic at legislative level to bringing the specially protected area of Chatyr-Kul Lake in compliance with national and international requirements (ramsar Convention). One of the measures may include a 500-meter coastline area of restricted access for the Big and the Small Lake, and to identify the 'areas of complete no-disturbance"

238. Table 6.6 presents the most typical negative factors impacting flora.

Table 6.6: Negative factors affecting flora

Negative Factors	Direct	Mitigation	Indirect	Mitigation
Extermination	Destruction as a result of overgrazing, embankments, pits, trenches and other excavations.	Selection of locations in the presence of a florist, prohibition of cattle grazing in the area of protected areas and roads, the definition of a 500-meter water-protection zone around the Big and Small Lakes		
POlltion of the environment	Fuel spill, sanitary waste waters	Standard procedures	Exhaust gases, dust, changes in soil	Standard procedures

Poaching of the road workers	Collection of herbs and plants	Rules of workers' behavior (system of fines)	-	

Table 6.7: Potential Impact and Mitigation Measures

Project Activity	Potential Impact	Mitigation Measures	Institutional Responsibility
Design Stage			
Route alignment	Physical impact of the new road	Reduce to minimum	**MoTC /PIU**
Baseline environmental monitoring and ambient air monitoring to identify probable impact onto Chatyr-Kul Reserve area	During construction and operation quality of air and water may get worse due to exhaust gases and occasional oil spills of hazardous materials	Transport vehicles must comply with national emission standards.This stage includes components to control potential spills of hazardous materials	**MoTC/Design Institute/ KHM and KJSR**
Construction			
Noise from construction equipment	Noise on the Project site may not exceed 70 dB(A)	Equipment/machinery must comply with national standards on noise; construction personnel personal must have personal protection gear	Contractors will prepare and implement thei r EMP and HSP, solid wastes management in line with the best international practices. Monitoring consultants will be responsible for monitoring of pollutant sources, wastes management practices. The monitoring results will be included in the regular reports to MoTC, PIU and ADB. MoTc/PIU will include relevant clauses into contracts to implement EMP, including encouragement and fines. ADB will make sure that bidding documents incorporate EMP, environmental encouragements and balancing factors.
Soil erosion and waste water from construction sites and construction camps	BoD and coliform bacteria	Waste water control including settling ponds, silt traps etc. Construction camps located outside the Chatyr-Kul Lake basin area.	
Wastewater, usedoilandlubricants and insignificant oil spills from the equipment servicing areas and sites		Earth banks and settling ponds on technical maintenance sites, concentration of machinery outside the Chatyr-Kul Lake basin area.	
Construction dust and exhaust gases from construction equipment and vehicles	Increase of volatile particles, NO_2,SO_2 on construction sites and adjoining areas	Dust control by water sprinkling. The Contractor's equipment must comply with national emission standards	
Excavated materials, construction garbage	Excavated material and non-hazardous solid wastes	Excavated material can be used as the base material to control waste water drainage	
Operation and Maintenance			

Noise and vibration from vehicle traffic	Minimal or none	The road dressing will reduce noise and vibration levels	**MoTC**
**Contaminated drainage and water and probable hazardous spills **	Diesel fuel, gasoline and other hazardous materials, - contamination of soil, ground and surface water	Prevention of spills, control and counter-measures including improved road safety, drainage control and settling ponds.	MoTC will include in the bidding documents; Contractors perform according to requirements and specifications. MoTC ensures due technical maintenance of spill control systems
Improvement of access to the Chatyr- Kul lake	Intrusion and poaching in the Reserve area	Modernized access control and increase in frequency of Reserve area local staff patrolling	Karatal-Zhapyryk State Reserve

BOD=biologicaloxygendemand, dB (A)=decibelacoustic, MoTC =MinistryofTransportandCommunication, NO_2=nitrogendioxide, NO_X=nitrogenoxides, PIU=Project implementation unit, SO_2= sulfur dioxide.

6.3. Potential Impacts During Design and Construction

239. As discussed in chapter 3 of this report, at the design stage, various alternatives were evaluated based on economic, environmental, financial, and social aspects. The preferred design, rehabilitation in place, will have some negative impacts during the construction stage when equipment and work crews are mobilized to the project area.

240. Major impacts anticipated are noise and vibration from construction equipment; soil erosion and waste water discharge from work sites and construction camps; wastewater, waste lubricants, and minor fuel spills from construction staging and maintenance areas; dust from earthwork; exhaust emissions from construction equipment; and construction spoils and other construction-related solid wastes.

241. Up to 220 workers at a time are expected, along with more than 80 pieces of heavy equipment. Total earthwork is estimated to be 480,000 m3. About 80 truckloads per day of material will be moved to the site, equivalent to the current traffic flow. Thus, construction vehicles will effectively double the total traffic volume during construction.

242. Some excavation of earth will be required for construction and improving drainage system, but alternations to topography will be minimal. No major changes to drainage patterns will occur. Borrow pits for earthen material and quarries for rocks will be necessary. Borrow pits for earthen material were not proposed in the Chatyr-Kul area. However, the preliminary design team has identified 5 rock quarry sites in the Chatyr-Kul area (км 507+600, 514+600, 518+00 и 528+200).

243. Soil and water contamination are possible due to sanitary wastes, wastewaters from construction equipment maintenance, and uncontrolled disposal of construction waste materials. Soil and water contamination are also possible due to spills of waste oils and fuel from construction equipment, and similar spills which could occur due to vehicle accidents on the road. As the road has a design lifetime of 20+ years, and the construction period is less than 5 years, the potential impacts from fuel spills are much greater in the operations period. Spill scenario is discussed further in section 6.4.2.

244. Potential impacts on fauna will mainly be from temporary increases of dust, noise, and vibration from construction activities. Additional impacts on fauna and flora may arise from the increased number of construction workers in the area. For example, the risk of wildlife poaching may increase along with the temporary influx of construction workers, this fact may also results in the growth of road kills.

245. Potential impacts during construction are mostly acute, temporary, and reversible. For example, dust emissions may increase slightly, but will be reduced in the operational period

compared to current conditions (see discussion in section 6.4.1.). The main exception is potential hazardous materials and/or wastewater spills which could flow into the Chatyr-Kul ecosystem. The sensitivity of the ecosystems to such shock loads has not been quantified, and extensive research would be required to determine critical pollutant concentrations for the various species in the ecosystem.

6.4. Potential Impacts During Operations

246. The road has a design lifetime of 20+ years, and impacts are dependent mainly on future traffic increases. As the operational period is much longer than the construction period, the cumulative impacts from operations are of greater concern than during construction.

247. Computer modeling was conducted to determine emissions levels of noise, vibration, dust, suspended particulate matter (SPM), nitrogen dioxide (NO2), sulfur dioxide (SO2), and carbon monoxide (CO). Dust emissions, noise, and vibration are all predicted to be reduced due to paving of the road. Ambient concentrations of SPM, NO2, SO2, and CO are predicted to increase slightly, but the concentrations decline sharply with distance from the road. As a distance of 5 km from the road, the increased concentrations with the project are very slight. The total air pollution load will increase due to increase in traffic, but ambient air quality is expected to be maintained well below WHO guidelines for SPM, NO2, and SO2. Emission scenarios you can see in Section 6.4.1.

248. Possible hazardous materials spills and easier access to the Chatyr-Kul protected area are the main impacts during operations. Some hazardous cargoes are transported across the road at present, including cyanide (which is used at gold mining operations in the KR). Other hazardous materials of concern are: petroleum-derived fuels (diesel, gasoline, kerosene, propane, etc.), fertilizers, and pesticides. Liquid materials are of much greater concern, as an accidental spill could result in immediate release of the materials into the watershed. The impacts of a catastrophic spill into the Kosh-Kul or one of the perennial streams cannot be fully predicted at present; given the sensitive ecosystems of the Chatyr-Kul, such scenarios will be prevented to the maximum extent possible, and spill response capacity will be mobilized to mitigate such events.(for detail information, read discussion in Chapters 6.4.2 and Chapters 7).

249. Additional impacts on fauna and flora may arise from the increased number of travelers transiting the project area, i.e., possible encroachment and poaching in the protected area. For the other common species which are able to migrate to alternative habitats, the road may continue to be a barrier to movement. As for permafrost, the project is an improvement of the existing road where 2-3 m high embankment has been in place for many years. New embankment will not impinge on undisturbed wet land, and there should be no impact on permafrost.

6.4.1. Emission Scenarios

250. Potential impacts from noise, vibration, and air pollutants were analyzed by numerical dispersion models at the point of maximum impact: a location about 2 km away from the road in avian breeding area. Four (4) cases were analyzed: (1) present condition, (2) future condition without pavement, (3) future condition with pavement and (4) during construction. Dust emissions, noise, and vibration are expected to improve with the project. Emissions from vehicles (carbon monoxide, carbon dioxide, particulate matter, nitrogen oxides, and sulfur oxides), are expected to increase in some proportion with increasing traffic, but are predicted to be lower in the with the Project than in the “no project” scenario. Results are summarized in Table 6.7, and presented graphically in Figures from 6.2 through 6.8 (detailed information about analysis of emission is presented in Annex 8)

Table 6.7: Summary of Emissions During Construction and Operations

SCENARIO		(1) Present (2011)	(2) Future (2015)	(3) Future (2015)	(4) During construction	Allowable range for human (except as noted)	Effectiveness of rehabilitation
Assumption		Unpaved	Unpaved	Paved	-		
Traffic volume	Nos./day	More than 90	200	200	>100 единиц строительного оборудования		
Traffic speed	Km/h	20	20	35	-		
Indices at the location 2km away from the road (birds breeding area)							
Noise	дБ(A)	50.9	52.9	50.3	51.2	40-45 (Фауна)	Better than present condition
Vibration	дБ(A)	26.9	29.3	21.5	30.4	50	
Dust	т/yers/км^2	0.250	0.500	0.003	0.270	200	
NO_2	μг/м^3	0.44	0.72	0.52	1.58	80-120	Slightly worse than present condition if rehabilitated, but better than the case if not rehabilitated
SPM	μг/м^3	0.023	0.037	0.027	0.061	100-200	
SO_2	μг/м^3	0.070	0.011	0.009	0.070	110-150	
CO	μг/м^3	0.31	0.50	0.37	0.31	12,500 -25,000	
CO_2	т/yers/км	**118**	**188**	**148**	**165**	**-**	

Note: noise limit for fauna is from L.C. (Eelco) den Boer, *Traffic Noise Reduction in Europe*, March 2007
Source: JOC, draft EIA report, December 2009.

251. The long-term impact of noise and vibrations on birds and other sensitive species is difficult to predict. Observations in the Chatyr Kul area indicate that some bird species are already adapted to the noise and disturbance of traffic on the existing road along the south side of the lake (see Figure 4.8 showing identified habitats), while some bird species occupy the area on the east side of the lake farther from the road. These observations are consistent with studies in other areas (e.g., at airports) where some avian species adapt to traffic disturbance and continue to occupy their habitat, while some species will shift to areas farther from the disturbance.

252. As noted in Figures 6.2 and 6.3 noise and vibration levels are predicted to decrease due to paving of the road. Noise levels during construction may exceed 70 dB(a) adjacent to the road, but are predicted to decline below 70 dB(a) less than 100 meters from the road. Vibration during construction is expected to be higher than present conditions, but will be significantly lower after paving of the road. As shown in Figure 6.10 dust levels may increase slightly during construction, but will be effectively eliminated by paving the road.

253. Figures 6.4 and 6.6 show predicted NO_2 and SPM concentrations. NO2 and SPM are predicted to increase during construction due to emissions from heavy equipment, but this increase is limited to a distance of less than 500 meters from the road.

254. Figures 6.7 and 6.8 show predicted SO_2 and CO concentrations, which are predicted to be higher after construction, based on projected increases in traffic growth, but will be lower than if the road is not paved..

Notes to Figures 6.2-6.8: *Blue line—current situation, Red—future without road dressing, green—future with road dressing, violet –during construction period. The lower axis shows the distance from the road (m).*

Fig 6.2:Prediected noise levels

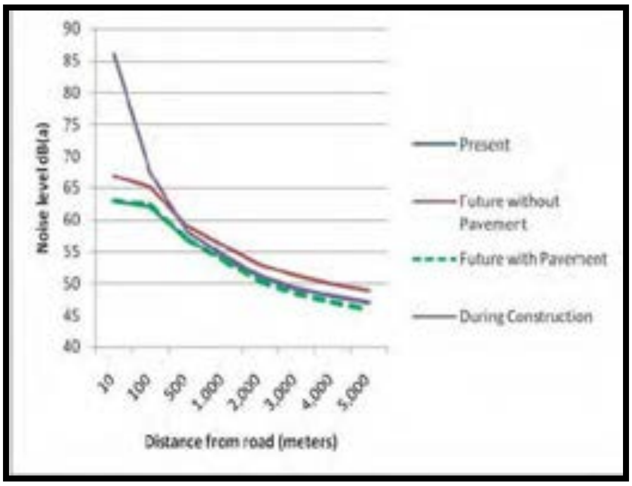


Fig 6.5:Predicted dust levels

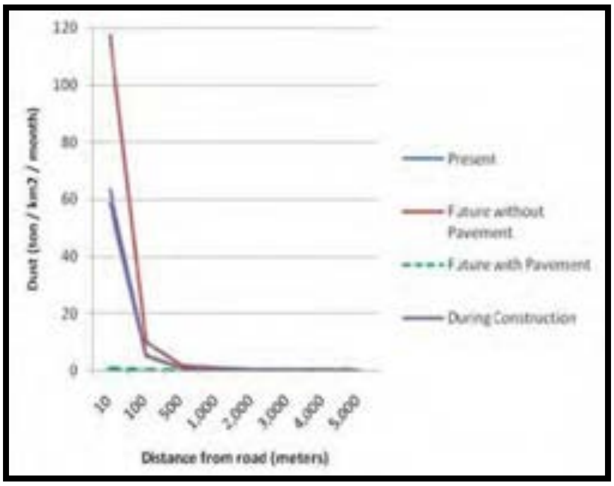


Fig 6.3: Predicted vibration levels

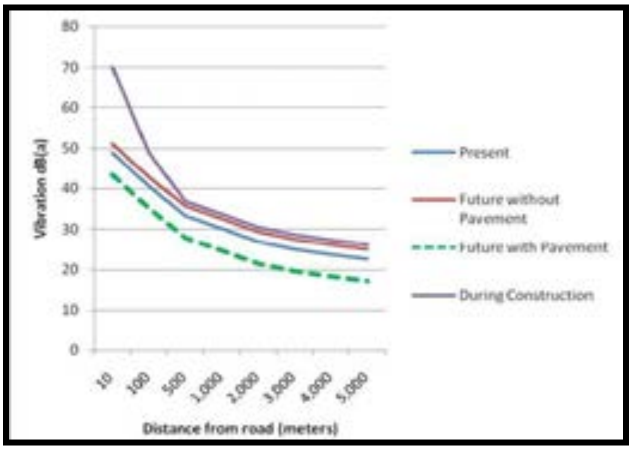


Fig 6.6: Predicted NO2 Levels

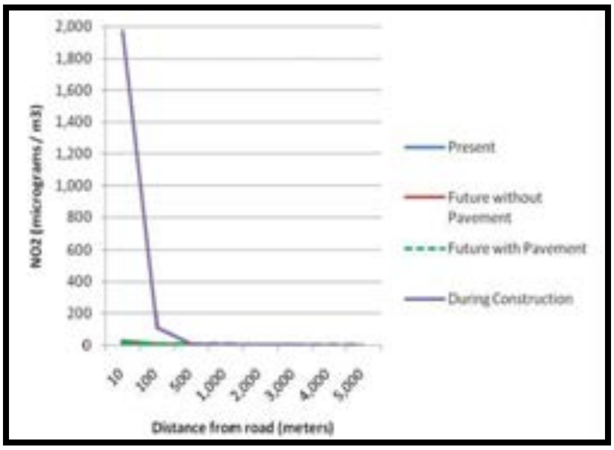


Fig 6.4. Predicted SPM Levels

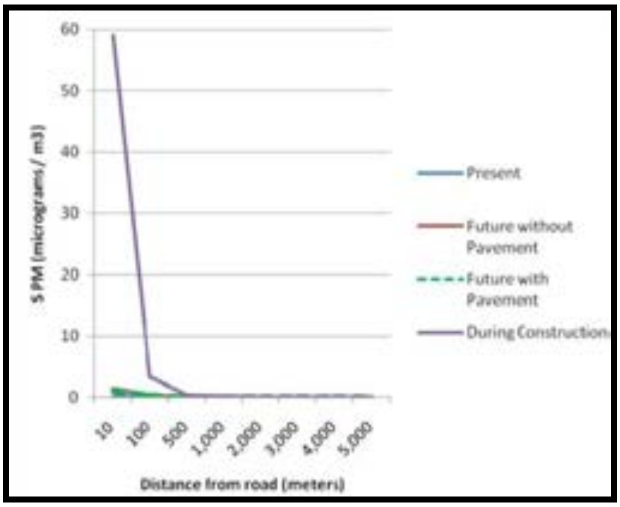


Fig 6.7: Predicted SO2 Levels

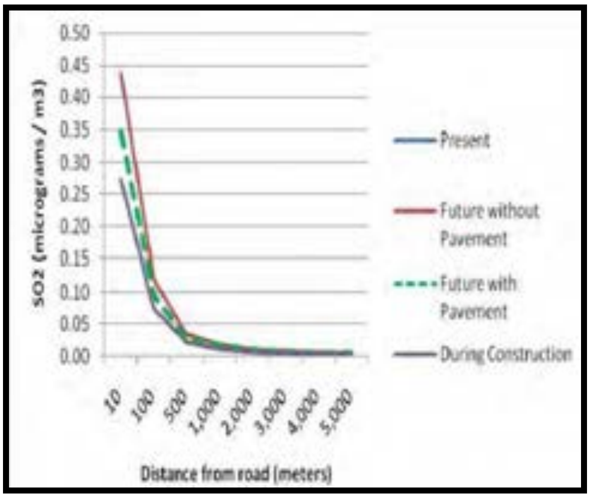
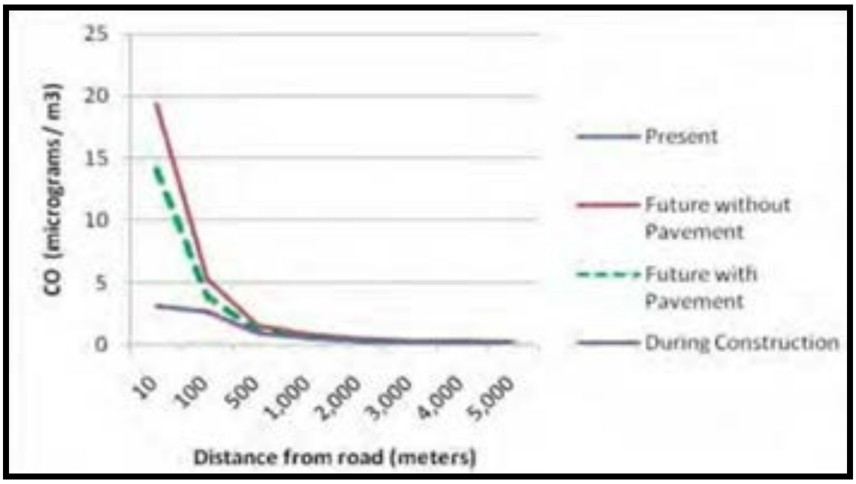
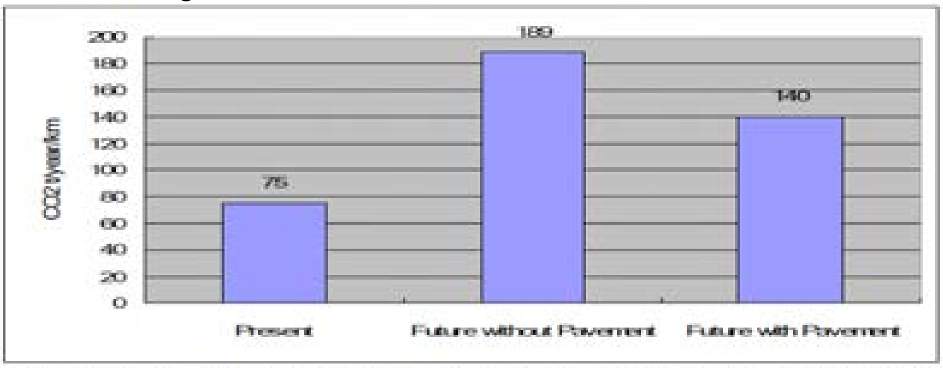


Fig 6.8. Predicted CO2 Levels



255. As shown in Figure 6.8, CO_2 emissions from the project area were estimated at 75 ton/km/year in 2009, and estimated at 189 tons/km/year in 2015 without the project due to increased traffic volumes. In the "with project" scenario, CO_2 emissions are estimated at 140 tons/km/year in 2015 because CO_2 emissions increase with traffic volume but decrease with higher velocity of vehicles. Thus, the project has a beneficial scenario compared to business as usual with respect to GHG emissions.

Figure 6.9: Greenhouse Gas Emissions Scenarios



В Диаграмме: Текущее состояние. В будущем без дорожной одежды. В будущем с дорожной одеждой
Источник: JOC, рабочий вариант отчета ОВОС, декабрь 2009 г.

Source: JOC, draft EIA report, December 2009

256. Eliminating all of the project-related GHG emissions would have no effect on the national or global total emissions trajectory: GHG emissions are insignificant in all scenarios. The total energy related GHG emissions of the Kyrgyz Republic were 4.95 million tons carbon dioxide equivalent ($MtCO_2e$) in year 2006, ranking the country 131st out of 224 reported [data from US DOE-EIA]. These emissions represent only 0.017% of the global energy-related total.

6.4.2. Spill Scenarios

257. At present, there is some transport of hazardous cargo, and trucks and other vehicles are prone to minor leakage of engine oil, hydraulic fluids, and transmission fluids. An accident could involve spillage from a car or truck fuel tank. Four scenarios have been considered, as follows:

- Scenario 1: short-term acute – a hazardous material spill which flows uncontrolled to the Lake

- Scenario 2: long-term chronic – percolation of fuel into soil, with dissolution and long-range transport in groundwater
- Scenario 3: short-term chronic – fuel spills into soil and flows without dispersion or dissolution; and
- Scenario 4: long-term seasonal – spring runoff becomes potentially contaminated from contact with the road and flows uncontrolled toward the Lake.

258. The potential impacts of these scenarios assume that there are no physical controls to contain a spill and contaminated runoff water.

6.4.2.1. Scenario 1

259. The worst-case, acute, scenario is a hazardous material spill which flows uncontrolled to the lake without any dilution or biodegradation. This scenario is conceivable around Km 515 to Km 525, where the road is less than 1 km from Kosh-Kul. Impacts on the Chatyr-Kul ecosystem cannot be quantified at present, as there are no identified threshold contaminant concentrations for sensitive species. An uncontrolled spill can cause "shock load" to sensitive species. Rapid changes in pH, reduction of dissolved oxygen, increases in nitrate and/or phosphate, would be detrimental to the lake ecosystem.

260. This worst-case scenario is more likely under present conditions than during operations, as spill containment procedures will be in effect at the start of the construction period, and the road will include engineered drainage controls to minimize impacts from hazardous materials spills.

6.4.2.2. Scenario 2

261. A likely long-term chronic scenario is that residual fuel and oil from contaminated runoff or a minor fuel spill will percolate into groundwater, with the resulting dissolved constituents posing a potential long-term threat to flora and fauna in the lake. A minor fuel spill could occur anytime from a truck accident which results in spillage from the truck's fuel tanks. Contaminated runoff will be generated during the spring and summer, when snow melts and maximum rainfall occurs.

262. Groundwater pollution analysis was conducted assuming a 100 liter gasoline spill which percolates into groundwater and flows toward the lake. The concentration of gasoline in groundwater reaching the lake at a distance of 3,000 meters may be close to 0.1 mg/L, which is the recommended limit of gasoline concentration in the water for baby planktons. Summary of analysis is presented in Table 6.8, and details of this analysis are included in Appendix 8 to this report.

Table 6.8: Results of Groundwater Gasoline Pollution Analysis

Amount of gasoline spilled Littre	Groundwater velocity (m/day)	Maximum concentration of Gasoline in the groundwater (mg/L) at 1000 – 3000 m distance		
		1000 m	2000 m	3000 m
100	0,1	0,1	0,01	0,0
100	1	0,3	0,09	0,
100	1	0,3	0,10	0,
100	1	0,3	0,10	0,

Source: JOC, draft EIA report, December 2009; see modeling summary in Appendix 3.

6.4.2.3. Scenario 3

263. Another short-term chronic scenario is a hazardous material spill in winter which could theoretically flow across frozen ground directly into surface water. Except for a spill occurring adjacent to Kosh Kul or one of the perennial streams flowing into Chatyr Kul, this scenario is actually unlikely as an uncontrolled spill of fuel or other liquid would probably encounter and partially melt ice and snow while flowing toward the lake. Assuming a 100 liter spill encountering a 10 centimeter (cm) thick layer of soil with 8% porosity, the fuel would percolate into the soil

and occupy an area of only 12.5 m2. This would be equivalent to a square 3.5 m x 3.5 m, or a circle with a radius of 1.99 m. The basic calculation is:

$$\{[100l x(1m^3/1000l)]/[10смx(100cm/1m)]\}/0.08=12.5m^2$$

264. Assuming that such a fuel spill flows through groundwater without mixing (laminar “plug” flow), the spill could reach the lake within 20 to 30 days as shown in Table 6.9. The potential impacts would be similar to Scenario 1.

Table 6.9: Bulk Fuel Spill Scenario

Amount of gasoline spilled Littre	Ground water velocity (m/day)	Days to reach the lake surface		
		1000m	2000m	3000m (Lake)
100	0,1	10 000	20 000	30 000
100	1	1000	2000	300
100	10	100	200	300
100	100	10	20	30

Source: ADB staff consultant estimates

6.4.2.4. Scenario 4

265. Another long-term scenario is seasonal runoff of water during the spring thaw period which becomes contaminated due to contact with the road (“contact water”). This seasonal pollutant load occurs every year, and presents a chronic threat to the lake ecosystem because the pollutant loads will accumulate in the lake, and the extent of possible degradation or sequestration of pollutants is unknown. Potential impacts of this scenario are similar to that for Scenarios 2 and 3, as the contaminant concentrations in contact water will be low. Contact water percolating into the soil could dissolve and exhibit behavior as simulated in Scenario 2, or could exhibit plug flow behavior noted in Scenario 3.

266. This type of non-point source pollution has been the subject of extensive research in the US and other countries. An initial estimate of the potential pollutant loads from contact water is presented in Table 6.10. This estimate uses pollutant concentrations for rural roads (measured in other countries), shown in second column of the table. These concentrations are multiplied by the average May rainfall (35 millimeters, as shown in Figure 4.4) falling on the 12 meter wide roadway, along the 30 km length of road in the Chatyr Kul watershed (total volume of 12,600 cubic meters, or 12.6 million liters). Assuming total annual precipitation equivalent to 350 millimeters of rainfall, a worst case estimate of the total annual load would 10 times higher that the loads for estimated for May. Taking the May runoff loads in column three times 20 provides estimated cumulative pollutant loads for a 20-year operational period (shown in the fourth column of Table 6.10).

267. It is important to note that the estimates shown in Table 6.10 are only first approximations, are somewhat hypothetical, but are conservative as the key assumption is that runoff concentrations would be steady for a 1-month period. In reality the concentrations would be expected to decline sharply over the 1-month period as residual pollutants are flushed off the road with each successive rainfall event. Monitoring of runoff water at the project area is recommended to determine actual pollutant loads, which would then allow further evaluation of potential long-term ecosystem impacts.

Table 6.10: Estimated Pollutant Loads from Contaminated Runoff Water

Pollutant / parameter	Concentration in Runoff Water (micrograms per liter)	Estimated Pollutant Load in Chatyr Kul in May (kilograms)	Estimated Cumulative Pollutant Load Over 20 Years (kilograms)
Total suspended solids	41,0	516,6	10 332
Volatile suspended solids	12,0	151,2	3 024
Total organic carbon	8,0	100,8	2 016

Chemical oxygen demand	49,0	617,4	12 348
Nitrate + nitrite	0,46	5,8	115,92
Total copper	0,022	0,28	5,54
Total lead	0,080	1,01	20,16
Total zinc	0,080	1,01	20,16

Source: Victoria Transport Policy Institute, http://trainsnotlanes.info/Documents/tca0515.pdf, accessed on 26 September 2010. Pollutant concentration data are derived from Eugene Driscoll, et al. *Pollution Loadings and Impacts from Highway Storm water Runoff*. Publication Number FHWA-RD-88-007, Washington DC, April 1990; and from Richard Forman, et al. 2003. *Road Ecology: Science and Solutions*. Island Press (www.islandpress.com).

268. The risk of a spill is considered to relatively low as about 2% of registered vehicles have been involved in traffic accidents every year between1997 to 2007. There are no accident statistics specifically for the project area [although anecdotal sources report one accident per year.] Hazardous cargoes are subject to KR / MOTC placarding requirements. Hazardous material shipments traverse the project area in convoys (with a pilot car) to minimize accident risk. According to the State Customs Service, hazardous materials shipments in 2010 include explosive and chemicals. The total shipments as of early November 2010 have been as follows:

(i) Explosives –7vehicles, total 88,8tons
(ii)Chemicals–44vehicles, total1285,5tons

269. The frequency of shipments has been about 1 every 2 months for explosives and about 3-4 per month for chemicals.

270. The spill scenarios discussed above assume that there are no drainage controls to prevent contaminants from reaching the lake. The road design will include run-on/run-off control to maintain structural integrity of the road, and retention basins for control of potential fuel spills. MOTC also proposes to implement a roadside assistance program which will include spill control and countermeasures capability.

6.5. Mitigation Measures

271. Referring to the Figure 6.1 and anticipated impacts discussed above, mitigation measures have been identified according to 2 strategic activities:

(i) Pollutant source control and monitoring, and
(ii) Receptors protection.

272. Pollutant source control and monitoring comprises proactive measures to avoid, minimize, and mitigate pollution impacts from the Project. Receptor protection comprises a parallel set of measures to enhance the ecological management activities at the Chatyr-Kul protected area which will facilitate long-term ecosystem conservation and possible future enhancements.

273. Although further baseline characterization is necessary to implement a viable environmental and ecological monitoring program, detailed knowledge of the receptors sensitivity to various pollutants is not required to design an effective mitigation program for controlling pollution at the source. Thus, various mitigation measures are recommended to avoid, minimize, and mitigate potential negative impacts. This “no regrets” approach is consistent with KR objectives for protected areas and ADB’s Safeguard Policy Statement 2009.

274. As discussed in the analysis of alternatives in Section 3, the proposed design was selected partly because it is expected to have the least environmental impact of the various alternatives considered. Therefore, the overall project design will avoid and minimize most of the negative impacts associated with building a new road. Passive drainage controls and geoecological barrier at the most vulnerable road stretch along Kosh-Kul Lake will further avoid and minimize potential negative impacts. Additional operational controls will mitigate potential negative impacts.

6.5.1. The No Regret Approach

275. The Project area is a poorly studied protected natural habitat which is characterized as balanced but rather susceptible area. The Consultant presumes that long-terms and regular, cumulative or catastrophic anthropogenic impact may result in unpredictable consequences. The Consultant believes that it is wiser to prevent any negative impact of the kind, for as soon as the process of alteration of natural conditions is started there will be no, or minimal opportunity to stop it, and without any chance of reverse.

276. The Project area is the area of accumulation of large numbers of heavy transport operated at high altitudes. In such conditions, with the oxygen deficit, the engine/motor fuels do not burn fully and the exhaust gases contain increased volumes of heavy and toxic elements; they are present not only in the fuels (gasoline, diesel) but also in the depressors and antigels to diesel fuel.

277. At high vehicles' performance load frequent fuel injection systems failure may accur, also appear oil drips on transmission and the roadside accumulates products of tyre wear-off, fine particles from brake shoes. As a rule, these materials contain elements from the groups of toxic and heavy metals, polyaromatic hydrocarbons (PAH) and other chemical compiunds.

278. The main channels of their teansportation to environment are air, water and soil. Under the conditionsof the Project area the use of high-tech methods of their control is difficult and rather costly.

279. The Consultant supports the *No regret approach*[1] as suggester in the draft EIA versions in 2010 and 2012. The biggest concern in the Project area are the petroleum products and contained therein heavy metals such as Cd, Pb, Hg, Cu, Zn, Ni, Cr and other, and also other elements asuch as chlor-organic compounds, synthetic surface-active substances etc.

6.5.2. Mitigation Measures During the Operational Period

280. Excavation of earth and operation of asphalt plants will not be allowed in Chatyr-Kul Lake basin between Tuz-Bel pass (KM 501) and Torugart Customs point (KM 531). Asphalt plants, machines depots and servicing stations for construction equipment/machinery and construction camps will be located between the BCP KM 478 and KM 500. Construction equipment/machinery will have to comply with national noise and gas emission standards. At this in this project area the Contractor is using mostly new oad and consruction ueqipment.

281. Borrow pits will be proposed to be located in 4 locations in the area of Chatyr-Kul watershed. To minimize potential negative impacts during construction the borrow pits will be located outside of Chatyr-Kul area. However, for emergency reasons, Additional Requirements for Borrow Pits Management have been developed within the watershed area (see Borrow pit management plan, Annex 9). The excavated material and rock excavated for construction purposes in Chatyr-Kul area will be used to build roads or for unstructured backfillon the base of revised Borrow Pit Management Plan it was decided that borrow pit at km508+600 (Chatarak river bed) will not be developed in any case since this borrow pit area is critical habitat for rare endemic species of insects – locust (Plotnikovia Wingless Locust)

282. The excavated fills from the earthworks including excavated material to construct drainage structures and settling ponds will be used as base material or unstructured backfill, where necessary. Other non-degradable wastes will be removed beyond the Chatyr-Kul watershed.

283. Measures to catch spills will include construction of earth banks, silt traps and settling ponds, as needed, in construction camps, concentrations of construction machinery and equipment, machinery maintenance sites and active construction sites if located near water courses.

[1] Explanation to the No Regret is used the UNO institutions, for more details see http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-annex-ru.pdf

284. Contractors will not be allowed to drive into Chatyr-Kul protected area,- briefings will be provided to all the Contractor' personnel. Additional warning signs will be installed along the road at every 2 kilometers on the 2 km periphery of the buffer zone to inform the nomadic population not to pasture cattle in this territory, as well as truck drivers for careful driving.

6.5.3. Mitigation Measures During the Operation Period

285. Paving the road will reduce dust, noise, and vibration, and computer modeling indicates that primary pollutants from vehicle emissions will remain well below WHO guidelines during operations, as discussed above. Aside from paving the road, no additional mitigation measures are proposed for dust and vibration control.

286. Some provision for livestock crossings are recommended, such as enlarged culverts. This could require increasing the elevation (height) of the road, which would increase costs. Enforcing speed limits may be sufficient to prevent accidents involving vehicles and livestock. Vehicles using the road are required to meet Kyrgyz emissions standards or equivalent PRC standard.

287. Contaminated runoff water and small fuel spills, discussed above, will be mitigated by passive run-on/run-off controls including spill control berms, retention ponds, silt traps, and possible oil-water separators or oil-sorbent materials.

288. An example of a retention pond is shown in Figure 6.14. MOTC will be responsible for routine maintenance of these components to ensure they remain functional.

Figure 6.14: Example of Retention Pond (at electrical substation)

289. For the purposes of monitoring of environmental componenets Consultant has selected monitoring equipment. This lis of equipment is coordinated with MoTC and SAEPF. This equipment will be transferred o the KJSR Directorate to monitor quality of air, water, soil, biodiversity and levels of dust, noise and vibration in the Project area. The KJSR staff will be responsible for monitoring electric cinductivity, concentrations of heavy metals in water and soil, probable oils spills, dissolved oxygen in water and other monitoring indicators. KJSR will be responsible for this laboratory functioning. Table 6.11 below shows the list of the proposed equipment.

Table 6.11: Proposed equipment for environmental monitoring

№	Equipment	Parameters to measure	Qty
1.	Mobile/stationary lab Polarography TA – 7	Heavy metal ions and toxic elements in the soil and water Cd, Pb, Zn, Cu, Hg, As etc	1
2.	Portable waterproof Ph-meter ANION -7000	Hydrogen ion activity (pH), oxidation-reduction potential nitrate activity (Eh) and air temperature	1
3.	Gas analyzer, portable DAG-500 O_2, CO, NO, NO2, SO_2 + soot in air	The content of hazardous air pollutants, including soot content	1
4.	Noise-vibration meter Octava 110A-EKO	noise, infra-sound, general and local vibration measurement (3 bands)	1
5.	MARK 302 (NOVOLAB) (portable dissolved oxygen analyzer	Oxygen (O_2)	1
6.	ANION 4120 (designed to measure total salt content expressed as NaCl and other electrolytes, water temperature and electric conductivity	Conductivity/Salinity	1
7.	Other equipment and fixtures: - A laptop; - MFU (printer, scanner and copier - 3 in one); - inflatable boat; - The camera; - Video Camera; - Spyglass (2pc.); Binoculars (2 pc.)- - GPS - positioner; - Minor inventory	X	

290. This and other measures of passive control will be modernized to improve capacity to control oil spills and counter-measures. This will include development of the emergency spills plan, staff training and allocation of emergency and rescue equipment to liquidate oil spills at KM 501-KM 531 at the existing RMU. Another mitigation measures will include visual inspection of vehicles for safety to identify any active oil/petroleum products leakage, increased wareness of drivers and also road signs indicating that Chatyr-Kul area is the protected territory.

6.5.4. Mitigation measures in the sphere of sanitation and hygiene

291. A detailed program for this will be developed by MOTC with assistance from its International Environmnetal Consultant. Capacity building activities, environmental public awareness programs and technical design of infrastructure interventions will be funded by the project within the Ecological emergency budget.

Water supply and water diversion

292. With the improvement of the road surface at the customs post Torugart number of transit passengers, drivers and service personnel, including members of the Customs Service will increase. In order to ensure minimum hygiene requirements and creating a positive work environment / for people stay at the customs post is a need to create a local infrastructure such as safe water (for drinking and household needs), as well as effective treatment of wastewater.

293. The problem of water supply and wastewater treatment at the customs post Torugart is a single element of health and environmental safety. Lack of ways to provide safe drinking water and effective treatment and disposal of sewage in the watershed zone Torugart can subsequently jeopardize the ecosystem of the project area.

Water supply

294. At present, operating post of the customs service Torugart is supplied with delivered water from various sources. As part of the project activities Consultant recommends to conduct a relevant survey work on the development of engineering drawings for future drilling water well at the customs post. At the meeting, 16 March 2013 between the Consultant and the Client was an understanding of the issue. At the meeting it was announced intention to begin negotiations on this issue at the level of the Government.

Water diversion

295. Waste diversion in this area is critical. At the design stage by the supervisory staff and the MoTC KR (IPIG), at the first phase, it was planned to install septic tanks (sealed and / or unsealed), which could be purified by specialized machine 1 time per week (sealed version), or 1 time per month (unsealed version). However, due to the fact that this option involves a number of additional arrangements, and will largely depend on the availability of fuel, good condition of the machine, its operation schedule, and the weather conditions. The Consultant considers that these methods are not safe from an environmental point of view, and difficult to achieve, taking into account local climatic conditions.

296. Traditional water treatment system in the project area is also difficult to implement because of the climatic conditions and environmental constraints. The Consultant recommends exploring the use of new technologies for efficient wastewater treatment, suitable for use in extreme (polar) environment which fosters a deep cleaning of waste water such as sewage effluent, to the level of household consumption. At the same time, the technology, in addition to standard methods of treatment should ensure effective disinfection and neutralization of detergents, xenobiotics, elements of petroleum products and other potentially hazardous elements (eg heavy metals).

Hotels or Guest houses

297. In the high mountains, with predominantly constant low air temperatures and the remote in space and time from satisfactory living conditions in the area of customs post Torugart requires a warm room, hot food and places to stay.

298. At the MoTC it was discussed to use of the house for the engineers of the Project as a hotel/motel at km 531 of the road with the reimbursement of the Contractor upon completion of the work. The Consultant believes that option unacceptable due to the fact that a) in such a house will constantly arise deficit availability, b) gathering of people at this point would require parking arrangement, and c) require the establishment of sanitation (water, septic tank or water treatment), d) proximity of Chatyr-Kul lake makes this option environmentally unacceptable. Furthermore, any additional burden on this alpine ecosystem, especially its development (building) contradicts with the national law and the international obligations of the country.

299. Consultant considers it is necessary to consider the possibility of building in the area of customs post Torugart which is already under human influence, a small hotel / motel or hotel for transit passengers and drivers by about 50-60 people. Such a hotel / motel must be supplied with electricity, drinking cold water and provide wastewater treatment.

Domestic Waste

300. Even now the cluster of domestic waste along the road and at the customs post is a serious concern. No significant measures for the collection / disposal of garbage have been taken yet. With the growth of traffic and passenger traffic, this problem will become more acute, having a negative impact not only on health and sanitary conditions, but also on the landscape and the overall environmental well-being of the project area. The problem of the pollution of the project area household waste is as acute as the problem with wastewater treatment.

301. Following consultations with the Ministry of Transport and Communications, it was decided that the issue of waste management in this project area will be addressed at the level of

At-Bashy ayil okmotu. The Consultant believes that for effective work it is necessary to carry out a training and educational program for separate waste collection and disposal for public services (border and customs posts) to the local population (KM 531) and transit passengers and drivers.

302. At the informational level to provide training for local people and government officials about the need to comply with health and environmental safety. It is also advisable to install two large information boards at the customs and border posts with the information that this section of road is a protected area, protected by the state, and informing about the pollution inadmissibility of a designated section of road. Information on the shield should be in Kyrgyz, Russian, English and Chinese.

303. On the shield is necessary to apply a schematic inscription about this: "Warning: You cross the territory of Karatal-Zhapyryk State Reserve and a portected zone of waterbirds! Transit Areat. Stopping at the road sections 531km-501km. Prohibited. Do not drop rubbish! Penalty - 5000 soms. Area is protected by the state.

304. Along the whole of the protected section of the road need to install the standard traffic signs "No Stopping", "Speed limit", "Warning! Animals on the road," and signs prohibiting littering the ground. The Consultant also recommends to develop graphic elements of social advertising (iconography) available to perception regardless of the knowledge / no knowledge of languages

7. Environmental Monitoring System

305. The Environmental Monitoring System has been developed as part of the environmental assessment to avoid, minimize, and mitigate potential negative impacts of the Project. The proposed design has been selected from several alternatives based on economic, financial, environmental, and social aspects. The proposed Project has the smallest environmental “footprint” of the alternatives (except for abandonment of the road and closure of the border crossing). At the stage of the EIA updating the baseline environmental studies were carried out in the susceptible zone of Karatal-Zhapyryk State Reserve; this data included in this updated EIA and form core of environmental monitoring system.

306. The Environmental Monitoring System in the project area has passed through several stages of updating, and in the implementation phase, as and when required, will be complemented by additional materilas and data, taking into account field conditions, performance of the construction contractor and the feedback of stakeholders. The Environmental Monitoring System includes plan and parameters of monitoring (tables 7.1-7.12).

307. Development of an environmental monitoring system in the territory of Karatal-Japyryk Reserve and the area of lake Chatyr-Kul is the main focus of this Project. As stated above, this area is a unique ecosystem, located in the high mountains, and almost not impacted by human activity. Therefore, its preservation requires a specific approach combined with the ongoing monitoring of environmental conditions and trends, by also considering the current anthropogenic load that is associated with overgrazing and the growing future impacts caused by increased traffic intensity, construction and subsequent operation of the BNT road.

308. In this regard, each monitoring system would normally include a system of indicators and indicator’ constants in time and space. Generally, an indicator is a value that shows the change in the controlled process setting, or a state of an object in the form of the most convenient for visual, acoustic, tactile or other way of information interpretation. An indicator in ecology is a system of assessed properties of the state of ecosystem. Indicators show the ecosystem’s vector: improving, degrading or remaining unchanged [ru.Wikipedia.com]. Indicators and their constants usually determined following negative factors identification of quality of ecological components. From scientific point of view, the constant indicators readings can be used to track the state of environment and its dynamics in accordance with the factors of road construction.

309. Indicators should have a number of important characteristics:

- There should be an empirical or theoretical evidence of cause-and-effect relationship between the changes in the indicator values and the measured parameters;
- Indicators should reflect the essential characteristics of the system which are important for decision making. They should reflect the long-term trends in economy, social life and environment;
- Indicators should be representative, sensitive and reliable, that is, to reflect the changes in the system, the properties of the entire system, not just some of its individual elements, and should be applicable to the area where they are used, and to reflect its specificity.
- Indicators should be qualitatively and quantitatively measured, the units must be accepted and standardized, to be comparable with the counterparts in the other regions (communities). Important for each indicator to reflect some specific features of the development process, and not to duplicate the other indicators.
- Another precondition for effective indicator development is its availability. This refers to the availability of data and possibility for the updates, financial availability, data for verification in the sense that the indicators should not be too expensive, with short computation time and their preparation.

310. The indicators within this project must be quantified optimal, adequate, and not to create additional physical, financial, and other operational difficulties for the person responsible for field data collection. Any excessive complexity of an indicator and its parameters may complicate the work and not provide for the expected result.

311. There are key endicators which cannot be, under no circumstances, reduced down or excluded from the register due to their importance for general environmental assessment. In general, it is recommeneded to, at certain stage, assess the need in hyman, material and technical resurces of the proposed monitoring system to evaluate its efficiency and sustainability..

312. Each sector under consideration is accompanied by the developed indices and indicators, with all the relevant data and information on the site, time and benchmarks, preferably, enclosed in a table in such a manner that the responsible officer of the Reserve, who will assume this work, shall have full and well-structured picture on the sampling procedures.

313. In Chatyr-Kul lake basin, of the KR Red Data Book species, registered 17 types of birds, 4 mammals (brown bear, snow leopard, Marco Polo ship and Siberian jerboa). However, by their biological and ecological parameters only 1 or 2 types of birds and 1 of mammals (jerboa) can be used as indicator species. Additional data on the indicator and the Red Book species may be obtained from the results of the last field studies carried out by team of scientists at the end of June 2013 under the Environmental Monitoring Baseline Survey.

7.1. System of Monitoring and Indicators (soil)

314. Heavy metals distribution in the soil is determined by numerous factors. It depends on the pollution sources and the regional meteorological characteristics, geological factors and landscape conditions in general. Source of contamination determines the quality and quantities of the dispersion products. In this case, the degree of dispersion depends on the height of release. Duration of availability of the particle emissions in the atmosphere depends on their mass and physical and chemical properties. The heavier particles are, the faster they precipitate. Heavy metals coming from soil to plants, passing in trophy chains have a toxic effect on plants, animals and humans.

315. The Kyrgyz Republic has not yet developed national MPC for heavy metals. But since the world science operates several methodologies for MPC identification (Obukhov, Clark, Ilyin, Cloquet) to identify MPCs for heavy metals, they can well be used in this study.

316. Of specific importance is the methodology by V.Ilyn. the studies show that the soils in the project area are carbonate, and the average soil reaction is alkaline. Therefore methods by V.A.Ilin and Klock (1982, 1992 and 2007) were used to determine heavy metals MAC in the research, which is also widely used in the CIS countries.

317. Permanent observation points are established for the systematic monitoring (annually during the construction period and every 3 years during the operational period) information on the soil state with a concrete completeness and accuracy. The number of these sampling points within the protected area of the Lake Chatyr-Kul and the surrounding area, depending on the diversity and features of the soil cover is 9.

318. The prosed system to monitor soil blanket of the protected area of Chatyr-Kul Lake is a guideline to implement monitoring (reaserch, laboratory and office works) ensurng monitoring, generalization and systematization of true information on the soil cover condition.

319. Monitoring is a system of observation and control over following:

- - qualitative soil condition, assessment of the direction and intensity of the detected changes, the forecast of further development;
- - Highlighting of regions with unfavorable environmental conditions (erosion, salinization, rocky, heavy metal contamination, etc.)

- - Rational use and soil protection in the reserved site of Chatyr-Kul lake and the surrounding area during road construction works and its further exploitation.
- Recommendations to prevention and eliminate negative processes.
- Provision with information on the soil cover status of ecosystems in the reserved site of Chatyr-Kul lake and the surrounding area.

320. The target for monitoring is the soil cover of natural ecosystem in the reserve area of Chatyr-Kul lake and the main executor of this monitoring shall be Karatal-Zhapyryk Reserve Directorate.

321. Soil monitoring assumes the following works implementation:

- organization of the soil monitoring (training of specialists (soil scientists, analysts – lab assistants) for monitoring delivery);
- Conduct observations (field, laboratory and office work) for the dynamics of soil processes and heavy metals;
- Development of soil-monitoring card schemes on the received results;
- Prepare technical reports on the results of soil-monitoring studies.

322. There are following monitoring indicators: the humus content, gross forms of nitrogen, phosphorus and potassium; mechanical makeup: salinity, alkalinity, gross and mobile forms of heavy metals. Benchmarks of monitoring are MPC of heavy metals (Ilin V. A., Chuldzhiyan H.),

323. Important to remember that air pollution by exhaust gases containing heavy metals impacts humus cover and other surface soils parameters. Destruction of humic acid under the influence of settling acids from diesel exhaust gases and fuel is the reason to activate erosion process. They destroy not only chemical, but also physical structure of soil and reduces its width. The latter alters ground water regime and leads to development of soil salination. Taking into account that soils in the area of Chatyr-Kul Lake have natural tendency to salination additional anthropogenic factors may aggravate this destructive process.

Table 7.1: The section coordinates on the fertility of soil

Observation sites	Sections	Coordinates	
		N	E
I	1	40° 33′ 51.1 ″	075° 05′ 53.8 ″
II	2	40° 33′ 05.0 ″	075° 14′ 24.3 ″
III	3	40° 32′ 53,4 ″	075° 18′ 15,6 ″
IV	4	40° 33′ 56.9 ″	075° 21′ 22.1 ″

324. Soil fertility monitoring shall be done once a year during construction period and operation. The time of the day is of insignificance. Sampling shall be done in 4 monitoring locations down to the horizons of the mother rosk with the following chemical analysis in laboratory (see Annex 8 to this report).

325. Along the road for monitoring of soil pollution by heavy metals there is a selection of soil samples that is carried out twice a year (spring and fall). The number of these points within the protected area is 8 points (see Annex 8).

Table 7.2: The coordinates of the soil samples on heavy metals

Observation sites	Points	Depth, sm	Coordinates	
			N	E
I	1	0- 20; 20- 50	40° 33′ 57,1 ″	075° 05′12,0 ″
	2	0- 20; 20- 50	40° 33′ 58,3 ″	075° 05′12,3 ″
II	3	0- 20; 20- 50	40° 33′39,9 ″	075° 07′44,9″

	4	0- 20; 20- 50	40° 33′ 57,1 ″	075° 05′22,3 ″
	5	0- 20; 20- 50	40° 33′37,8 ″	075° 07′44,7 ″
III	6	0- 20; 20- 50	40° 33′18,6 ″	075° 11′07,1″
	7	0- 20; 20- 50	40° 33′19,9 ″	075° 11′07,7″
	8	0- 20; 20- 50	40° 33′20,8 ″	075° 11′07,9″
IV	9	0- 20; 20- 50	40° 33′01,1 ″	075° 14′23,5 ″
	10	0- 20; 20- 50	40° 32′59,8 ″	075° 14′22,9 ″
V	11	0- 20; 20- 50	40° 33′ 07,1 ″	075° 19′ 17,8 ″
	12	0- 20; 20- 50	40° 33′ 05,1 ″	075° 19′17,0 ″
	13	0- 20; 20- 50	40° 33′ 02.2 ″	075° 19′ 14.7 ″
	14	0- 20; 20- 50	40° 33′ 01,1 ″	075° 19′ 13,9 ″
VI	15	0- 20; 20- 50	40° 33′ 08,6 ″	075° 19′38,8 ″
	16	0- 20; 20- 50	40° 33′06,4 ″	075° 19′39,7 ″
	17	0- 20; 20- 50	40° 33′05,5 ″	075° 19′40,0 ″
VII	18	0- 20; 20- 50	40° 33′ 56.2 ″	075° 21′ 22.7 ″
	19	0- 20; 20- 50	40° 33′35,3 ″	075° 20′42,7 ″
VIII	20	0- 20; 20- 50	40° 35′21,0 ″	075° 24′35,4 ″
	21	0- 20; 20- 50	40° 35′20,0 ″	075° 24′35,1 ″
	22	0- 20; 20- 50	40° 35′18,4 ″	075° 24′ 34.8 ″

326. Texture, humus, total and mobile forms of nitrogen, phosphorus, potassium, absorption capacity, the absorbed sodium, water extract and heavy metals in accordance with the methods specified in the chapter "Methods and Techniques" were determined in the laboratory. Tools required for monitoring are also identified in this chapter.

Table 7.3: Monitoring indicators on soils

Indicators (status of soil)	**Indicator constant**	**Place of sampling**	**Number (units, heads)**	**Time of day and year when the sampling is made**	**Methods of sampling**
		Detailed map with a scale of 1:300,000 showing GPS-points is in Annex 1			
1 - group study of the physical and chemical characteristics of the soil profile in the project area		By Horizons according to standard procedure, the points 026 – 029			Standard accepted procedures, including laboratory analysis
2 - group study of toxic heavy metal in the project area,	Pb, Cd, As, Cu, V, Sn, Zn, Sb, Mo, Co, Hg, Ni	By Horizons according to standard procedure, points 034-038	By MPC for neutral, acidic and alkaline soils		Standard accepted procedures, including laboratory analysis (Method Obukhov / Clark / Ilyin)
3-group study of potentially hazardous areas of zones of erosion in the project area.	Fractions sized 0.1-0.5 мм.	By Horizons according to standard procedure, points 026 – 029	Absence indicates a growing erosion		Standard accepted procedures, including laboratory analysis

7.2. Monitoring system and indicators (zooplankton and zoobenthos)

327. In the process to assess the status of water ecosystems special attention shall be paid to looking for the species types-indicators which react to the change of aquatic strata if exposed both to natural and anthropogenic factors. Of the plankton organisms such groups can be rotifers; their certain types in their mass can develop, say, if the organic content in water is increased. The indicator types can indicate the increase in water of some chemical elements, such as pesticides, petroleum products, heavy metals, are not established so far. But the two types of seed shrimps, - F.mosquensis and L.inopinata, can serve as indicators to monitor pollution of the lake's soil by the passing motor transport. Also, seed shrimps of the subfamily Candoninae, familiy Candonidae can serve as indicators of the water mass quality, and their absence will indicate the aggravated situation concerning oxygen in the lake.

328. In the places of carbonic water outcrops, the seed shrimps die since in the acid water their shells thin-out, and this helps to monitor the acid water distribution in the lower water layers of the lake. Of the maggots found in large amounts in the lake as bio-indicators can be used, including the chironomid maggots of the type Chironomus, sub-family Chironomini, and Chironomides thummi Kiefer of the family Podonominae - Psilotanypus imicola Kiefer. All these types were found in large amounts in the western part of the Big Lake in sediments enriched with detritus and other organic remains. The most peculiar signs of water eutrophication, i.e. pollution with organic substances shall appear in the western part of the Big Lake and in Small Lake through the increased number chironomid maggots of the types Chironomus, Psilotanypus and bugs of the Hygrotus familiy (Coelambus).

329. The season for monitoring is mid -June – September (every month). The best part for monitoring is the western part of the Big Lake and Small Lake. The monitoring points shall be identified together with the Reserve's officer responsible for monitoring of biota in the Lakes.

Table 7.4: Monitoring indicators for hydrobionts

Indicators (status of water quality and soil)	Indicator constant	Place o fsampling	Number (units, heads)	Time of day and year when the sampling is made	Methods of sampling
				July and august	Zooplankton caught by plankton net made of mill sieve № 56 with 20cm diameter inlet. Net was used to seine a water column from the lake bottom till its surface. The collected material was placed in a container, fixed with 4% formaldehyde and labeled
Zoobentos: Ostracodes- F.mosquensis и L.inopinata can serve as indicators of the lake ground pollution by vehicle traffic. Ostracodes of sub-family Candoninae of family Candonidae	The absence in the samples indicates a worsening oxygen conditions in the water	22 points, as shown in Annex 4 "Points of aquatic organisms collection and the resulting volume of material"		Mid-August	Zoobenthos was selected with scraper, washed through the sieve of the sieve № 56, was placed in a container with 4% formaldehyde and labeled
Chironomid larvae of	The growth				

the genera Chironomus, Psilotanypus and beetles of the genus Hygrotus (Coelambus)	in the number of samples indicates signs of eutrophication, ie organic pollution				

7.3. Monitoring System and Indicators (flora)

330. Monitoring can be delivered by staff of the Karatal-Dzhaparyk Reserve with participation of a specialist-botanist. The vegetation season for plants in the construction area is short, so the vegetation monitoring should be done once a year during most of the vegetation period in July. Duration of the monitoring is one week.

331. As indicator species for vegetation the dominants could be used, including the subdominants of individual associations of vegetation. Current state and the abundance of dominant species, as well as coordinates of sites for monitoring are highlighted for the initial researches. Monitoring should be conducted according to the same procedure as the initial researches:

Table 7.5: List of indicator types on plant associations:

Associations	Coordinates	Indicators types
Association *Hordeum brevisubulatum* (Trin.) Link + *Festuca kirghisorum* (Katsch. ex Tzvel.) E.Alexeev	40º 33'12,8" N 75º 12'28,3" E. l.	1. *Hordeumbrevisubulatum* (Trin.) Link – current abundance on the Drude scale: Sp - moderate (5–30 %) 2. *Festuca kirghisorum* (Katsch. ex Tzvel.) E.Alexeev– current abundance on the Drude scale: Sp - moderate (5–30 %)
Association *Festuca valesiaca* Gaudin + *Hordeum brevisubulatum* (Trin.) Link	40º 33'11,7" N 75º 12'40,7" E. l.	*Festuca valesiaca* Gaudin – current abundance on the Drude scale: Sp - moderate (5–30 %) *Hordeumbrevisubulatum* (Trin.) Link – current abundance on the Drude scale: Sp - moderate (5–30 %)
Association *Kobresiacapilliformis* Jvanova + *Kobresia humilis* (C.A.Mey. ex Trautv.) Serg.	40º 33'09,4" N 75º 13'04,5" E. l.	1. *Kobresiacapilliformis* Jvanova – current abundance on the Drude scale: Cop_2 – richly (50–70 %) 2. *Kobresia humilis* (C.A.Mey. ex Trautv.) Serg. – current abundance on the Drude scale: Cop_1 – a lot (30–50 %)
Association *Kobresiacapilliformis* Jvanova + *Kobresia humilis* (C.A.Mey. ex Trautv.) Serg.	40º 33'45,6" N 75º 06'48,8" E. l.	1. *Puccinelliahackeliana* V.Krecz. – current abundance on the Drude scale: Sp - moderate (5–30 %) 2. *Calamagrostis tianschanica* Rupr. – current abundance on the Drude scale: Sp - moderate (5–30 %)
Association Carexsp. + Carexmelanantha C.A.Mey.	40º 33'48,1" N 75º 06'20,3" E. l.	Индикаторныйвид: *Carex melanantha* C.A.Mey. – current abundance on the Drude scale: Cop_1 – a lot (30–50 %)
Association *Oxytropis tianschanica* Bunge + *Hordeum brevisubulatum* (Trin.) Link	40º 33'11,7" N 75º 12'40,7" E. l.	1. *Oxytropis tianschanicakeliana* Bunge – current abundance on the Drude scale: Cop_1 – a lot (30–50 %) 2. *Hordeumbrevisubulatum* (Trin.) Link – current

		abundance on the Drude scale: Cop_1 – a lot (30–50 %)
Association *Leucopoaolgae* (Regel) V.Krecz. et Bobr.+ *Hordeum brevisubulatum* (Trin.) Link	40º 34'11,2" N 75º 21'53,6"" E. l.	1. *Leucopoaolgae* (Regel) V.Krecz. et Bobr. – current abundance on the Drude scale: Cop_1 – a lot (30–50 %) 2. *Hordeumbrevisubulatum* (Trin.) Link – current abundance on the Drude scale: Cop_1 – a lot (30–50 %)
Association Saussurea faminziniana Krasn. + Calamagrostis tianschanica Rupr.	40º 34'10,2" N 75º 21'43,6" E. l.	1. *Saussurea faminziniana* Krasn. – current abundance on the Drude scale: Cop_1 – a lot (30–50 %) 2. *Calamagrostis tianschanica* Rupr. – current abundance on the Drude scale: Cop_1 – a lot (30–50 %)
Association Suaeda olufsenii Pauls.+ Calamagrostis tianschanica Rupr.	40º 33'55,2" N 75º 21'43,6" E. l.	1. *Suaedaolufsenii*Pauls.– current abundance on the Drude scale: Sp - moderate (5–30 %) 2. *Calamagrostis tianschanica* Rupr. – current abundance on the Drude scale: Sol – few, rarely (1-5 %)
Association *Polygonumpamiricum*Korsh. + *Suaedaolufsenii*Pauls.	40º 34'40,1" N 75º 23'10,2" E. l.	1. *Polygonumpamiricum*Korsh.– current abundance on the Drude scale: Cop_1 – a lot (30–50 %) 2. *Suaedaolufsenii*Pauls.– current abundance on the Drude scale: Cop_1 – a lot (30–50 %)
Association *Acantholimon tianschanicum* Czerniak. + *Suaeda olufsenii* Pauls.	40º 34'38,1" N 75º 22'11,1" E. l.	1. *Acantholimon tianschanicum* Czerniak. – current abundance on the Drude scale: Cop_1 – a lot (30–50 %) 2. *Suaedaolufsenii*Pauls.– current abundance on the Drude scale: Cop_1 – a lot (30–50 %)

332. To obtain comparable results within the frame of the monitoring surveys the abundance of indicator types should also be delivered on the Drude scale basis:

Cop_3 - are abundant (70-90% of the grass stand volume)
Cop_2 - abundant (50-70%)
Cop_1 - many (30-50%)
Sp - moderate (5-30%)
Sol - few, rarely (1-5%)
Un - in one specimen

333. Reducing of the indicator types' abundance and its transformation into a different scale category should be considered as the deterioration of the ecosystem. The same abundance - the ecosystem state - stable. The increase of abundance – improvement of the ecosystem.

7.4. System and Monitoring Indicators (avifauna)

334. One of the simple and effective methods of environmental protection is bird monitoring, because they first begin to respond to any environmental changes such as climate and vegetation change, decreasing forage resources, etc. Using biological indicator species parameters of environmental factors can be estimated and prediction of changes in the future after the road construction begins can be projected.

335. The proposed indicators include such species of birds, as swan, demoiselle, wild duck, duck, pintail, garganey, teal, steppe buzzard, sparrow hawk, golden eagle, bearded vulture, Himalayan (snow) neck, horned lark, and stove-dancer. The methodology described in the chapter related to the area study (Davletbakov A.T, 2003).

336. The most common quantitative method is a bird trip. Counting is to ensure that the observer is going on the pre-selected routes for all major biotopes with convenient speed for observing and he/she counts all birds occurring in the frames of records, identified on voice or appearance regardless of their distance. Birds are determined up to species. All data is recorded in the record sheet.

337. **Registration method**. Record blank/form for the data counting should provide a table prepared in advance. Example of the blank fulfillment (see Table 7.6, Form № 1).

338. For each record there is a need to register the date and time of the recording, venue, weather conditions - sunny, cloudy, temperature (heat, cold) and wind intensity (weak, moderate, severe), the presence or absence of precipitation. All information on the meeting birds are recorded in the record forms. All records on the birds meetings are delivered once, during recording. It's not allowed to do it after recording just having in memory.

339. Recording time. Time is very important and to know when it should be started in order to keep records. It should be delivered in the period of greatest activity of birds when there are less chances for pass of different specimens. The best time is morning just after sunrise from 6 to 10-11 AM. It's necessary to choose a day with good weather conditions in order to obtain comparable results.

340. The surveys/records should be carried out during the breeding season - in May – June that will reflect the state of the breeding bird population. The recording line may not be strongly fixed, but it should run as close as possible to the main line route passing on all the main biotopes. The right choice of venue recording has initial importance, and this is a reason why before planning of the route it should be preliminary detailed exploring/familiarization with the study area and identification of key biotopes.

341. The width of the recording strip depends on the nature of the terrain - in the forest area it should not take more than 50-100m. (i.e., 25-50m. in each direction from the motion direction), in the open landscape it is sometimes possible to record at a greater distance. For recording of birds there is a need to have a binoculars with multiplicity of 10 and working telescope - 30 times.

Table 7.6: Registration procedure and the Record Form № 1 (sample)

Biotope description: HS, SH, NG, PR	Chatyr-Kul lake	Time
Date “ 20 “ May 2013.		from 7 : 00 AMtill 9: 00 PM
Geographic coordinates or place name:		
Coordinates on GPS: NE height		
Weather Condition: Clear, Cloudy		(underline as applicable)
transect № 1 Recorder-Sarygulov T.		
Species Mountain Goose Wild duck/mallard Coot	Quantity 20, 12, 3, 5. 22, 10, 47, 50… 100, 23, 70	

Table 7.7: Monitoring indicators of bird population

Indicators (status of water quality and soil)	Indicator constant	Place of sampling	Number (units, heads)	Time of day and year when the sampling is made	Method
Whooper Swan, demoiselle, sparrow hawk,	Population dynamics	Roadside site study area of the pass Tuz-Bel to the customs		Breeding, wintering	Identification of birds by their singing, by visual observation of alleged

golden eagle, bearded vulture, Himalayan (snow) neck, horned lark, wheatear-dancer)		station at the pass, areas for the Reserve's monitoring red-listed species, or according toTable33, indicating areas with GPS-references		(more details will be determined by a qualified ornithologist)	and known feeding ground. Observation of the first detection of the recalculation of the average values in accordance with the procedure of trass counting. Data processing in the laboratory of Zoology, National Academy of Sciences BPI using standard procedures.

7.5. System and Monitoring Indicators (mammals)

342. In the surveyed area there are 10 identified species of mammals: gray marmot - (Marmota baibacina Kastschenko, 1889), jerboa jumper - (Allactaga sibirica Forster, 1778), the narrow-skulled vole - (Microtus gregalis (Pallas, 1779), the eastern mole voles - (Ellobius tancrei Blasius, 1884), rabbit-sandstone - (Lepus capensis Linnaeus, 1758), the wolf - (Canis lupus Linnaeus, 1758), Fox - (Vulpes vulpes Linnaeus, 1758), ermine - (Mustella ermine Linnaeus, 1758), mountain goat - (Sapra ibex Linnaeus, 1758).

343. There are two species of mountain sheep - (Ovis ammon), jerboa jumper - (Allactaga sibirica) that are listed in the "Red Book of the Kyrgyz Republic ". Adequately, the best species for the monitoring of rare mammals species are included in the "List of rare and endangered species of the Kyrgyz Republic", but mountain sheep are visiting this site not often and visits to the territory of the reserve and the road are random. The number of Coney jumpers is low and its detection is possible only in the night taking into account the weather conditions, of this area that complicates the monitoring delivering.

344. Based on the species composition and quantity there is the single monitoring type of mammals state during rehabilitation and subsequent operation of the road is a gray marmot (Marmota baibacina). Other types are few or determination of their quantitative and qualitative composition is associated with certain difficulties.

345. Recording of marmots is necessary to conduct in the first half of August, when it's possible to take into account the young animals. Recording is carried out by clear weather conditions from 8 to 12 am during the time of greatest activity of marmots, separately for yearlings and older animals that with a certain habit are easily differed by color. For recording the Recorder should have 8x binoculars and a rangefinder. Recording should be delivered from the car that is moving with a speed of 5.7 kilometers per hour because the animals in this sector are less afraid of the car comparing with human. Records are delivering at a distance of 250 meters from the Recorder in both directions. Recording is done separately for two categories of animals - young specimens of the current birth year, and adults that are older than one year. Therefore the recorder should have the skills to determine these categories at the distance, as well as the skills of distance identification or have a rangefinder.

346. Records delivered on 4 transects.

a. Transect № 1 – length is 10 km from Tuz-Bel Pass in the direction of a Custom Post, this is the area of maximum impact grazing.

b. Transect № 2 from Tuz-Bel Pass across the country road along the western lake shore before the rocks located near of the lake, the length is 7.7 km.

c. Transect № 3 - is a continuation of transect № 1, length is 18 km up to the Customs Post.

d. Transect № 4 from the Customs Post on the way to the Ak-Sai, length is 7 km.

347. For further analysis transect is divided into sections in kilometers, and the records on it are delivered separately. There is a need also to consider the number of breedering sites and number of dogs that have a significant impact on the population of marmots.

Table 7.8: Number of gray marmots along the road and the vicinity of Chatyr-Kul lake in August 2012 (the baseline for comparative analysis)

Indicator	Transects				
	№ 1	№ 2	№ 3	№ 4	Total
Adults	56	37	263	35	391
Young	7	10	90	30	137
Total:	63	47	353	65	528
% of young	8	21	34	46	25.9
Concentration of a / sq km.	12.6	13.4	39	18	24.9

348. Calculation of the population concentration. Animals were recorded at a distance of 250 meters from the Recorder in both directions in surveys, so that the total width of the transect is 500 meters or 0.5 km. In order to calculate the covered area there is a need to multiply the transect length by 0.5 kilometers, that is the width of the transect and we will get square of the recorded transect. In order to calculate the concentration of the animals population it's necessary to divide number of recorded animals in the transect by its square.

349. After recording and counting of the population concentration per square kilometer it's necessary to calculate the percentage of young specimens in the population. The Record Card is filled and is subject to further analyse. It's necessary to emphasize that up to 75% of young marmots are killed by shepherd dogs in the shepherds' sites. Under such conditions the number of marmots in the future will be decreasing.

Table 7.9. Monitoring indicators for mammals

Indicators	Indicator constant	Place of sampling	Number (units, heads)	Time of day and year when the sampling is made	Methods of sampling
Marmot	Population density for 1 km2	Areas 1,2,3 and 4 according to the data of studies in 2012	Population dynamics	Spring-summer and fall	Counting birds at a distance of 250 m on either side of the road
Narrow-skulled vole	Colonies	Areas 1,2,3 and 4 according to the data of studies in 2012	Population dynamics	Spring-summer and fall	Counting birds at a distance of 250 m on either side of the road
Valpes vulpus	Availability of specimen	Areas 1,2,3 and 4 according to the data of studies in 2012	Availability of specimen	Year round	Visual observation

7.6. System and Monitoring Indicators (insects)

350. It is proposed to using three methods. Below these methods are considered in decreasing order of potential information content.

351. (Method 1). Visual observation (and sample collection by standard mowing of uncertain taxonomic appliance) on selected transects of Orthoptera, butterflies, chafers and large

bumblebees. SOS indicator is number of certain taxons. It's an integrated indicator, that means that the specialist could make a conclusion based on the defined, i. e. non-random change in the local population of terrestrial insects. Defined indicators - number of recorded specimens (average on two-time registration).

352. Transects should be selected by the Recorder based on the specific circumstances. I. e. below (in the next section) proposed area (square is 5.10 ha) instead of specific route and in this area it's necessary to select a distance- transect for recording. Selection based on the conditions means the setting of optimal transect within this area of 5-10-hectare, for example, if earlier there is a livestock grazing, it's necessary to develop the route left-hand or right-hand. Because livestock at least scares away insects, and probably also ease away so much grass and flowering plants that slacken site during of a few days will not attract bees, butterflies and Orthoptera. The bandwidth of observation is 2 ± 0,2 m for seated butterflies, bees, beetles and Orthoptera horses, ~ 1.5 m for other beetles, and 10 ± 2 m for flying butterflies. Since transects are paired, each pair of selected routes should be laid on a visual similar areas of vegetation.

353. Period - beginning – mid of new moon August (or beginning), the recording should be delivered two times, but not in one day under comparable weather conditions, "the second or third day without precipitation, clear or weak cloud", in the first half of the day, when the wind is not stronger than 2 points. Passing time of transect, i. e. required time for the recording in 150-250-meter route that depends on the circumstances (there is an advice to spend 20-30 min.). Required total time to carry out the survey (4 transects) is 3-5 days depending on the weathe.

354. Required equipment (for one Recorder): entomological net (any suitable), stain, forceps (large and small), camera, GPS-navigator, thermometer (atmospheric or universal), field entomological box. Consumables (without specifying of an adequate stock): envelopes for butterflies, cotton mattresses (with envelopes and a box), entomological pins (it's better to have all sizes, but could be limited, in principle, by number 1), the poison for the stains filling (ethyl acetate or tsianplav).

355. (Method 2). Taking into account the diversity (and random sampling of questionable taxonomic appliance) of entomofauna. Modification - the definitive taxonomic identification is delivered only for two species that are determined by quantitative proportion. Purposefulness is explained by the fact that during the recording of transect Recorder have the opportunity to work on fototropic entomofauna in free time in the evening and a few hours after sunset. The COC Indicator (that is simple) is a number of taxons (defined indicator - the number of registered species), the mass fraction of a species Cerapteryx megala (indicator - percentage) and the presence of the species Isochlora viridissima (indicator - registration of at least one specimen). Isochlora viridissima (appendix 8).

356. Location - in the vicinity (within 100 m) of locus, where collection on the light in 2011 and 2012 is implemented. The presence of competitive light sources is influencing on the situation choice that means that the screen (or tower) should not be closed for recording. Sufficient distance depends on the power of competitive light sources.

357. Period – beginning- mid of the new moon August (similar with the method (1)), recording should be delivered two or three times, and indicator is composed of the results of 2-3 non-rainy evening. There is a need to begin recording immediately after sunset and to finish by 1 o'clock at night.

358. Required equipment: generator, screen or tower (for example, as in Fig. IV / 6), fluorescent light (color temperature is 6300-6600K, it's desirable presence in the spectrum of soft UV radiation) with an output power of 400-600W, connecting cables and connectors , insulin syringe, and then all defined according to the above method (1). Consumables (without specifying of an adequate stock): fuel and fuel additive for power generator, spare lamo, ammonia solution for injection, and all defined according to the above method (1).

359. Besides of non-definite identification there is following disadvantage of this method on comparison of stationary night samples on light: a specific implementing record method could

influence on results. Moreover, a large number of species of high-mountain night lepidopterous are potentially highly vulnerable (due to low population concentration), that's why long term presence of additional source of intense light will be another negative factor in population of phototropic insects. This method is completely deprived of any kind of selectivity in changes detecting caused by various factors, or more simply - potentially such monitoring only will reflect the deterioration of the different species populations of night lepidopterous, primarily due to degradation of vegetation cover due to overgrazing in the past and present.

360. (Method 3). Imago Recording of Oeneis hora that is potentially sensitive (larval stages) to the factor of dust. It's very difficult to take into account the larval stage and the differences in the biology of males and females are determined by communication force due to the local presence of forage plants caterpillars. Baseline environment assessment indicator shall be either extinction or severe decline of the numbers of both sexes (taking into account random population fluctuations). This is simple indicator, and in this case it has only added value – because in summer time the Oeneis hora falls beyond the Method 1 procedures. The definitive indicators are the number of recorded species of males and females (average of 2 - 3 times registration/recording). Since this method of investigation largely depends on the level of solar activity, it makes sense not to use this method.

361. Transects and selection criteria based on the circumstances are the same as for the Method 1. In principle, this simple recording can be executed, after simple instruction, by a non-specialist (i. e. the executor of soil or plant monitoring).

362. Period - from late May to mid-June of the moonlight August (or the first of two), the Recorder should spend two or three times, but not in one day when it will be sunny weather in the morning. The bandwidth of observation is 1 ± 0,2 m for seated specimens, and 10 ± 2 m for flying insects. Time spent in transect, i.e. required for recording in a 150-250-meter route, depending on the specific circumstances (it's recommended to spend 20 ± 5 min.). Thus, in order to conduct the survey (4 transects) there are 5 about days required.

363. Equipment is the same as on the method (1), but in principle, we could be restricted only by visual observation (qualified Recorder is able to determine the sex of the butterflies in flight).

364. Thus, there are two proposed pairs of areas (each area per 5-10 hectares) where it's necessary to choose per one pair maximally similar to each other in the segment of transect for recording - in areas that are conditionally designated as follows (please, see the attached lightweight map-scheme):

365. LT = venue where records are delivering by use of collecting method on the light,

1 = "Chatarak" - "experience"

2 = "Chatarak" - "control"

3 = "Torugart" - "experience"

4 = "Torugart" - "control"

366. The area conventionally named "Chatarak" corresponds to the entomological complex of sedge kobrezievniks (№ 2 in the "Baseline monitoring"), and "Torugart" - entomological complex of albiflorous bluegrass steppe communities (ibidem. № 1). Terms "experience" and "control" are quite conventional, but in the selected sites in the north and south of the BRT road or closer-far, the impact intensity of road construction and road maintenance at least by a factor of dust should be different.

367. Implementers of Entomological Monitoring should carefully follow the instructions, all registered Identified species are recorded in the registration card, the card should also include other data (fulfillment of all fields are obligatory), and specimens of unknown species should to be taken and delivered to the specialists. For the convenience of records keeping the forms are simplified. The altitude may be skipped, and of the weather conditions the "sunny-cloudy" conditions can also be skipped (see the conditions described in the methodology above (1)). But

is the “sunny-cloudy” conditions are marked, then it is required to do it properly, in scores by using the following conventional signs (see Table 7.10):

Table 7.10: Legend/System to indicate the “sunny-cloudy” conditions/

Alfa-numerical	Icons	Description
s=4	☼	Sunny, noclouds
s=3	∅or✹	Haze, lightclouds, ofpartiallywithheavyclouds
s=2	⊗or ●	Sunisobscured (noshadow), cloudy, almost heavy clouds, possible light precipitations
s=1	✹	No sun, precipitations
Icons: «с» OR✱ = «snow», «г» = «hail», «г» OR⚡или☂ = «storm», «л» OR☂ = «rainfall», «д» OR♦♦ = «moderate rain», «лд» OR♦ = «light rain», «т» = «fog», б/о = «no precipitation»), s=0 OR☽ – «at night time, at moonlight ».		

368. Coordinates, ground air temperatures, wind vector and velocity are the most important factors. For the wind the scale and indications are as follows (see Table 7.11):

Table 7.11: Scale and indications for wind

Wind	
Vector	**N, S, W, E, SW, NNW, SEE**
Intensity	0– nowind (still, or up to 1 m/s), 1 –lightwind (up to 5 m/s), or unsteady, 2 – moderate (5–10 m/s, gusts to 12–15 m/a), 3 – strong (over 12 m/s);
Example: «w=NW2» = “north-westwind, 5–12 m/s»	

369. If dead specimens are found they are marked with special signs as shown in the Table 7.12:

Table 7.12: Special Records

Record	Meaning
1♀, 2♂, 3ex, 2†♂	Found 1 female, 2 males, 3 of unidentified sex, 2 dead males.

7.7. Monitoring System Introduction and Maintenance

370. Implementation and supporting the monitoring system is an important aspect of its operation and effectiveness. Therefore at the outset it is necessary to take all of the key issues and risks into account. In this sense, there are a number of areas that should be considered and developed.

371. First, the professional level of employees who will be engaged in data collection and sampling, counting specimen in a population in a given habitat, and other similar work is important. Employees must have the skills to work in this area and to understand the methods of environmental monitoring in the project area, to understand their nature, and the specificity and mechanism of negative and positive effects of various natural and anthropogenic factors. In addition, these employees must be skilled in working with special equipment that will be used in the selection and initial analysis of samples.

372. Second, you must determine how you will form a database of all samples and collected field data on who and how to maintain it, to analyze, and which will be sent the results of analyzes, as well as who will be the official owner, and who will be included in the circle of users of the information. This will require the addressing of an institutional plan. In addition, it is necessary not only to have the skills to work with databases, analysis, and have the appropriate equipment and software appropriate to the needs and objectives of the Project,, and most importantly - goals of preserving the fragile ecosystem Chatyr- Kul and Karatal-Japyryk Reserve. Obviously, the ultimate beneficiaries of analytical information should be the three following entities: SAEPF KR, MoTC (represented IPIG), and consulting company for supervision of construction work.

373. They should also carry out the initial stage of the selection and arrange a group of experts in the field of monitoring, who should have the basic education skills in the industry and a willingness to work at high altitude and remote Reserve.

374. Selected staff will pass through an additional training under the guidance of the scientists, carrying out work under the project, and in the first two years working together will develop effective monitoring scheme for a specific target area. They will be trained in the methods of sampling the air, water and soil, counting and registering populations of birds and animals in the project area, as well as the registration of the primary data in a specialized database. For additional skills, these professionals will be trained to work with digital maps and GIS software. A serious support in this sphere could be support extended by ADB, which would allow financing introduction of GIS in KJSR, to procure necessary equipment, licensed software and carry out training courses for the KJSR staff.

375. Informational resources collected in this manner for several years shall be then published on the specialized website for general access to all the stakeholders. It will be a contribution not to only protect the unique Chatyr-Kul ecosystem, but will also allow for the unique data for specialized research institutions and organizations.

376. Financial issues shall be discussed together between SAEPF and MoTC, and during the first several years with the consulting company of the BNT-3 road section.

377. It is recommended to locate the monitoring station in the place where Ak-Sai river flows into Chatyr-Kul Lake. There is almost no traffic on Ak-Sai watershed, and this place should remain undisturbed. One station is recommended on the northern side of the Lake to monitor Argali habitat. The other station is recommended to locate on the southern end of the Lake to monitor habitats of water fowls. Additional station is recommended to locate at Kosh-Kul Lake where the project road is the closest to water courses flowing into Chatyr-Kul Lake; this is the maximal point of negative impact. As discussed in section 6, it is recommended to install automated monitoring stations for water monitoring at Kosh-Kul Lake and in several other locations where creeks are traversing the road.

378. Short construction season and climatic specifics in the project area require to using similar equipment and methodologies. Contractor is advised to procure such services from the government structures of associated accredited organizations in the frames of the standard procurement procedures.

379. During the construction season 2013 there will be implemented a measurement program to identify vibration levels from construction equipment with subsequent recommendations on mitigation with account to the specifics of the project area. Subsequently, the funding could come from additional grants and subsidies from the government and international donors.

8. ENVIRONMENTAL MANAGEMENT PLAN

380. The EMP comprises a 2-track strategy: (i) pollutant source control and monitoring; this includes proactive mitigation of potential impacts from road construction and operations; and (ii) receptor protection; this includes upgrading the protected area facilities and management capacity, and restoration of sensitive habitats in the Chatyr Kul ecosystem (in effect, this is an in situ biodiversity offset). This 2-track strategy remains valid taking into consideration results of the Environmental Baseline Survey Report of March 2012.

381. The EMP will be implemented in three stages: (i) before construction, (ii) construction, and (iii) operation and maintenance. EMP is dynamic and will be updated and adjusted in line with the newly obtained results, contractors' performance and monitoring results. IPIG will be responsible for introducing modifications to the EMP and include them in the report which will be submitted to ADB twice a year.

382. Tables 8.1-8.4 at the end of this section present the Environmental Management Plan (EMP) that identifies feasible and cost-effective measures to be taken to reduce potentially significant adverse impacts to acceptable levels. The tables 8.1-8.4 reflect the various stages of the project cycle: pre-design, design, construction and operations and maintenance. Tables 8.5-8.7 describe environmental monitoring activities at the pre-design, construction and operations stages.

383. This EMP is site-specific, and is focused on the rehabilitation and upgrading of the Project road. The Contractor will be responsible for preparing more comprehensive EMPs based on this EMP. Before construction activities commence, the Contractor will prepare and submit proposals and method statements consistent with the EMP to the IPIG for review and approval.

8.1 Mitigation Plan at the Pre-Design Stage

Table 8.1: Mitigation Plan at the Pre-Design Stage

EMP: mitigation measures at pre-design stage			
Area	**Potential impact**	**Mitigation measures**	**Responsibility**
Air quality	Borrow pits, asphalt plants and stationary pollution sources	In order to prevent ambient air pollution the Contractor will prepare Air Quality Plan (AQP) and submit it to the Engineer as part of his Site Specific Environmental Management Plan (SSEMP) (or Construction Environmental Monitoring plan). This Plan will in detail describe dust control actions (watering of road sections, covering soil backfill sand stockpiles etc.), together with the information on the type, age and standards of the equipment and machinery together with the detailed air quality monitoring program. This Plan will include contingencies in case of emergency air pollution by toxic agents. Contractor will abstain from using open fire to burn garbage or any other inert materials. Contractor will undertake and avoid construction machinery and equipment idling to prevent air pollution. This plan will be finalized at the design stage to become an integral part of the SSEMP.	• Contractor selects locations • Engineer and environmental expert approve Action Plan
Topography	Selection sites for borrow pits and crushers	Several locations for borrow pits were identified; these locations were approved. Such sites require approval before the construction works, and approvals by Engineer and Environmental expert. Borrow pit locations shall be identified in the SSEMP. Contractor will ensure that borrow pits and crushers: – Located not any closer than 300 meters from sensitive receptors to prevent impact from noise and dust; – Located outside agricultural lands, and – Located on state-owned lands. In addition, any excavated alluvial or riverbed material extracted for	• Contractor selects locations and obtains approvals from Engineer, Environmental expert and other agencies. • Engineer, following such approval, obtains permits from MoTC and Environmental expert. • Engineer will test materials for stability.

		culverts clean-up can be used for the road base construction. This material will be tested by Contractor and Engineer for stability.	
Hydrology and soils	Selection of borrow pit sites	Due to the sensitivity of the borrow pit sites selection Contractor shall prepare a Borrow Pit Action Plan (BPAP) and submit it to Engineer prior to construction works as part of the SSEMP. This Plan will identify locations of the proposed sites; such sites shall be approved by Engineer, MoTC and Environmental Expert. Borrow pit locations are shown in the Contract.	• Contractor selects locations and submits them for approval. • Engineer obtains approval from MoTC and Environmental Expert.
	Selection of sites for asphalt plants	Asphalt plants shall not be located closer than 500 meters form residential areas or other sensitive objects. Asphalt plant locations shall be indicated in the SSEMP prepared by Contractor and approved by Engineer, MoTC and Territorial Administration for Environmental Protection and Forestry (TAEPF).	• Contractor selects locations and submits them for TAEPF approval. • Engineer obtains approval from MoTC and TAEPF.
	Selection of sites for construction camps	Contractor shall be responsible for preparation of the Plan for Construction Camps (CCP), which is the part of SSEMP. This Plan will include the proposed location of structures and buildings, including sanitation facilities and other environment-sensitive sites. Contractor shall follow the following terms of the Plan: • Wastewater shall be collected and diverted from the camp territory via a sewerage system and located on such sites and in such a way to avoid pollution. • Direct discharge of sanitary and waste water on the ground shall not be allowed. Utilization of petroleum-containing materials in the open ground or water shall not be allowed. • Locations for liquid wastes collection shall not permeate into the ground. • Any oil and petroleum spills shall be immediately removed; means for such spills neutralization and soil detoxification shall be kept readily available on camp sites. • Construction and working grounds shall be facilitated with toilets; liquid wastes shall not permeate into the ground. • Utilization of the pumped or wastewater in the surface water or	• Engineer approves of the Plan

		water sources, is not allowed. It should be collected in the settlings ponds or containers for the further disposal. • Equipment and materials to prevent oil spills shall be kept on-site. The following terms and conditions must be observed to prevent oil spills and reagents storage: − Equipment fuelling to be done only in specialized places. − All containers (tanks) and storages for fuel and reagents (if any) shall be placed on the impermeable base and fenced. Such areas shall be located outside any watercourses or water-logged areas. The ground base and walls of the earth fills shall be capable of 110% capacity load of such tanks and containers. − The equipment fuelling procedure shall be strictly controlled and regulated by the formal procedures, protected by earth set off to prevent potential spills of petroleum products and hazardous liquids. − All the valves and fuelling nozzles shall be protected from unauthorized access, disconnected and locked up, if not in use. − Such tanks or containers shall be properly marked about their content. Avoid any pollutants getting into water sources. − Utilization of petroleum products and other potentially dangerous liquids into soil or water sources shall not be allowed. − In case of occasional oil spills they shall be immediately removed, or neutralized. Such hazardous materials must be kept in a safe place as designed for safe storage for this type of materials. Construction camp shall be designed in such a manner, to the extent possible, so that all temporary structures are located not closer than 50 meters from water sources, water courses and canals. As Engineer may deem necessary, Contractor will arrange	

		due truck washing site to wash trucks and wheels at their exit from the camp. If necessary, Contractor will maintain proper cleanness of transport and vehicles (washing out of sand and dirt from the body and the wheels) before vehicles departure from the camp. Contractor provides necessary means for vehicles washing in the territory of the camp and ensures that the washed out dirt will not travel outside the camp.	
Soils	Soil pollution	Contractor is responsible for preparation of the Emergency Response Plan (ERP), which will include means of integrity of materials used for transportation/storage of hazardous materials, oil spills and such materials related hazardous events and actions. The ERP will in detail the process of such materials handling, reporting, emergency situations and identify the organizational structure (including responsibilities of the authorized personnel). The EPR, as part of the SSEMP, shall be submitted to Engineer for approval.	• Contractor prepares ERP • Engineer approves of the ERP as part of SSEMP
Flora	Sprigging operations	Contractor is responsible for the areas which might require procurement of the aboriginal vegetation (seeds) for slopes stabilization.	• Contractor selects location
Land use	Loss of property and land	MoTC prepares Land Condemnation Plan and Land Acquisition and Resettlement Plan (LARP), obtains approval from ADB for its further implementation. Approvals for land use shall be obtained before the commencement of constructions works.	• MoTC finalizes LARP • ADB approves of LARP
Wastes and pollutants	Waste management	Contractor prepares Waste Management Plan (WMP), and as part of SSEMP it will include the following items on wastes handling and management: – Solid wastes – Food leftovers – Inert wastes – Secondary wastes – Plastic – Metal – Wood – Construction wastes – Hazardous wastes	• Contractor prepares WMP • Engineer approves of WMP as part of SSEMP

		– Liquid wastes This Plan will also include provisions for excess materials utilization. The WMP will indicate of such wastes formation and methods and means of their utilization.	
Safety and health	Workers' health and safety	Health and Safety Plan (HSP) shall be prepared by Contractor as part of SSEMP. This Plan will include items related to incidental outbursts of toxic fumes, oil spills and chemical reagents (if any), safe drinking water, labor safety and first aid in case of emergency.	• Contractor prepares HSP • Engineer approves of HSP as part of SSEMP
Requirements to EMP	Preparation of SSEMP	Contractor shall prepare his HSP as part of SSEMP, which will include: • Physical environment management – Soil – Water – Air • Environmental management – Flora – Fauna – Protected areas • Economic parameters management – Infrastructure – Transport – Land use – Agriculture • Social and cultural resources management – Communities, education and healthcare facilities, – Historical and cultural sites – Noise In addition, SSEMP shall contain specific management plans (as Attachments), related to: • Borrow pits management • Response to emergency situations	• Engineer approves of SSEMP

		• Air quality • Water quality • Noise levels • Wastes management • Dust control • Construction camps • Health and safety Each section will describe location of monitoring spots and mitigation measures, responsible people and reporting schedule. Design work may not start without approval of SSEMP by MoTC, Engineer and Environmental Expert. SSEMP can be amended upon completion of the pre-design and design works, but construction may not begin with approval of EMP by MoTC, Engineer and Environmental Expert.	
	SSEMP as an integral part of the bid documents	Contractor is responsible for the EMP implementation. The bidding documents shall have the Environment Protection section. EMP is a part of the bidding documents so that the bidder is aware of the environmental requirements for the Project.	• MoTC verifies if EMP is included into bidding documents

8.2 Mitigation Plan at the Design Stage

Table 8.2 provides for mitigation measures at the stage of detailed project design

Table 8.2:
EMP: mitigation measures at the stage of detailed design

Area	Potential impact	Mitigation measures	Responsibility
Soil	Soil erosion	In order to reduce soil erosion process the technical project design shall include: • Slopes of cuts and embankments shall be arranged with account to soil stability and other conditions according to the Project Specification on erosion protection; • In the areas with steep slopes the project shall include rock fall protection design, rip-raps, protection structures and gabions; • For embankments higher than 6 meters a step-like slopes must be arranged • Interception ditches must be arranged at the slope tops in the cut-off areas, or on the benches. For steep slopes drainage systems must be arranged to intercept water flows and their diversion from the slopes.	• Contractor includes mitigation measures in the Project. • Engineer considers and approves of the document
	Slopes stabilization	The design will require installation of the culverts of proper size to avoid the impact of loose soil and their clogging under the unstable stripped slopes. In addition, Contractor, in the course of works, shall provide for: • Design dissipation areas from drainage made of rip-raps to prevent erosion, where necessary. • Discharge chutes and outlets shall be aligned with rip-raps/concrete facing. • Side slopes reinforced according to the soil types and other conditions as specified in the Project design documents for erosion prevention. It is recommended to reinforce steep slopes by rip-raps or other material. • Arrange bench cuttings of the road if their length is over 6 meters.	• Contractor includes mitigation measures in the Project. • Engineer considers and approves of the document

Air	Air quality	At this stage borrow pits location and quarries and asphalt plants require approval by Engineer and Environmental Expert. It is necessary to make sure that such sites are located in accordance with requirements for selection of such areas, as shown in Section 4. None of the asphalt plants or borrow pits should be located closer than 300m from any residential areas, protected areas or sensitive sites.	• Contractor prepares ACP • Engineer considers and approves of ACP as part of SSEMP.
Geology and seismic conditions	Seismicity	Seismic parameters of potential earthquake impact shall be considered at this stage. The earthquake load shall be included into the design parameters of structures, including bridges to avoid their destruction in the operation period.	• Contractor includes mitigation measures in the Project.
Hydrology	Drainage	The project design works make sure that drainage systems and culverts are improved to allow for increased water volumes and water diversion. The project design takes into account all historical and forecast data on precipitation and water availability of rivers/creeks. All structural components shall comply with the adopted standards and best practices applicable to the current construction conditions.	• Engineer considers and approves of the document
	Wells	Contractor will prepare all the permits and before any well drilling works.	• Contractor collects permits and approvals • Engineer considers the permits before the drilling works.
	Bridges	All new and expanded bridges designed for 75 years of operation time. Bridge rehabilitation and improvements will ensure their lifetime for 50 years. Design of all the components of structures shall comply with bridge design standards as indicated in the Special Requirements to Contractor. The designed bridges shall have aesthetic look and reflect the environment.	
Protected areas	Impact onto protected areas	The project shall not disturb the ecological integrity of the following sites and territories: • The Ramsar site (watershed area of Chatyr-Kul Lake, KM 501-531) • The Narzan Springs (11 km from Torugart Pass, KM 531)	• Contractor includes mitigation measures in the Project. • Engineer considers and approves of the document.
Soil and ground	Heavy and toxic metals,	In the course of the design works Contractor shall foresee appropriate arrangement neutralize heavy metals, toxic elements and contact water	• Engineer coordinates this with MoTC. • Contractor includes mitigation

quality	contact water	from the road at the KM 501-KM 531.	measures in the Project.
Mammals	Decrease of populations	Contractor, in addition to the standard measures, will also foresee measures as indicated in Chapter 6.2.1 of the EIA: • Training for the workers on the prohibition and responsibility of animal poaching. • Introduce the system of fines, if necessary • Coordinates with Engineer and Environmental Expert locations for earthworks • Avoids any oil spills	• Engineer coordinates this with MoTC. • Contractor includes mitigation measures in the Project.
Aquatic fauna	Disturbance of habitat	Contractor, in addition to the standard procedures also considers the measures as indicated in the EIA (Chapter 6.2.2): • Training for workers • Coordinates with Engineer and Environmental Expert locations for earthworks • Avoids any oil spills	• Engineer coordinates this with MoTC. • Contractor includes mitigation measures in the Project.
Avifauna	Decrease of population and disturbance of habitats	Contractor, in addition to the standard procedures also considers the measures as indicated in the EIA (Chapter 6.2.3): • Training for workers on the responsibility for of birds and chicken catching or poaching, or destruction of birds' nests. • Introduce the system of fines, if necessary • Coordinates with Engineer and Environmental Expert locations for earthworks • Avoids any oil spills	• Engineer coordinates this with MoTC. • Contractor includes mitigation measures in the Project.
Insects	Decrease of population and disturbance of habitats	Contractor, in addition to the standard procedures also considers the measures as indicated in the EIA (Chapter 6.2.4): • Training for workers on their responsibility for prohibited actions • Coordinates with Engineer and Environmental Expert locations for earthworks • Avoids any oil spills	• Engineer coordinates this with MoTC. • Contractor includes mitigation measures in the Project.
Flora	Loss of vegetation	In the process of design Contractor will ensure that asphalt plants, construction camps and other equipment/facilities were located according their designated allocation plan. Contractor will avoid, where possible, loss	• Contractor includes mitigation measures in the Project. • Engineer considers and approves of

		of vegetation. Where this is inevitable, Contractor will ensure re-vegetation procedures by using seeds of the aboriginal types of vegetation in the disturbed areas.	the document.
Health and safety	Health and safety	Contractor will ensure the issues of safe traffic organization in the project area by installing proper road signs, such as “Crossroads” “Speed Limit”, “Diversion”, “Road Works” “No Traffic/No Driveway”. If required, Contractor will install road signs indicating time for roads closure / opening.	• Engineer considers and approves of the document.

8.3 Mitigation Plan at the Construction Stage

Table 8.3 provides for mitigation measures at the stage of construction

EMP: mitigation measures at the stage of construction			
Area	**Potential impact**	**Mitigation measures**	**Responsibility**
Air quality	Open burning of wastes	Contractor will not burn wastes or other materials without approval by Engineer.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
	Smoke from burning	Contractor will not install burners, boilers or similar equipment fed by any type of fuel that might generate polluting substances with out due approval by Engineer.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
	Exhaust fumes from construction equipment	Contractor will maintain and service construction equipment to keep it in proper technical condition to control emissions. Such equipment (including controlling equipment) are subject to regular inspections by Engineer. Such inspections shall be registered in the Log Book as part of the monitoring activity. Contractor shall: • Avoid equipment running idle; • Prohibit housing equipment and tools in the open areas which emit visible smoke	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor

	Volatile pollutants from asphalt plants and borrow pits.	Contractor will allocate conveyor belts against the wind protection fencing (borrow pit areas); discharge chutes of hoppers shall be covered to avoid dust blowing off. All the dust-generating conveyor material must be covered.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
	Dust from unpaved roads, open soil and stockpiles.	Contractor ensures measures of dust control: • The beds of the trucks hauling material shall be covered either by tarp or other material (fixed) to prevent dust blowing off the trucks; • Waste collection sites must be tamped to avoid formation of dust. • In the places of regular vehicles movement the rods shall have hard surface, and • Contractor ensures water sprinkling (on the roads, construction sites and unpaved road sections) at least twice per day, or more, as Engineer may deem necessary)	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor
Topography	Cuts and fills	Contractor ensures: • Any excess of dump soil may not be used; its utilization in rivers/tributaries or water courses may not be allowed. • In case of accumulation of the excess material (if not provided for by the project design), this shall be reported to Engineer to identify designated place for its storage/utilization. • Temporary and permanent material storage areas shall be on state-owned lands, and by no means can be dumped on to agricultural, fertile lands or lands of protected areas, or other water courses. • In case construction wastes dumped on to designated place, or the silt is washed out then such a pollutant or wastes shall be removed and the land and storage area to be restored to its initial state as Engineer may deem expedient.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor. • Contractor obtains permits from SAEPF.

	Slopes stabilization	Contractor will ensure: • Final shaping-up of slopes will be done in the locations identified by Engineer and as soon as possible after their filling up with soil. • Where necessary, Contractor will make ditches on slopes for re-vegetation of aboriginal plants. • Construction works in the areas prone to erosion or flooding shall be done only in dry season.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
	Borrow pits	Before opening any borrow pit of crusher site Contractor shall obtain proper permits. Borrow pits to be located in environmentally safe locations: • Not closer than 500 meters to water courses; • Outside agricultural lands, and On state-owned lands.	• Contractor, in coordination with Environmental Expert, obtain permits. • Engineer verifies permits before the pit opening.
		Alluvial material taken upstream from the blocked culverts can be used as base material. • This material shall be checked by Contractor and Engineer for its use as base material. Such material shall be used first before the uses of the other material from borrow pits or material reserve.	• Engineer tests material before its use.
		Development and recultivation of borrow pits, located in Chatyr Kul lake area, and should be carried out in accordance with Borrow pit management plan specially developed for this section (km501-km531). Monitoring of these borrow pits is carried out on daily basis and summary information is provided once a month.	• Contractor, Consultant, IPIG (MOTC) • Contractor, Consultant, IPIG (MOTC)
Soils	Loss of fertile soil	Engineer will ensure adequate measures in place to prevent irreplaceable loss of fertile soil cover or its deterioration by construction equipment in the course of construction works. Protection of fertile soil layer is the priority task.	• Engineer coordinates with MoTC and Contractor
	Erosion	Contractor ensures: • Material that is less prone to erosion can be used around bridges and culverts • Restoration of vegetation on the stripped slopes includes; (i) selection of the fast-growing local types of flora; (ii) immediate re-vegetation of all slopes and banks, if not covered with gabions,	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.

		(iii) placement of fiber material to allow for seeds to sprout with account to local climate.	
	Pollution due to oil spills or hazardous materials	Contractor will ensure: • All petroleum and chemical materials kept of the impermeable base, and fenced. Such storage areas to be arranged outside from any water courses or water-logged areas. The base and the walls of such banks shall be capable of 110% weight of the fuel/lubricant tanks. • Areas for repairs in construction camps organized on the impermeable base with drainage to collect oil spills. Vehicle repairs on the open ground will not be allowed. • Fuelling of equipment shall be under strict control and regulated by the formal procedures. In all such areas oil/fuel pans shall be used. The used oil is collected and utilized by the licensed subcontractor. • All the valves and filling nozzles must be protected from unauthorized access or vandalism and locked up, when not in use. • Tanks and drums have clear marking about their content. It is necessary to avoid any pollutants getting into water sources. • Tanks and drums with bitumen shall not be kept on the open ground, - only in the impermeable pallets/base. • Locations for the use of bitumen shall be arranged on the impermeable surface.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
Hydrology	Drainage	Contractor will ensure: • t the construction site Contractor builds, maintains, removes and replaces, as needed, temporary drainage structures and undertakes safety measures to avoid damage from flooding or wash-out of silt from construction sites.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
	Construction camps and storage areas	Contractor will ensure: • Waste water shall be collected and diverted from the territory by a sewage system and located in the manner and in places preventing environmental pollution.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of

		• Direct discharge of sanitary and waste water on the ground shall not be allowed. Utilization of such materials in the open ground or open water sources is prohibited. • Places for liquid wastes collection shall not allow any seepage into the ground. • Any oil spills must be immediately removed, and means for their removal and soil clean-up shall be kept in construction camps. • Construction and work sites shall be equipped with toilets, without liquid seepage into surface waters. • Utilization of pumped and waste water in surface water courses is not allowed. It should be collected in settling ponds, or tanks for further removal. • The following rules to prevent oil spills and reagents storage must be observed: • Equipment fuelling shall be done only in designated places. • All petroleum and chemical materials kept of the impermeable base, and fenced. Such storage areas to be arranged outside from any water courses or water-logged areas. The base and the walls of such banks shall be capable of 110% weight of the fuel/lubricant tanks. • Fuelling of equipment shall be under strict control and regulated by the formal procedures and done in the locations protected by earth banks to prevent oil spills or potentially hazardous liquids. • All the valves and filling nozzles must be protected from unauthorized access or vandalism and locked up, when not in use. • Tanks and drums have clear marking about their content. It is necessary to avoid any pollutants getting into water sources. • In case of occasional oil spills they must be immediately removed; such materials shall be kept in safe areas as designated for hazardous materials. • As Engineer may deem necessary, Contractor will arrange a vehicle washing ditch, or site at the exit from construction sites and ensures that vehicles are clean from sand and dirt (body and	Contractor.

		wheels) before they leave. Dirty water or dirt travelling from the construction sites will not be allowed.	
	Construction of bridges	Contractor will ensure: • Flow diversion from abutments • Cofferdams, silt traps or other structures for silt capturing. • Cofferdams drainage or clean-up shall be made to prevent siltation.	• Contractor implements mitigation measures. • Contractor coordinates with TAEPF. • On regular basis, Engineer implements monitoring activity of Contractor.
	Borrow pits	Contractor will ensure: • Reclaim borrow pits upon completion of works in full compliance with applied standards and requirements. • The terms of contract shall include terms for borrow pits opening and the use of material. • Material excavation and borrow pit restoration and the adjoining area shall be done according to the terms of the contract. • Additional borrow pits will not be opened until the previous sites are restored.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
Flora and fauna	Loss of flora	Contractor will ensure: • Ensure over-grassing, where necessary. • Provide construction camps with adequate fuel to prevent fuel stocking from unauthorized sources.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
	Protected areas	Opening of new borrow pits and excavation areas will require approval by SAEPF. Engineer ensures safety of the protected areas. Fencing around nestling places and identified areas of rare spcies. Limiting construction work during breeding and nestling time	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor. • See Section 4.4.3 Contractor and CSC should involve staff of KJSR
Land use	Construction camps and other temporary	Contractor is responsible for good order in the territory of construction camps. The used land shall be restored to acceptable level within the	• Contractor implements mitigation measures.

	structures	due time.	• On regular basis, Engineer implements monitoring activity of Contractor.
Transport and Infrastructure	Road closure and by-pass roads	Contractor will ensure: • Installation of road signs and pointers for the by-pass roads. Such roads shall not impact the boundaries of the protected area of Chatyr-Kul Lake (except for the area of the Smaller Lake). • At the KM 501 and KM 532 there will be installed a roadside information stand with the following text in Kyrgyz, Russian, English and Chinese languages:“Specially Protected Area of Karatal-Zhapyryk State Reserve. KM 501 – KM 532 No Stopping!” except at designated parking areas. Put additional roadsigns along the road, at every 2 km. • All by-pass roads to be coordinated with Engineer. • Contractorisresponsibletokeeptheroadopenduringconstructionworksatleastto 50% in daytime, and 100% at the end of the working day.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
	Electric systems	For the period of construction all power transmission lines shall not be disconnected except during the period of relocation of electric poles. Contractor will coordinate with local electric power authority.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
Wastes and pollutants	Pollution	Under no circumstances the excess material can be utilized without prior permission of Engineer. No dumping of such material shall be done in rivers or watercourses. Coordination with Engineer and Environmental Expert is required.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor
	Inert and liquid wastes	Contractor will ensure: • Installation of garbage cans on working sites; • Maintain construction sites in good order, and provide all necessary means required for all wastes storage for their final utilization/removal; • Train personnel in waste management practices and procedures	• Contractor implements mitigation measures. • RMU (MoTC) approves of such sites location. • On regular basis, Engineer implements monitoring activity of

		as part of ecological process • Collect and remove hazardous and hazard-free materials separately in the locations approved by Engineer and Environmental Expert. For this purpose (if required) a specialized company can be contracted to collect wastes from camps and temporary storage areas for their further disposal.	Contractor.
	Hazardous wastes	The rules of handling and utilization of hazardous wastes shall be integrated in the WMP. Locations for utilization of hazardous wastes shall be coordinated with SAEPF. Contractor will collect the carbon-containing wastes, including used oil, for their safe removal for processing or utilization at temporary storage areas orhand over it to licenced operator.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor
Health and safety	Health and safety of workers	Contractor will ensure: • Occupational safety training for personnel. All the Contractor staff shall attend the safety training with account to the duration of works, and levels of management. • Safety meetings shall be held on the monthly basis, which will be attended by safety officials, unless otherwise stated by Engineer. • Inspections. Contractor will, on the regular basis, check, test and maintain all the safety equipment, working platforms, fixtures, step-ladders and other means; hoisting, lighting, signaling and safety equipment. The lighting and marking for such equipment shall not be obstructed and must be readable. Dirty or broken equipment, or misplaced equipment must be immediately fixed and replaced properly. • Protection gear and clothes must be available on site at any working time; effective measures must be taken for their due use and replacement. All construction equipment must be equipped with safety means. • First aid means. Contractor ensures a fully equipped first aid premises with climate-control inside the building/room at the level of +20oC. The terms of first aid to be coordinated with Engineer. • Contractor will cooperate with local health protection authorities and will conclude a contract for probable use of hospitals and	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.

		other means.	
	Health and safety of subcontractors	All subcontractors will receive copies of the SSEMP. All sub-contracts will contain clauses to ensure the observance of the SSEMP at all stages of works. All the subcontractors will appoint a safety representative for the entire period of works, unless otherwise stated by Engineer in written form.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
	HIV /AIDS	Contractor with the support of relevant offices will hold an HIV / AIDS training for workers, as required, according to the terms of the Contract.	• Contractor implements mitigation measures. • Service provider conducts trainings. • Engineer approves of the Program.
Protected areas	Impact on the protected area	In order to avoid potential negative impacts Contractor will: • Stick to the adopted international practice and requirements to ensure environmental safety as regards to the protected area, and the specific requirements as stated in the EIA. • In case of finding any archeological or historical artifacts (movable or immovable) in the course of works, Contractor will undertake all the necessary measures for their protection and report to Engineers and local authorities of such findings. Provided the continuation of works will expose threat to such artifacts, the works must be suspended until proper measures are taken for their due protection.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.
Noise	Construction noise and vibration	Contractor will ensure: • Control of the sources, such as exhaust systems, noise reducers at the air intakes and regular equipment maintenance; • Requirements for allocation of stationary equipment close to ecologically sensitive receptors or sites, optimization of the noise load and the use of protection mechanisms/tools, where necessary, shall be done in line with the standard procedures.	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor.

8.4 Mitigation operation and maintenance stage

Table 8.4 provides for mitigation measures, stage of operation and maintenance

EMP: mitigation measures at the stage of operation and maintenance			
Area	**Potential impact**	**Mitigation measures**	**Responsibility**
Air quality	Motor road	Potential impact at the operational stage as prescribed by the Project documents, EIA and EIA Monitoring Section 7.1.	• ir pollution monitoring implemented by MoTC and SAPF (KZSR)
Soils	Erosion	Contractor can be held responsible, during 1 year liability period. MoTC performs visual monitoring of the road and related erosion process (If any). In case of identification of erosion it shall be reported to the MoTC; the latter will call Contractor to responsibility. The final payment under the Contract is not done until the failure is redressed.	• oTC and SAEPF monitoring vegetation growth and oversee erosion potential.
	Slopes stability	Taking into account the specifics of the Project area and engineering conditions Contractor will pay special attention to slopes stability, especially in the areas where road crosses creeks/torrents/rivers.	• MoTC (RMU), SAEPF (KZSR) coordinate their activity on slopes stability and vegetation growth (if applicable).
Hydrology	Hydrology and water quality during construction works.	Under the Contract Contractor can be held responsible, during 1 year liability period. SAEPF (KZSR) perform regular monitoring of water quality and observations in the area of completed construction along rivers/water courses and Chatyr-Kul Lake. Any problems identified, this shall be reported to MoTC and the latter will engage Contractor for improvements. The final payment under the Contract is not done until the failure is redressed.	• MoTC (RMU), SAEPF (KZSR) monitor water quality.
Protected areas	Impact on the protected area	To avoid any potential negative impacts Contractor will: • Adhere to adopted international practices and requirements to ensure environmental safety as regards to the specially protected area, and in the with the specific requirements as stated in the EIA • Maintain the roadsigns • Maintain the drainage system and settling ponds	• Contractor implements mitigation measures. • On regular basis, Engineer implements monitoring activity of Contractor .

8.5 Environmental monitoring plan at the pre-design stage

Table 8.5 provides for environmental monitoring at the pre-design stage

monitoring at the pre-design stage					
Area	**Monitoring**	**Location**	**Schedule**	**Responsibility**	**Reporting**
Water quality	Contractor will implement standard instrumental monitoring. The monitored parameters include: • Total content of the weighed particles • Biological oxygen demand (BOD) • Dissolved oxygen (DO) • Coliform bacteria • Oil contamination	Recommended standard parameters for monitoring: • 50 m downstream minimum of 5 borrow pits; • 50m downstream from bridges i.a.w. monitoring points. Engineer may also recommend additional monitoring locations during construction period.	Standard water quality monitoring shall be implemented immediately after receiving of the bidding documents to identify baseline levels in the identified locations, as specified by SSEMP.	Consultant controls and supervises Contractor's activities.	Consultant summarizes the results and analysis and submits them to the Employer.
Air quality	Contractor will implement standard instrumental monitoring. The monitored parameters include: • Weighed particles • Sulfur dioxide(SO_2) • Nitrogen dioxide (NO_2) • Carbon oxide (CO)	Recommended standard parameters for monitoring - according to the identified monitoring locations. Engineer may also recommend additional monitoring locations during construction period.	Standard air quality monitoring shall be implemented immediately after receiving of the bidding documents to identify baseline levels in the identified locations, as specified by SSEMP.	Consultant controls and supervises Contractor's activities	Consultant summarizes the results and analysis and submits them to the Employer.

8.6 Environmental monitoring plan at the construction phase

Table 8.6 provides for environmental monitoring at the construction phase

monitoring at the stage of construction					
Area	**Parameters**	**Location**	**Schedule**	**Responsibility**	**Reporting**
Air quality	weighed particles, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon oxide (CO), soot, led, cadmium, benz(a)pirene. Other parameters may be recommended by Engineer.	Locations for monitoring identified for 6 locations according to EIA. Additional parameters may be recommended by Engineer.	Monitoring implemented: - before construction works (April-May); - after one week after commencement of construction works; - monthly during construction works; - 1 week following the accomplishment of construction works.	TERA consultant. It may engage third parties. Air quality program shall be combined with water quality monitoring program, and toxic metals content in soils.	Independent expert will provide the results to Contractor and Engineer within 3 days.
Surface water	• Total content of the weighed	Main surface water monitoring locations identified in the EIA.	Monitoring implemented: - before	TERA consultant. It may engage third	Independent expert will provide the results

	particles • Biological oxygen demand (BOD) • Dissolved oxygen (DO) • Coliform bacteria • Oil contamination • nitrogen • sulfur • cadmium • led	Engineer may also recommend additional monitoring locations, and may include monitoring impacts of significant waste water (construction camps, construction sites etc).	construction works (April-May); - after one week after commencement of construction works - monthly during the construction season; - May-June; - 1 week following the accomplishment of construction works	parties. Water quality monitoring program shall be combined with air and toxic metals in soils monitoring programs.	to Contractor and Engineer within 3 days..
Soil fertility	• humus content; • gross forms of nitrogen, phosphorus and kalium; • mechanical composition; • salinity; • alkalinity	There are 4 monitoring locations according to the EIA. Engineer may also recommend additional monitoring locations.	Monitoring implemented: before construction works (April-May); - 1 week following the accomplishment of construction works	TERA consultant. It may engage third parties. Soil fertility program shall be combined with monitoring program on air, water quality and heavy metals content in soils.	Independent expert will provide the results to Contractor and Engineer within 3 days..

Heavy metals	• led • arsenic • cadmium • strontium • nitrogen • sulfur	There are 8 monitoring locations according to EIA. Engineer may also recommend additional monitoring locations.	Monitoring implemented: before construction works (April-May); - 1 week following the accomplishment of construction works	TERA consultant. It may engage third parties This monitoring program shall be combined with air and water quality monitoring programs.	Independent expert will provide the results to Contractor and Engineer within 3 days.
Noise and vibration	• Level of noise Laeq 1h (dBA) • Vibration level	Monitoring locations identified in the EIA in the most sensitive areas.	Monitoring will be carried out monthly during the construction season.	TERA consultant. It may engage third parties	Independent expert will provide the results to Contractor and Engineer within 3 days.
Household wastes	household wastes collection and discharge from the campsites and worksites	Construction camps, places of permanent and temporary stay of workers and personnel	Regularly	TERA, MoTC, SAEPF	Contractor will include information on waste management in the regular report according to the reporting schedule and submit it to Engineer

8.7 Environmental monitoring plan at the period of operation

Table 8.7 provides for environmental monitoring at the stage of operation

monitoring at the stage of operation					
Area	**Mitigation**	**Location**	**Schedule**	**Responsibility**	**Reporting**
Air quality	weighed particles, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon oxide (CO), soot, led, cadmium, benz(a)pirene. Other parameters may be recommended by Engineer.	Locations for monitoring identified for 6 locations according to EIA. Additional parameters may be recommended by Engineer..	Once a year	KJSR	KJSR can engage independent Consultant for monitoring. Water quality monitoring program shall be combined with monitoring program on air, heavy metal content in the soil.
Surface water	• Total content of the weighed particles • Biological oxygen demand (BOD) • Dissolved oxygen (DO) • Coliform bacteria • Oil contamination • nitrogen • sulfur • cadmium • led	Main surface water monitoring locations identified in the EIA. Engineer may also recommend additional monitoring locations, and may include monitoring impacts of significant waste water (construction camps, construction sites etc).	summer time as work schedule of KJSR or as needed to follow any accident	Monitoring will be carried out by KJSR	KJSR can engage independent Consultant for monitoring. Water quality monitoring program shall be combined with monitoring program on air, heavy metal

					content in the soil.
Heavy metals	• led • arsenic • cadmium • strontium • nitrogen • sulfur	There are 8 monitoring locations according to EIA. Engineer may also recommend additional monitoring locations.	Once after project completion	Consultant TERA and MOTC	KJSR can engage independent Consultant for monitoring . Soil quality monitoring program shall be combined with monitoring program on air, water quality.

8.8 Environmental Monitoring plan for Soil, Fauna and Flora

Table 8.8 provides for environmental monitoring for soil, fauna and flora.

Мониторинг почв, фауны и флоры в период строительства и эксплуатации					
Area	**Mitigation (INDICATORS)**	**Location**	**Schedule**	**Responsibility**	**Reporting**
Hydrocoles	1. Lake soil contamination –presence of two species of ostracods F.mosquensis и L.inopinata 2.deterioration of oxygen regime in water basin –decline in ostracod population of sous-famille Candoninae of family Candonidae 3. Signs of eutrophication of Big and small lakes - the increase in the population of chironomid larvae of the Chironomus family, Psilotanypus and beetles of the Hygrotus family (Coelambus).	Western part of the Big Lake and in the Small Lake Western part of the Big Lake and in the Small Lake Western part of the Big Lake and in the Small Lake	Middle of August Middle of August Middle of August	Methodological and technical support will by provided by the Consultant and group of scientists.	1. KJSK will collect data, summarize and analyse 2.Consultant will help KJSR staff to prepare the report. 3. KJSR will submit the report to TAEPF and SAEPF under Government. 4.Consultant hands over the report to Employer.
Flora	21 species of indicators of vegetation: - Reduction of the abundance of indicator species and its transition into a different category of the scale - the deterioration of the ecosystem; - Abundance – constant condition of ecosystem; - increase in abundance – improvement of ecosystem condition.	GPS – coordiantions are indicated in monitoring system	Within 1 week in the middle of July	Methodological and technical support will by provided by the Consultant and group of scientists	1. KJSK will collect data, summarize and analyse 2.Consultant will help KJSR staff to prepare the report. 3. KJSR will submit the report to TAEPF and SAEPF under Government. 4.Consultant hands over the report to

					Employer.
Birds	Dynamics of population of indcator species of birds: whooper, demoiselle, sparrow-hawk, eagle, bearded vulture, Himalayan vulture, horned lark, isabelline wheatea.	Roadside territory of theinvestigated area from Tuz-Bel pass till customs control point; KJSR sections where Red Book species will be monitored, or in accordancy with the Table 33 monitoring system showu\ing sections with GPS-reference.	Nestling in May – June from 6 p.m. to 10 p.m; winter quarters (details will be determined by ornithologist)	Methodological and technical support will by provided by the Consultant and group of scientists	1. KJSK will collect data, summarize and analyse 2.Consultant will help KJSR staff to prepare the report. 3. Data proceeding in the laboratory of zoology of BSI NAS 4. KJSR will submit the report to TAEPF and SAEPF under Government. 5.Consultant hands over the report to Employer.
Mammals	Grey marmot (Marmota baibacina) –population density for 1 $м^2$, population dynamics Narrow skulled vole (Microtus gregalis) - population dynamics Red fox (Vulpes vulpes Linnaeus)	Monitoring is carried out at 4 transects, which are shown in monitoring system (sections 1,2,3 and 4 according to data collected during investigation in 2012)	Marmot- in the first half of August, in clear weather from 8 to 12 during day time Field mouse - spring-summer-Autumn	Methodological and technical support will by provided by the Consultant and group of scientists	1. KJSK will collect data, summarize and analyse 2.Consultant will help KJSR staff to prepare the report. 3. KJSR will submit the report to TAEPF and SAEPF under Government. 4.Consultant hands

	– precence of species		Red fox – throughout the year		over the report to
Insects	Monitoring, method №1. Number of some taxons appears indicator. Monitoring, method №2. Number of taxons appears as indicator. (indicator to be determined – number of registered species), mass fraction of species Cerapteryx megala (indicator – percentage) and the presence of Isochlora viridissima species	Transects should be selected by checkers on the base of certain conditions. In vicinities of (in radius till 100 m) locus, where insects collected to the light in 2011 and 2912.	Early-mid August new moon Early-mid August new moon	Methodological and technical support will by provided by the Consultant and group of scientists	1. KJSK will collect data, summarize and analyse 2.Consultant will help KJSR staff to prepare the report. 3. KJSR will submit the report to TAEPF and SAEPF under Government. 4.Consultant hands over the report to

384. EMP also includes description of responsibilities and authorities for mitigation and monitoring, reporting and review, preliminary cost estimates work program(see below)

8.9 Institutional responsibilities for EMP implementation

8.9.1. MOTC/PIU

385. The existing IPIG includes 4 officers responsible for environmental and social safeguards implementation. The IPIG is responsible for the ongoing ADB-funded projects.

386. IPIG ensured that the tender documentation included criteria for environmental policy, health and safety and environmental certification criteria, as noted. Special conditions of the contract include penalties and incentives for compliance with environmental indicators. The IPIG will prepare monitoring reports 2 times per year and submit these reports to ADB. The IPIG will prepare environmental management reports every 6 months during construction and annually through the first year of operations. The reports will cover EMP implementation with attention to compliance and any needed corrective actions. Additional public consultation will be conducted as necessary during construction. The IPIG has created its new website http://www.piumotc.kg/ which includes provisions for public disclosure and public comments.

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8.9.2. Supervision Consultants

387. Consulting services will be mobilized to implement the 2-track EMP strategy. Supervision consultants will be recruited to assist in overall project implementation including design review and EMP implementation. The supervision consultants will take primary responsibility for the pollution source control and monitoring track, including the routine emissionsmonitoring during construction and operations. The scope of work is outlined below.

388. For the pollutant source control and monitoring track, the supervision consultants will:

- :Assist MOTC in developing and implementing spill prevention, control, and countermeasures, including orientation / training on international best practices, procurement and installation of appropriate road warning signs, and procurement of spill response equipment and materials to be pre-positioned in the Chatyr-Kul area
- Review construction contractors design for drainage and run-off control, including retention ponds, and recommended design modifications as necessary
- Conduct pollution source environmental monitoring and analyses (air, dust, noise, vibration, and water quality) twice yearly and at least once prior to commencement of construction; the Engineer will coordinate with the Karatal-Japyryk State Protection Office as necessary for water quality sampling, and coordinate with environmental laboratories for the water analyses
- Prepare specifications and procure the necessary field equipment and materials to implement the pollution source monitoring
- Prepare specifications for automated water sampling stations to be installed at key locations in the Chatyr-Kul basin; procure, install, and commission the stations (third party services may be employed as necessary); and
- Assist MOTC in preparation and delivery of progress reports two times per year

389. For the receptor protection track, the supervision consultants will:

- Compile analytical work conducted by various researchers and agencies, to identify the long-term requirements for ecological and water quality monitoring
- Conduct ecological surveys to determine current status and health of key indicator species in the Chatyr Kul ecosystem

- Conduct water sampling and analyses to establish baseline conditions for environmental monitoring during project construction and operations
- Identify near-, medium-, and long-term opportunities for ecosystem protection enhancements (e.g., fencing of key breeding and nesting areas; construction of artificial habitat for breeding and nesting; re-vegetation with indigenous plant species); and
- Implement low-cost near-term ecosystem protection enhancementsем.

390. Additional third-party services will be mobilized under the supervision consultants' contract as necessary. This includes baseline surveys, identification of ecological preservation and restoration opportunities, training for KJSPO, and initial implementation of biodiversity preservation and restoration activities. Third-party services will be employed for laboratory analyses. Preliminary EMP Cost Estimates (subject to revision) Table 8.2.

8.9.3. Construction Contractors

391. Construction contractors will be required to have a corporate environmental, health, and safety (EHS) policy, as well as environmental management certifications such as ISO 14001 (or equivalent). Contractors will have primary responsibility for worker health and safety at construction sites and camps. This includes provision of appropriate personal protective equipment (e.g., hard hats, safety boots, and hearing protection), provision of sanitation facilities, and maintenance of construction, domestic, and sanitary waste facilities. Supervision consultants will conduct routine inspection and exercise oversight of construction contractor EHS performance.

392. The construction contractors' main environment-related work item is for drainage, run-off and heavy metal controls; this will be included in the construction contract as a design-build line item. The construction contractor will design the control measures, the supervision consultants will review the proposed design, and IPIG / MOTC will endorse the final design.

8.9.4. Karatal-Japyryk State Reserve

393. The Karatal-Japyryk State Preservation Office will have primary responsibility for regulatory oversight in the Chatyr Kul protected area, including independent monitoring of air and water quality parameters. ADB will also conduct periodic review missions which will include field visits and auditing of EMP implementation.

8.9.5. Asian Development Bank

394. ADB will (i) will be responsible for review and approval of the EIA and EMP before contracts are finalized and construction commences; (ii) review monitoring reports; and (iii) officially disclose environmental safeguards documents on its Web site as necessary in accordance with the ADB Public Communications Policy (2009).

8.10 EMP Cost Estimates and Work Schedule

395. Preliminary cost estimates for the EMP are shown in Table 8.9. These estimates are based on a 3-year implementation period and are subject to revision. Most of the EMP cost is expected to be funded by the Project. Table 8.9 includes provisional estimates for training, equipment, and materials for the KJSPO; funding for these items has yet to be secured.

396. The largest cost item is a provisional sum of $1 million for drainage, run-off and heavy metal controls; this will be included in the construction contract as a design-build line item. The construction contractor will design the control measures, the supervision consultants will review the proposed design, and IPIG / MOTC will endorse the final design.

Table 8.9: Preliminary EMP Cost Estimates (subject to revision)

Activity	Unit	Unit Cost	Total
Track 1: Pollution Source Control & Monitoring			
Spill prevention, control, & countermeasures program for MOTC / IPIG (including training)	LS	$ 25,000	**$ 25,000**
Emergency Response Gear	LS	$ 25,000	**$ 25,000**
Road signs (emergency stopping only, speed limits, wildlife crossing)	LS	$ 5,000	**$ 5,000**
Air, Dust, Noise, & Water Monitoring & Construction EHS Inspections – Equipment	LS	$ 25,000	**$ 25,000**
Automated monitoring stations – initial installation and operations	LS	$ 100,000	**$ 100,000**
Supervision Consultants – Professional Remuneration for Monitoring [Assumes 2 times per year during construction season, 2 p-m/y x 3 years]	6 p-m	$ 20,000	**$ 120,000**
Spill control - interceptor drains and retention ponds (10 km x $100,000 / km) [Provisional Sum in Construction Contract]	LS	$ 1,000,000	**$ 1,000,000**
Subtotal			**$ 1,300,000**
Track 2: Receptor Protection			
Baseline data collection (sampling and analyses of air, water, noise, particulate matter	LS	$ 25 000	**$ 25 000**
Baseline Ecological Survey and Identification of Initial Protection Measures (consulting services, travel, workshops, etc	LS	$ 100 000	**$ 100 000**
Installation of Initial Protection Measures	LS	$ 25 000	**$ 25 000**
Implementation of Ecological Restoration Measures	LS	$ 40 000	**$ 40 000**
Support to public environmental awareness and hygience program	LS		**$50000**
Contingencies	LS	$ 10 000	**$ 10 000**
Subtotal			**$ 250 000**
ADDITIONAL: KJSPO Upgrades (funding to be determined)			
Training	LS	$ 50 000	**$ 50 000**

Laboratory Equipment	LS	$ 50 000	**$ 50 000**
Vehicles	3	$ 15 000	**$ 45 000**
Field Equipment	LS	$ 50 000	**$ 50 000**
Subtotal			**$ 195 000**
Total			**$1 745 000**
% of total project cost (assumes $70 million total)	**2,5%**		

Source: ADB staff consultant estimates and information provided by JOC and KJSPO.
Table reflects preliminary amount which will be finalized and updated by International Consultant of IPIG.

397. The budget for Track 2 is preliminary and subject to revision as new baseline survey work progresses. As noted in Section 7.2, the EMP – including the budget – will be updated and modified as necessary and appropriate based on results of additional baseline studies and monitoring results. Cost of EMP will consist of two parts (I) cost for EMP realization which consists of expenses on mitigation measures (as a part of works contract) and EMP monitoring (as part of supervision consultant's service) and (II) "Budget for emergence response ", which will cover the expenses on additional mitigation measures, monitoring and other technical support due to environmental sensitiveness.

8.11 Work Program

398. The preliminary work program for the first 3 years of implementation is summarized in Table 8.10, illustrating the 2-track approach discussed above. EMP related work began in 2011. Design review activities started in the first quarter of 2011.

399. Construction starts in spring 2013. However, initial inspection of construction staging areas and camps were conducted by supervision consultants before mobilization of construction contractors. Supervision consultants began routine emissions monitoring when construction commenced in May 2013. New baseline surveys continued in the beginning of 2013. Additional environmental activities will be carried out starting from 2013, if necessary.

Table 8.10 : Preliminary EMP Work Program (2013 – 2015)

Year	2013				2014				2015			
Activity	K1	K2	K3	K4	K1	K2	K3	K4	K1	K2	K3	K4
Track 1: **Pollution Source Control & Monitoring**		X	x			x	x			x	x	
Safeguards Capacity Building for IPIG												
Design review (MOTC /IPIG & ADB)												
Air, Dust, Noise, & Water Monitoring		X	X			X	X			X	X	
Visual Inspections of Construction sites and camps		X	X			X	X					
EMP Update (as necessary)												
Track 2: **Receptor Protection**												
Baseline data collection (air, water, etc.)												
Baseline Ecological Survey												
Identification of Initial Protection Measures												
Installation of Initial Protection Measurese												
Implementation of other Ecological Restoration Measures		X	X			X	X					

9. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

400. As noted in Section 1, CAREC Corridor 1 has been under development for several years, beginning in the late 1990s with the initial concepts for transport sector development in the context of regional cooperation. The Government of the Kyrgyz Republic (KR), Asian Development Bank (ADB), and other development partners have been collaborating specifically on the Bishkek-Naryn-Torugart road program for at least 5 years. The Bishkek-Torugart Road Rehabilitation Project was included in the ADB Country Strategy and Program Update for 2006 - 2008 (published in November 2005) as a proposed loan project for approval in 2008. The Joint Country Support Strategy for 2007 – 2010 (published in August 2007) also included the Bishkek-Torugart road project. The proposed Project is included in the ADB Country Operations Business Plan for 2009 – 2011, published in January 2009.

401. Information disclosure and public consultations for the ADB-funded portions of the Bishkek-Naryn-Torugart road have been carried out in accordance with the ADB Public Communications Policy 2005. The country partnership strategy and country operations business plan have been made available through ADB's website. As required by ADB policy, consultations have continued for the proposed Project, as discussed below.

9.1 Summary of Public Consultations and Stakeholder Consultation

402. Public consultation was held September 18, 2009 on the results of the EIA in Naryn City Hall. There were invited about 30 interested parties. During the meeting, no objections were made against the project, but was offered an earlier project implementation. As for the approach to the EIA, has been recommended consultation with key stakeholders, such as Karatal-Japyryk State Reserve, since they are responsible for the protection and monitoring of ecosystems in Chater-Kul.

403. The second public meeting for the presentation of a working version of the EIA report was conducted December 11, 2009 in Naryn, chaired by the State Secretary of the Ministry of Transport and Communications. A report on the recommendations was amended and submitted to the SRC for approval of the State Agency on Environment Protection and Forestry.

404. In August 2010, there were further consultations in the villages of Kara-Bulun and Kara-Suu [group JOC]. Among the issues raised were: concerns about dust, noise and vibration, employment opportunities, and other potential benefits of the project. Details of these consultation activities are presented in Appendix 5 to this report.

405. In September 2010, there were further discussions with key stakeholders associated with the reserved section of Chater-Kul, the main content of the discussion is presented in Appendix 5. Among the issues raised were: the potential impact on Chater-Kul, long-term management of the protected area Chater-Kul and road safety issues.

406. On April 30 2013 there were public consultations under the project in the Naryn oblast Administration building with public participation. Issues of land allocation for borrow pits, resettlement (km 531), local employment, ecological aspects of the project and mitigation measures were discussed. Details of these discussed issues are presented in Appendix 7.

407. One more public consultation on the update EIA is planned in Naryn by middle of august 2013, after the final draft update EIA be considered acceptable by ADB.

9.2 Public Disclosure

408. In addition to the public consultations, MOTC will disclose the environmental assessment and other environment-related documents available in accordance with Kyrgyz and ADB requirements for disclosure. In accordance with the ADB Public Communications Policy 2005, the draft EIA report was disclosed in November 2010 and posted on the ADB website 120 days prior to Board consideration. On public consultations main issues of the project will be provided to participants. By middle July 2013 final version of EIA will be posted on MOTC and ADB websites,

replacing the information, which was disclosed in 2010. This information will be disclosed to the public prior to public consultations which are planned in July 2013. Final version of EIA will disclosed by the end of August 2013.

9.3 Grievance Redress Mechanism

409. The negative environmental and social impacts of the Project are expected to be minimal. Rather, the Project is expected to bring some environmental improvements as well as social benefits in the form of reduced transit times and increased trade in the region. Some employment opportunities will be created during the construction period, and a small number of permanent jobs may be created in the Karatal-Japyryk State Preservation Office.

410. The construction activities will cause some disturbance in the project area due to temporary movement of equipment and materials, and temporary increase in the work force. The Project area does not have any permanent residents, although there is seasonal grazing by nomadic families. Potential disturbance to these seasonal residents is expected to be minimal, and would arise from restriction on grazing near the Chatyr Kyl protected area.

411. Currently MOTC established procedure to redress requests and grievances about project activities (established for current ADB projects), as well to respond to such requests and grievances. Consultations with representatives of public communities in September 2010 show that more effective grievance redress mechanism (GRM) is needed, which will cover whole Bishkek-Naryn-Torugart road, as well as the proposed project.

412. Regulation of ADB Safeguard policy, 2009, Annex 1, cause 20, clearly notes that Borrower is responsible for GRM:

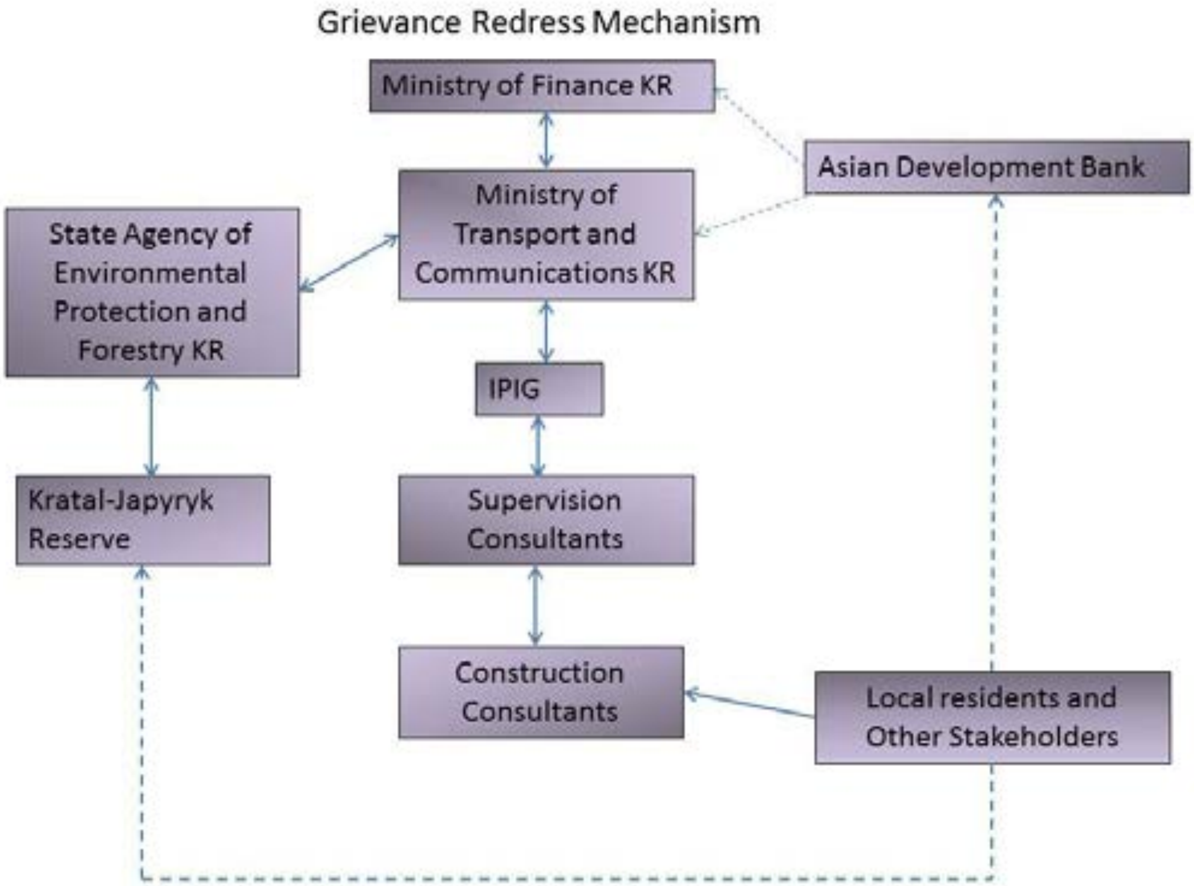
Borrower/Client must establish mechanism to receive and deal with complaints and grievances of persons in the project area for the implementation of project activities. The grievance mechanism should reflect the scale of the risks and negative impacts of the project. It should consider received complaints transparently, efficiently and intelliagently, taking into account gender and cultural background and should be available to all groups of the population in the project are, collection of payment or consequences are not provided for. The mechanism should not impede access to judicial and administrative system. Persons in the project area should be notified of this mechanism.

413. In the context of the proposed Project (as well as the broader Bishek-Naryn-Torugart road program), there are potential language and other communication barriers. Potentially affected people may have mobile phones and televisions, but may not have ready access to internet. In addition, Russian and/or Kyrgyz are the native language of potentially affected people.

414. While meaningful consultation of potentially affected people has been undertaken for the Project, there is a need for a sustained effort to address concerns and complaints. The general information flow for registering and responding to concerns and complaints is illustrated in Figer 9.1. At construction stage,construction Contractors, Consultants, IPIG, MOTC, perhaps MoF and eventually ADB if needed, should be notified of problems and grievances. At the operation stage, problems and grievance initially will be brought to notice of MOTC department at oblast level in Naryn and at regional level in At Bashy.

415. To solve possible complaints, requests, claims and other problematic issues of social and environmental characteristics Grievance Redress Group (GRG) has been established. This group comprises of local and central levels (decree on establishing GRG is in Appendix 10). This group will assemble to consider grievances as necessary and meet regularly if it is involved in other aspects of project realization, e.g. reular reportins about project implementation. As necessary GRG will be assited by KJSR, SAEPF staff and others.

Figure 9.1: Grievance Redress Mechanism



10. CONCLUSIONS, AND RECOMMENDATIONS

10.1 Key Findings

1. The analysis of alternatives concluded that, aside from the prospect of abandoning the road and closing the border at the Torugart Pass, the proposed Project is the best alternative with respect to potential negative environmental impacts. The “no action” alternative has a higher risk of environmental deterioration and negative impact on the Chatyr-Kul ecosystem. Other alternatives are not economically and financially viable, or would not provide the type of transport services needed to support economical and social development. The preferred alternative avoids and minimizes potential impacts of the project.

2. Impacts during construction are acute, temporary, and reversible, with the exception of possible hazardous materials spills. Impacts during operations are expected to be much greater as the road has a design lifetime of 20+ years, and pollutants entering the Chatyr-Kul aquatic ecosystem will accumulate because the lake has no outlet. The Environmental Baseline Survey Report of March 2012 provides the only recent monitoring to determine whether pollutants from the road are affecting the Chatyr-Kul ecosystem. Data on water quality and ecosystem indicator species is also limited. However, additional baseline data collection and surveys conducted prior to construction confirmed that the only source of negative impact onto the Chatyr-Kul ecosystem is the motor road. Such scenario of baseline data collection is common for road projects, implemented in ecosensitive zones.

3. The 2-track EMP remains valid, and comprises: (i) pollutant source control, and (ii) receptor [biodiversity] protection. A variety of “no regrets” mitigation measures -- mainly spill prevention, countermeasures and heavy metals control, -- will be incorporated into the road design, providing insurance against loss of biodiversity. The pollutant source control track will ensure that minimal impacts occur in the sensitive Chatyr-Kul ecosystem. The receptor protection track will include baseline surveys, identify short-term biodiversity protection measures, implement short-term biodiversity protection improvements, and identify medium-to-long term biodiversity improvement activities. The cost of the EMP is estimated at just over 2.5% of total project cost.

10.2 Conclusions and Recommendations

4. The proposed Project is the best alternative with respect to economic, environmental, financial, and social criteria. The Project will reduce transit time and cost, improve traffic safety and reduce accident risk.

5. The limitations of baseline data noted above are not unusual in international practice, and an effective mitigation program can be developed in parallel with new baseline surveys. Potential negative environmental impacts can be mitigated by implementation of the EMP. Additional environmental survey work will proceed in 2012-2013 as discussed above, and the EMP will be updated accordingly to ensure that environmental and ecological objectives in the project area are met.

6. The environmental assessment to date complies with ADB and Kyrgyz policy and guidance for transport sector projects. Appropriate assurances have been incorporated into loan and project agreements to ensure that the EMP is updated as necessary and fully implemented.

Appendix 1: Selected Photographs of Project Area

NOTE: photos taken during site reconnaissance on 21 September 2010

View to southeast at approximately Km 476 - Checkpoint at Km 478 visible in center background

Road maintenance facility located between Km 478 and Tuz-bel Pass. Facility is equipped with a 10-kW wind generator, reported to be inoperable.

Tuz-bel Pass, Km 501, looking west toward Arpo Valley. Note poor condition of road surface.

Karatal Japyryk Protected Area Sign at Tuz-bel pass. Only 2 such signs are currently visible from the road in the project area.

View toward PRC border at approximately Km 505, showing temporary location of nomadic shepherds.

Borrow area adjacent to road near Km 505.

View looking northeast at approximately Km 510: borrow area is visible in foreground; Chatyr Kul is visible in background.

View to east at damaged culvert near Km 512; note potholes in road.

View looking north at Kosh Kul; approximately Km 520.

“Narzan” spring, located between Kosh Kul and Torugart Customs Post.

Torugart Customs post at Km 531; note truck which had been disabled for 5 days at time of visit.

Appendix 1: Photos from Site Reconnaissance in 2009

View at Km493 looking toward Torugart (16 October 2009)

View at Km506 toward Checkpoint (16 October 2009)

View at Km512 toward Checkpoint (16 October 2009)

View of Koshi-Kul at Km521 (16 October 2009)

View at Km521 toward Checkpoint (16 October 2009)

View at Km530 toward Torugart Customs (16 October 2009)

Footprint of animals remained around Km512 (16 October 2009)

Hole on the box culvert (16 October 2009)

Chatyr Kul Lake, Birds and At-Bashi Ridge behind (18 September 2009)

Wetland around Koshi-Kul Lake with Livestock (18 September 2009)

The results of the socio-economic survey

Appendix 2

No.		1	2	3	4	5	6
Address		Kyzyltuu	Dologoi	Karabulun	Karabulun	Ak-Beit	Ak-Beit
Number of family member		5	1	6	5	3	5
Age of householder		37	22	38	47	76	51
Sex		male	male	male	male	female	male
Total cultivated land	using ha	4		2.8	1.5		
	Irrigated land	4		2.8	1.5		
	Dry land						
	Woodland						
	Orchard						
	Pasture						
Quality of land							
	As good or better						
	Almost as good	✓					
	Not nearly as good			✓	✓		
	Much worse						
Number of livestock							
	Cows	3	10	2	1	1	3
	Sheep	20	100	20	30	10	
	Goats	10	20	5		6	5
	Horses	1	4	2	1	1	
	Donkey and Mules		2				1
	Chickens and other pourltry	10	0				
Floor space of home m2		36	24	110		16	16
How old is the house year		40	3	6	5	60	39
Numer of vehicle owned							
	Passengers car	1					
	Truck						
	Tractor						
	Other(specify)						
Products for sell							
	Crops						
	Vegetables						
	Livestock	✓	✓	✓	✓	✓	✓
	Poultry						
	Milk		✓				
	Egg						
	Fruite						
	Non-food						
	Household production						
Location to sell							
	In the field or home to						
	Besides the highway						✓
	Local market	✓	✓	✓		✓	✓
	Naryn/At Bashi markets	✓	✓	✓	✓		✓
	Bishkek market						

No.		1	2	3	4	5	6
Address		Kyzyltuu	Dologoi	Karabulun	Karabulun	Ak-Beit	Ak-Beit
Transportation of product							
	Foot					✓	
	Hand cart						
	horse/donkey						
	Passengers car (sedan car)			✓			
	Van (mini bus)						
	Small truck		✓		✓		✓
	Large truck	✓	✓	✓	✓		
	Bus						
If highway is improved you can sell at far distant market ?		yes	yes	yes	yes	yes	yes
Source of water							
	Pipe						
	Well				✓		
	Spring	✓	✓	✓		✓	✓
	River/lake						
	Rainwater						
	Buy						
What is the water quality?							
	Excellent						
	Good				✓		
	Fair			✓		✓	
	Poor	✓	✓				✓
Safe to drink without boiling ?		yes	yes	yes	yes	yes	yes
Toilet							
	Flushed toilet						
	Latrine outside of house	✓	✓	✓	✓	✓	✓
	No toilet						
Duration of electricity available? Hours/day		zero	zero	24	24	zero	zero
How many months your house was heated?		10	9	6	8	8	9
Location of public telephone							
	In your house						
	In neighbour's house						
	At public place within 5 minutes walks						
	At public place more than 5 minutes walks				✓		
	No telephone available	✓	✓	✓		✓	✓
How many minutes to walk to your nearest bus stop?		45	60	5	5	3	5
Mode of transportation to waorking place/school/market							
	Bus						✓
	Car	✓	✓	✓			✓
	Truck				✓	✓	✓
	Foot			✓	✓		✓

No.		1	2	3	4	5	6
Address		Kyzyltuu	Dologoi	Karabulun	Karabulun	Ak-Beit	Ak-Beit
Did any school aged children miss attendance more than 2 weeks?		No	No	No	No	No	No
Main reason not missing more than 2 weeks							
	Cost too much						
	farm work						
	other work (specify)						
	School too far						
	no teacher						
	No book or supplier						
	No proper clothing						
	Bad weather						
	Illness						
	Don't like study						
Rate the quality of education to childeren							
	Excellent						
	Good				✓		✓
	Fair	✓		✓		✓	
	Poor		✓				
Affordability to pay for education							
	Impossible						
	Very difficult					✓	✓
	Difficult			✓			
	Not difficult	✓			✓		
	No body goes to school						
In the past 3 months, any family member needed medical care?		No	No	yes	No	yes	yes
The person was treated by							
	Doctor						✓
	Nurse					✓	✓
	Dentist					✓	
	Pharmacist						
	Midwife					✓	
	Traditional healer			✓			
	No body (did not seek treatment)						
Affordability to pay for medical care							
	Impossible						
	Very difficult	✓				✓	✓
	Difficult						
	Not difficult			✓			
	No body goes to medical care						
Rate the quality of medical service							
	Excellent						
	Good	✓			✓		
	Fair			✓		✓	✓
	Poor						
	Very poor						

No.		1	2	3	4	5	6
Address		Kyzyltuu	Dologoi	Karabulun	Karabulun	Ak-Beit	Ak-Beit
Food are provided by							
	Cash purchase	✓	✓	✓	✓	✓	✓
	Household production	✓	✓	✓	✓	✓	✓
	Humanitarian assistance	✓	✓	✓			✓
	From friend or relatives						
Rate the situation of food securitye							
	Same as before	✓	✓	✓	✓	✓	
	Becoming worse						✓
	Becoming better						
To secure the food, did you do following for last three months?							
	Shift to cheaper food					✓	✓
	Reduce the number of meal					✓	✓
	Eat less						
	Find other job					✓	
	Sell households assets						
	Borow money						
	Accept gift /donation						
	Others						
Rate economic level oy your family							
	Low					✓	
	Lower middle	✓					✓
	Middle			✓	✓		
	Upper middle		✓				
	High						
Rate economic level oy your village							
	Low					✓	
	Lower middle		✓				✓
	Middle	✓		✓	✓		
	Upper middle						
	High						
Necesity of following							
	Provision/improvement of electricity supply	✓	✓	✓	✓	✓	✓
	Provision/improvement of water supply	✓	✓	✓	✓		✓
	Rehabilitation of main roads	✓	✓	✓	✓	✓	✓
	Improve quality of medical care			✓	✓		✓
	Reduction of medical care cost			✓	✓	✓	✓
	Improve quality of education				✓	✓	✓
	Reduction of education cost	✓	✓	✓	✓	✓	✓
	Loan provision	✓	✓			✓	✓
	Provide bath-house	✓	✓	✓		✓	✓
	Better access to distant market	✓	✓	✓	✓	✓	✓
	More job for local people	✓	✓	✓		✓	✓
	Pay delayed wages and pensions	✓	✓	✓	✓	✓	✓

No.		1	2	3	4	5	6
Address		Kyzyltuu	Dologoi	Karabulun	Karabulun	Ak-Beit	Ak-Beit
Opinion about rehabilitation of Bishkek-Torugart Road							
	Support	✓		✓	✓	✓	✓
	Indifferet		✓				
	Against						
Do you agree followings?							
	Communicatios between villages and oblast center improve	yes	yes	yes	yes	yes	yes
	Travel will be more convenient and safe	yes	yes	yes	yes	yes	yes
	Traveling time reduce	yes	yes	yes	yes	yes	yes
	Traffic accident reduce	yes	yes	No	yes	yes	No
	Damage to product while transport will reduce	yes	yes	yes	yes	yes	yes
	More local products will be go to distant market	yes	yes	yes	yes	yes	yes
	More outside products will be avilable in local market	yes	yes	yes	yes	yes	yes
About present life, you are:							
	Very satisfied						
	Satisfied	✓	✓	✓	✓		
	Unsatisfied						✓
	Very unsatisfied					✓	
After 1 year, your family will become:							
	Much better off						
	Somewhat better off	✓		✓	✓		✓
	Nothing change		✓				
	Somewhat worse off					✓	
	Much worse off						
After 1 year, your family are able to have basic necessities:							
	Very concerned					✓	
	A little concerned	✓		✓			
	Not worried		✓				✓
	Rather unconcerned						
	Not at all unconcerned						
How many year your are using same land		16		14			

VOC in the groundwater dispersion analysis as per ASTM E1739

$$c(t,x,y,z)=\frac{Q\times10^{6}\times2.7\exp\left(\frac{-\left(\frac{x-ut}{100}\right)^{2}}{4Dx\cdot t}-\lambda\cdot t\right)}{8(\pi\cdot t)^{1.5}\cdot(Dx\cdot Dy\cdot Dz)^{0.5}}$$

Groundwater → Enclosed-space vapors

$$VF_{wesp}=\frac{H\left(\frac{D_{ws}^{eff}/L_{GW}}{ER\,L_B}\right)}{1+\left(\frac{D_{ws}^{eff}/L_{GW}}{ERL_B}\right)+\left(\frac{D_{ws}^{eff}/L_{GW}}{(D_{crack}^{eff}/L_{crack})\,\eta}\right)}\quad\left(\frac{mg/L\text{-}air}{mg/L\text{-}H_2O}\right)$$

Groundwater → Ambient(out-door) vapors

$$VF_{amb}=\frac{H}{1+\left(\frac{U_{air}\;\delta_{air}\;L_{GW}}{W\,D_{ws}^{eff}}\right)}\quad\left(\frac{mg/L\text{-}air}{mg/L\text{-}H_2O}\right)$$

Surficial soil → Ambient(out-door) vapors

$$VFss=\frac{2W\,\rho_s}{U_{air}\;\delta_{air}}\;\text{sqrt}\left(\frac{D_s^{eff}\;H}{\pi\,(\theta_{ws}+k_s\rho_s+H\theta_{as})\;\tau}\right)\text{ or }\frac{W\,\rho_s\,d}{U_{air}\;\delta_{air}}\quad\left(\frac{mg/L\text{-}air}{mg/L\text{-}H_2O}\right)$$

whichever less

Surficial soil → Ambient(out-door) particulate

$$VFp=\frac{Pe\,W}{U_{air}\;\delta_{air}}\quad\left(\frac{mg/L\text{-}air}{mg/kg\text{-}soil}\right)$$

Subsurface soil → Ambient air

$$VFsamb=\frac{H\,\rho_s}{(\theta_{ws}+k_s\rho_s+H\theta_{as})\left(1+\frac{U_{air}\;\delta_{air}\;L_s}{D_s^{eff}\;W}\right)}\quad\left(\frac{mg/L\text{-}air}{mg/kg\text{-}soil}\right)$$

Subsurface soil → enclosed-space vapors

$$VFsesp=\frac{\frac{H\,\rho_s}{(\theta_{ws}+k_s\rho_s+H\theta_{as})}\;\frac{D_s^{eff}/L_s}{ER\,L_B}}{1+\frac{D_s^{eff}/L_s}{ER\,L_B}+\frac{D_{ws}^{eff}/L_S}{(D_{crack}^{eff}/L_{crack})\,\eta}}\quad\left(\frac{mg/L\text{-}air}{mg/kg\text{-}soil}\right)$$

$$D_s^{eff}=D^{air}\frac{\theta_{as}^{3.33}}{\theta_T^{2}}+D^{wat}\frac{1}{H}\frac{\theta_{ws}^{3.33}}{\theta_T^{2}}\quad\left(\frac{cm^2}{S}\right)$$

$$D_{crack}^{eff}=D^{air}\frac{\theta_{acrack}^{3.33}}{\theta_T^{2}}+D^{wat}\frac{1}{H}\frac{\theta_{wcrack}^{3.33}}{\theta_T^{2}}\quad\left(\frac{cm^2}{S}\right)$$

$$D_{cap}^{eff}=D^{air}\frac{\theta_{acap}^{3.33}}{\theta_T^{2}}+D^{wat}\frac{1}{H}\frac{\theta_{wcap}^{3.33}}{\theta_T^{2}}\quad\left(\frac{cm^2}{S}\right)$$

$$D_{ws}^{eff}=(h_{cap}+h_v)\;/\;\left(\frac{h_{cap}}{D_{cap}^{eff}=}+\frac{h_v}{D_s^{eff}}\right)\quad\left(\frac{cm^2}{S}\right)$$

	Used				Default
$c(t,x,y,z)$		mg/L		Concentration of leaked liquid in the groundwater	
Q	1.E-01	kL		Amount of leaked liquid	
u	10,000	cm/day		Velocity of groundwater	
t		day		Time	
Dx		m^2/day		Diffusion factor in x direction	
Dy		m^2/day		Diffusion factor in y direction	
Dz		m^2/day		Diffusion factor in z direction	
λ		1/day		Half life	
d	100	cm		Lower depth of surface soil zone	100
D^{air}	0.093	cm2/s		Diffuesion coefficient in air	0.05～0.1
D^{wat}	0.000011	cm2/s		Diffuesion coefficient in water	$0.5\text{-}1\times10^{-5}$
ER	0.00014	L/s		Enclosed air exchange rate	0.00014～0.00023
f_{oc}	0.001	g-C/g-soil		Fraction of organic-carbon in soil	0.001
H	0.003	$cm^3\text{-}H_2O/cm^3$-air		Henry's law constant	～0.2
h_{cap}	5	cm		Thickness of capilary fringe	5
h_v	295	cm	$L_{GW}-h_{cap}$	Thickness of vadose zone	295
I	30	cm/y		Infiltration of water through soil	30
K_{oc}	100	(g-C/g-soil)/(g-C/g-H_2O)		Carbon-water sorption coefficient	100>
Ks	0.1		foc×Koc	Soil water sorption coefficient	0.1
L_B	200	cm		Enclosed space-volume/infiltration area ratio	200
L_{crack}	15	cm		Foundation thickness	
L_{GW}	300	cm	$h_{cap}+h_v$	Depth to groundwater	300
Ls	300	cm		Depth to subsurface sources	300
Pe	6.9E-14	g/cm3-s		Particulate emission rate	6.9E-14
S	1750.0	$mg/cm^3\text{-}H_2O$		Pure component solubility	
Uair	225	cm/s		Wind speed above ground surface in ambient mixing zone	225
Ugw	2500	cm/y		Groundwater Darcy velocity	2500
W	1500	cm		Width of source area,parallel to wind, or groundwater flow	1500
δ_{air}	200	cm		Ambient air mixing zone height	200
δ_{gw}	200	cm		Groundwater mixing zone thickness	200
η	0.01			Area fraction of cracks in foundation/wall crack	0.01
θ_{acap}	0.038			Volumetric air content in capillary fringe soils	0.038
θ_{acrack}	0.26			Volumetric air content in foundation/walls cracks	0.26
θ_{as}	0.26			Volumetric air content in vadose zone soils	0.26
θ_T	0.38			Total soil porosity	0.38
θ_{wcap}	0.342			Volumetric water content in capirally fringe in soils	0.342
θ_{wcrack}	0.12			Volumetric water content in foundation/wall cracks	0.12
θ_{ws}	0.12			Volumetric water content in vaose zone soils	0.12
ρ_s	1.7	g/cm3		Soil bulk density	1.7
τ	9.46E+08	s		Average time for vapor flux	9.46E+08
D_s^{eff}	7.28E-03	cm^2/s		Effective diffusion coeficient in soil based on vapor-phase concentration	
D_{crack}^{eff}	7.28E-03	cm^2/s		Effective diffusion coeficient through foundation cracks	
D_{cap}^{eff}	7.25E-04	cm^2/s		Effective diffusion coefficient through capirally fringe	

D_{ws}^{eff}	6.33E-03 cm^2/s	Effective diffusion coeficient between groundwater and soil surface
VFwesp =	4.2E-04 $(\frac{mg/m^3\text{-air}}{mg/L\text{-}H_2O})$	Groundwater ⇒ enclosed space vapors
VFwamb	2.1E-06 $(\frac{mg/m^3\text{-air}}{mg/L\text{-}H_2O})$	Groundwater ⇒ ambient vapors
VFss	1.8E-05 $(\frac{mg/m^3\text{-air}}{mg/kg\text{-soils}})$	Surficial soils⇒ambient air(vapors)
VFp	2.3E-12 $(\frac{mg/m^3\text{-air}}{mg/kg\text{-soils}})$	Surficial soils⇒ambient air(particulate)
VFsamp	1.4E-05 $(\frac{mg/m^3\text{-air}}{mg/kg\text{-soils}})$	Subsurface soil → Ambient air
VFsesp	2.5E-03 $(\frac{mg/m^3\text{-air}}{mg/kg\text{-soils}})$	Subsurface soils ⇒ enclosed spaced vapors

Numerical analyses were made based on the formula proposed by:

(1)Road Environment, Sankaido, 1997

(2) Technique of the Road Environmental Impact Assessment, Road Environment Institute 2007

(3) Technique for Environmental Impact Assessment, Chuou-hoki 1999

Noise

(1) Traffic noise

$L_{Aqe}=L_{wA}-8-20\log_{10}\ell+10\log_{10}(\pi\ell/d\cdot\tanh(2\pi\ell/d))+\alpha_d+\alpha_i$ Modified from ASJ CN-Model 2000

L_{Aeq} Equivalent noise level, d(B(A)

Noise increment ration in case of concrete pavement 0.1 Experimentary(Shoji)

L_{wA} Power level in average from a vehicle, dB(A)

$L_{WA}=46+6*a_2+30\log V$ (Low gear driving) Modified ASJ RTN-Model2003, Table2.3

$L_{WA}=90+10\log V$ (High gear driving) 〃

a_1:Ratio of smaller vehicle 0.01

a_2:Ratio of larger vehicle 0.99

ℓ Distance from source to the location of prediction(m)

H Effective emission height 0.3 m

d Average car head interval, d=1000V/N

V Average driving speed km/h

N Average hourly number of vehicle num/h

α_d Reduction by diffraction[dB(A)] in case:

	in case:
$\alpha_d=-9\log_{10}\delta-14.3$	$0.5\leqq\delta$
$-2.7(\log_{10}\delta)2-10.5\log_{10}\delta-14.5$	$0.07<\delta\leqq0.5$
$-3\log_{10}\delta-9.5$	$0.01<\delta\leqq0.7$
$-10\log_{10}\delta(0.2+2.5\delta)-10$	$-0.001<\delta\leqq0.01$
$0.24\delta\log10\mid\delta\mid-2.2$	$-0.015<\delta\leqq-0.001$
$0.2\delta\log10\mid\delta\mid+1$	$-0.3<\delta\leqq-0.015$

δ : difference of transmission distance

(2) Noise level from construction work and lorries

$L_{Aeq,T,Total}$ $=10\mathrm{Log}(10L_{Aeq,T,con}/10+10L_{Aeq,T,ve}/10)$

$L_{Aeq,T,Total}$ Sum of noise by construction work and lorries

$L_{Aeq,T,con}$ Total noise by construction work

$L_{Aeq,T,ve}$ Total noise by construction lorries

Table: Construction work power level at the reference point

		$L_{WAeff,I}$ dB(A)	⊿L d(BA)
Asphalt paving	Subbase/base course	103	5
	Asphalting	113	6
Concrete paving	Subbase/base course	116	5
	Concreting	108	5

a. Noise by construction work

$L_{Aeq,T,con}=10\cdot\log(1/T\cdot(\Sigma Ti\cdot10L_{Aeff,i}/10))$

$L_{Aeq,T,con}$: Total noise by construction work

T Working time

$L_{Aeff,i}$ $=L_{WAeff,i}-8-20\cdot\log(r/r_0)+\Delta Ld,i+\Delta Lg,i+\Delta L$

Noise level by i-th construction work unit

$L_{WAeff,i}$ Power level by i-th construction work unit at the reference point

⊿L Correction

r Distance to the location of prediction

r_0 Distance to the reference point

⊿Ld,i Reduction by diffraction, neglected for safety side

⊿Lg,i Reduction by the ground surface condition, neglected for safety side

b. Noise by construction lorries

$L_{Aeq,T,ve}$ $=10\log(10^{LA1}*N)$ (Assuming only one type of lorry)

$L_{A,i}$ $=L_{WA}-8-20\mathrm{Log}(ri/r_0)+\Delta Ld,i+\Delta Lg,i$

L_{WA} Power level of 10 tone Lorry=

N Number of lorry/hour

r Distance to the location of prediction

r_0 Distance to the reference point

⊿Ld,i Reduction by diffraction, neglected for safety side

⊿Lg,i Reduction by the ground surface condition, neglected for safety side

Air Pollution

(1) Air pollution by traffic during operation

Assuming infinite line source with wind direction right angle to the traffic

c(x,z)=Q/sqrt(2π σzU)・(exp(−(H−z)2/2/σz^2)+exp(−(H+z)2/2σz^2))

c(x、z)	Concentration of air pollutant, μg/m^3		
x	Distance m ℓ		
Q	Strength of emission of air pollutants(g/m・s)		
	Q=E・N/1,000/3,600		
	E:	NO_2	E=−0.902/V−0.00578V+0.0000439V^2+0.026 for Medium Car (V<20km/h: E=0.118g/km)
			E=−7.12/V−0.0895V+0.000735V^2+3.93) for Large Car (V<20km/h: E=2.08g/km)
		SPM	E=−0.0687/V−0.000385V+0.00000287V^2+0.017 for Medium Car (V<20km/h: E=0.007g/km)
			E=0.0318/V−0.0031V+0.0000227V^2+0.158 for large Car (V<20km/h: E=0.107g/km)
		CO	E=−12.5/V−0.0599V+0.000448V^2+2.2 for Medium Car (V<20km/h: E=0.636g/km)
			E=10.9/V−0.0168V+0.000115V^2+1.19 for Large Car (V<20km/h: E=1.45g/km)
		SO_2	E=0.0783/V−0.000162V+0.00000131V^2+0.0112 for Medium Car (V<20km/h: E=0.012g/km)
			E=0.0411/V−0.000699V+0.00000551V^2+0.0424 for Large Car (V<20km/h: E=0.033g/km)
		CO_2	E=976V$^{(-0.43)}$ g/km/day (By regression analysis, Shoji)

H	Effective height of emission		1
	In case of viaduct, add that height		
σz	Vertical dispersion factor m		
	σz=1.5+0.31x0.83	Without barrier or less than 3m high	
	σz=4.0+0.31x0.83	With a barrier equal or higher than 3m	
Z	Height of prediction m		
	Z_0:Initial height of prediction ı		1
	Z=Z0+⊿Z×N		
	⊿z:interval		1
U	Wind velocity, right angle to tł		1
	Width of road lane m		4

Table: Correction factor for the emission strength

Year	Correction factor (multiply the emission
2000	3.4
2001	3.3
2002	3.1
2003	2.8
2004	2.7
2005	2.3
2006	2.1
2007	1.8
2008	1.6
2009	1.4
2010	1.3
2011	1.2
2012	1.1
2013	1.1
2014	1.0
2015	1.0
2016	1.0
2017	1.0
2018	1.0

(2) Air pollution during construction (applicable to NO2 and SPM only)

Total of air pollutions by construction work and by lorries

a. Air pollution by construction work

Assuming wind direction of right angle to the road(y=0)

Σ c(x,z)	Sum of concentration by respective construction activity

$c(x,z)=Q/2\pi\sigma z\sigma yU\times(\exp(-(H-z)2/2/\sigma z^2)+\exp(-(H+z)2/2\sigma z^2))$

c(x、z)	Concentration of air pollutants
x	Distance of prediction m
Q	Emission strength(μg／s)
H	Emission height m
	In case of viaduct, add that height
σz	Vertical dispersion factor m
	σz＝1.5+0.31x0.83 =
	σz＝4.0+0.31x0.83
σy	Horizontal dispersion factor m
	σy＝W/2+0.46L0.81
	W: Road width m
Z	Prediction height m

Table: Emission strength construction work (g／unit／day)

	NO_2	SPM
Soil excavatior	3,800–9,700	110–290
Rock excavatic	7,000–18,000	200–520
Earth filling	3,400–8,600	100–260

b. Air pollution by lorries

See "air pollution by traffic"

Vibration

(1) Vibration by traffic during operation

L_{10} Upper limit of 80% range (dB)

$L_{10}=L_{10}*-\alpha l$

$L_{10}*$ Upper limit of 80% range dB) at the reference point

$L_{10}*=a\log(\log Q)+b\log V+c\log M+d+\alpha\sigma+\alpha f+\alpha s$

Q Equivalent traffic volume per 500 seconds per lane (number/500s/lane)
＝500／3,600／M＊(Q1+KQ2)

Q1 Number of large vehicles per hour (Number/hour)

Q2 Number of medium vehicles per hour (Number/hour)

K Conversion factor to medium vehicle from large vehicle=13

V Driving velocity, km/h

M Total number of lanes

$\alpha\sigma$ Correction factor by the evenness of the road surface(dB)
=8,2＊log10σ (in case of asphalt pavement))
σ : Standard deviation of 凸凹 on the road surface mm

αf Correction factor by the prevailing frequency of ground(dB)
=−20logf : f ≥ 8 ≥
=−18 : 8>f ≥ 4
=−24+10logf : 4>f

f Prevailing frequency of the ground

αs Correction factor by the road structure (dB) : Not considered for this analysis

αl Damping factor by distance(dB)
$=\beta\log(r/5+1)/\log 2$
$\beta=0.068L_{10}^{*}-2.0$ (Clay)
$\beta=0.130L_{10}^{*}-3.9$ (Sand)

r Distance m

(2) Vibration during construction

L_{total} Total vibrations by construction work and lorries
$=10\mathrm{Log}(10\mathrm{Log}L(r)/10+10\mathrm{Log}L_{10,ve}/10)$

L(r) Vibration by construction work

$L_{10,ve}$ Vibration by Lorries

a.Vibratiion by construction work

L(r)= $L(r0)-15\cdot\log(r/r0)-8.68\alpha(r-r0)$

L(r): Vibration level

L(r0): Vibration level at the reference point

r Distance to prediction

r0 Distance to the reference point

α Internal damping factor =0.01 (given by the work type)

Table: Vibration by construction work at the reference point

		Damping factor	$L_{10}*$ d(BA)
Asphalt paving	Subbase/base course	0.001	59
	Asphalting	0.001	56
Concrete paving	Subbase/base course	0.001	59
	Concreting	0.001	75

b.Vibration by lorries

$L_{10,ve}$ Upper limit of 80% range (dB)

$L_{10,ve}=L_{10}*+\Delta L$

ΔL Increment of vibration by lorries
$=a\cdot\log(\log Q')-a\cdot\log(\log(Q))$

Q' Equivalent traffic volume per 500 seconds per lane (number/500s/lane)
＝500／3,600／M＊(Q1+K(Q2+Qcon))

Q1 Number of medium vehicles per hour (Number/hour)

Q2 Number of large vehicles per hour (Number/hour)

Qcon Number of construction vehicles(=lorries) per hour (Number/hour)

K Conversion factor of large vehicle to medium vehicle

Dust

Rd=	Weight of dust fallen ton/km2/day		
	=N・Cd・(3.5・(0.2・x + 0.35))		
	N:	Daily total traffic volume	
Cd=	a・(u/u0)−b・(x/x0)−c		
	Cd:	Amount of dust fallen at the location of prediction which was raised by a truck ton/km2/m2/truck	
	a:	Unit dust fallen at the referent point	
		Dust fallen raised from $1m^2$ by a construction vehicle, ton/km^2/truck/m^2	
	u:	Wind velocity, right angle to road	
	u0:	Reference wind velocity	1m/s
	b:	Factor by wind	1
	x:	Distance m	
	x0:	Reference distance m	1
	C:	Coefficient of dispersion of fallen dust	2

Table: Unit dust fallen at the referent point

Surface conditions	ton/km^2/truck/m^2
Unpaved	0.23
Unpaved/steel plate	0.03
Unpaved/water sprinkled	0.012
Paved	0.0014
Paved with tire washed	0.0007

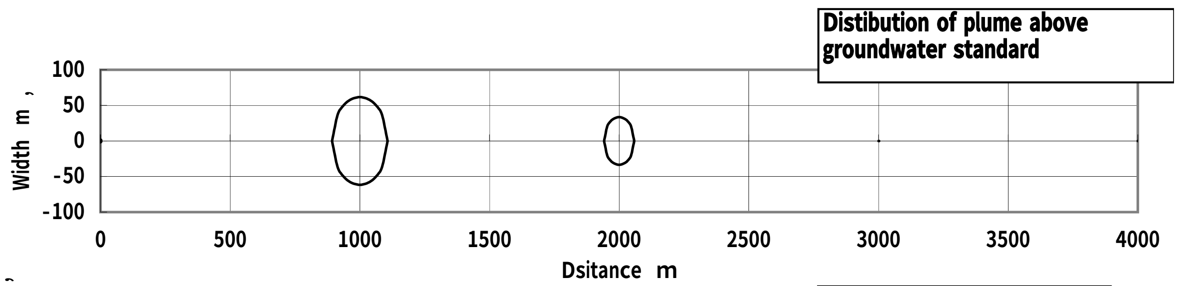
Plume (Point loading) and Environmental Standards：Baetsle's Model

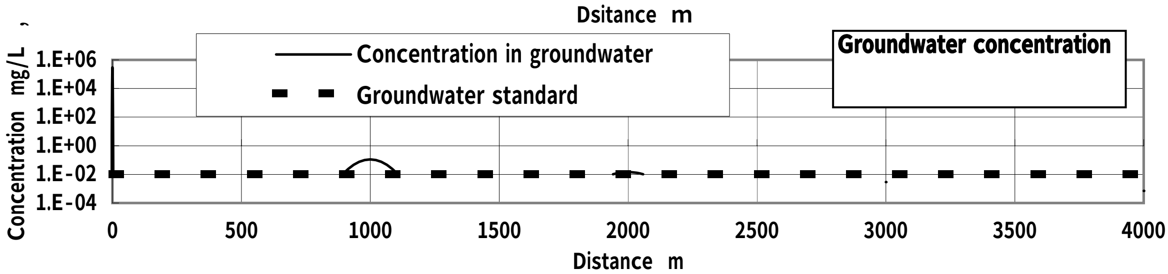
Groundwater velocity		cm/day	10	To be changed
Groundwater standard	Benzene	mg/L	0.01	
Air standard	Benzene	mg/m^3	0.003	
Half life	Benzene	1/day	0.0001	
Henry's Coeffi	Benzene	air	0.003	
Amount spilled		kL	1.E-01	
Dispersion factor		cm	120	
Detectable limit		mg/L	0.010	

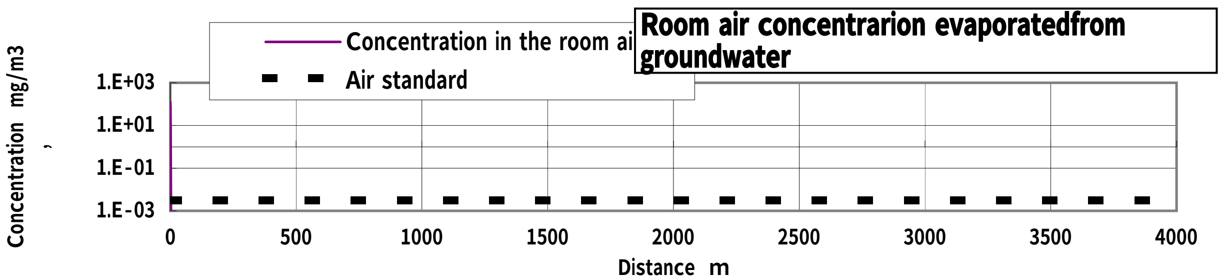
Recommended

Benzene	Trichloroethylene
0.01	0.03
0.003	0.2
0.001～0.01	
0.22	0.77

Pulume	Groundwater bevlocity	Elapsed day	Distance	Dispersion factor			Concentration at the center	Demension of plume above standards	
	u_t	t	x	Dx	Dy	Dz	c(x,0,0,t)	Length	Width
NO.	cm/day	day	m	m^2/day	m^2/day	m^2/day	mg/L	m	m
1	10	1	0.1	0.12	0.0	0.012	2.97E+05	6	3
2	10	10000	1000	0.12	0.0	0.012	1.10E-01	214	123
3	10	20000	2000	0.12	0.0	0.012	1.44E-02	116	67
4	10	30000	3000	0.12	0.0	0.012	2.91E-03	0	0
5	10	40000	4000	0.12	0.0	0.012	7.00E-04	0	0







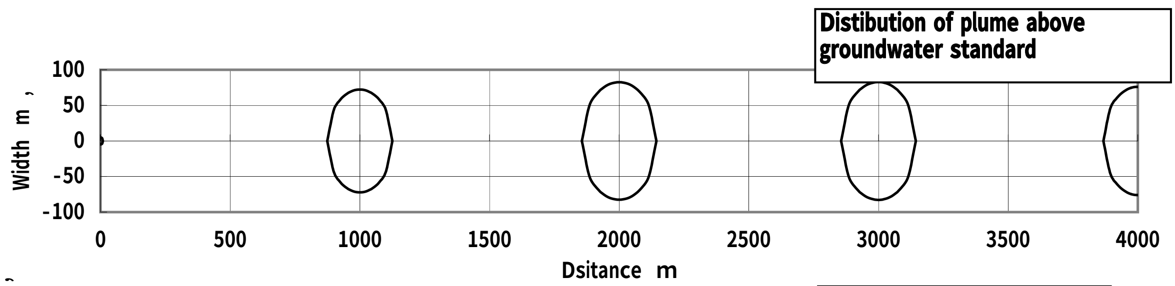
Plume (Point loading) and Environmental Standards：Baetsle's Model

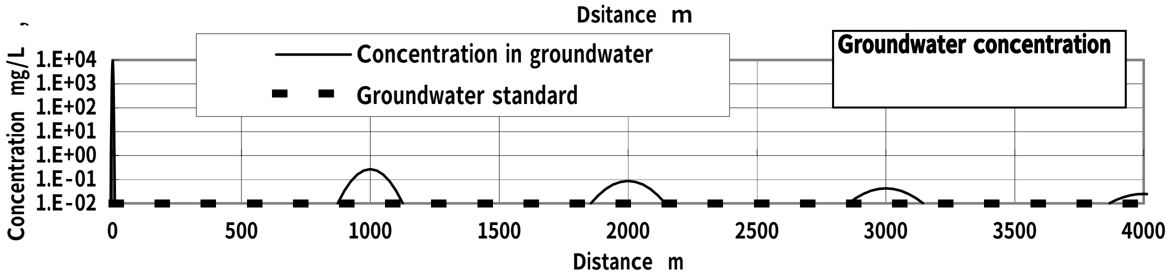
Groundwater velocity		cm/day	**100**	To be changed
Groundwater standard	**Benzene**	mg/L	**0.01**	
Air standard	**Benzene**	mg/m^3	**0.003**	
Half life	**Benzene**	1/day	**0.0001**	
Henry's Coeffi	**Benzene**	air	0.003	
Amount spilled		kL	**1.E-01**	
Dispersion factor		cm	120	
Detectable limit		mg/L	0.010	

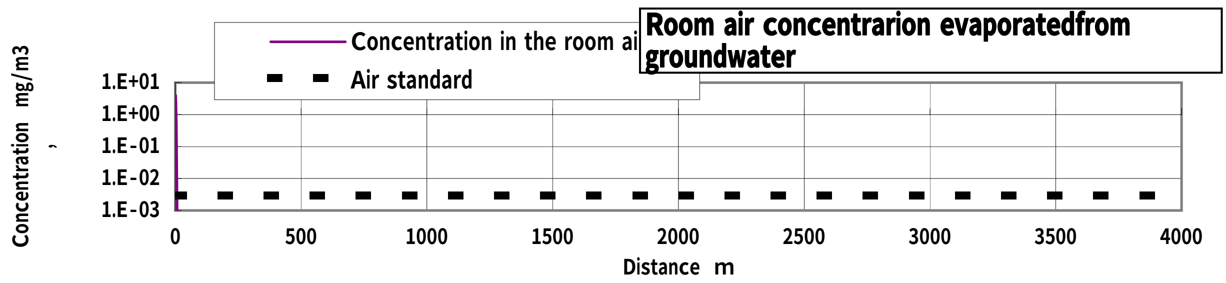
Recommended

Benzene	Trichloroethylene
0.01	0.03
0.003	0.2
0.001～0.01	
0.22	0.77

Pulume	Groundwater bevlocity	Elapsed day	Distance	Dispersion factor			Concentration at the center	Demension of plume above standards	
	u_t	t	x	Dx	Dy	Dz	c(x,0,0,t)	Length	Width
NO.	cm/day	day	m	m^2/day	m^2/day	m^2/day	mg/L	m	m
1	100	**1**	1	1.2	0.4	0.12	9.41E+03	16	9
2	100	**1000**	1000	1.2	0.4	0.12	2.69E-01	251	144
3	100	**2000**	2000	1.2	0.4	0.12	8.62E-02	288	165
4	100	**3000**	3000	1.2	0.4	0.12	4.25E-02	288	166
5	100	**4000**	4000	1.2	0.4	0.12	2.50E-02	265	152







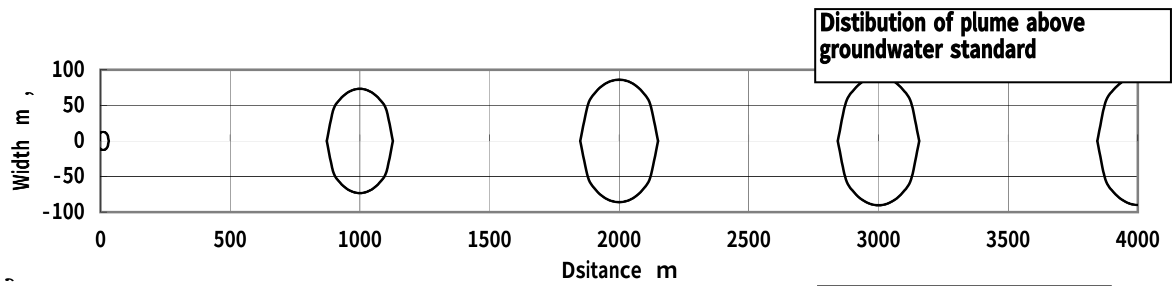
Plume (Point loading) and Environmental Standards：Baetsle's Model

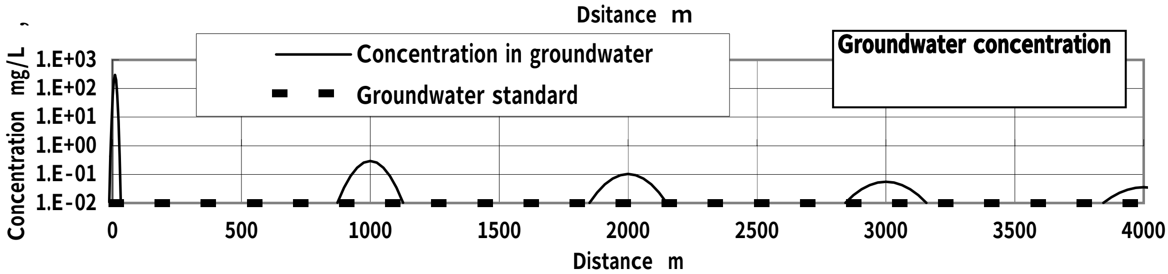
Groundwater velocity		cm/day	1,000	To be changed
Groundwater standard	Benzene	mg/L	0.01	
Air standard	Benzene	mg/m^3	0.003	
Half life	Benzene	1/day	0.0001	
Henry's Coeffi	Benzene	air	0.003	
Amount spilled		kL	1.E-01	
Dispersion factor		cm	120	
Detectable limit		mg/L	0.010	

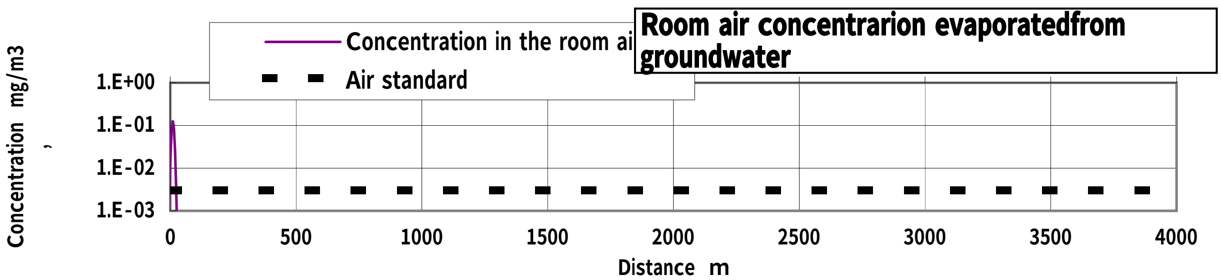
Recommended

Benzene	Trichloroethylene
0.01	0.03
0.003	0.2
0.001～0.01	
0.22	0.77

Pulume	Groundwater bevlocity	Elapsed day	Distance	Dispersion factor			Concentration at the center	Demension of plume above standards	
	u_t	t	x	Dx	Dy	Dz	c(x,0,0,t)	Length	Width
NO.	cm/day	day	m	m^2/day	m^2/day	m^2/day	mg/L	m	m
1	1,000	1	10	12	4.0	1.2	2.97E+02	44	26
2	1,000	100	1000	12	4.0	1.2	2.95E-01	255	146
3	1,000	200	2000	12	4.0	1.2	1.03E-01	299	172
4	1,000	300	3000	12	4.0	1.2	5.56E-02	314	181
5	1,000	400	4000	12	4.0	1.2	3.57E-02	313	180



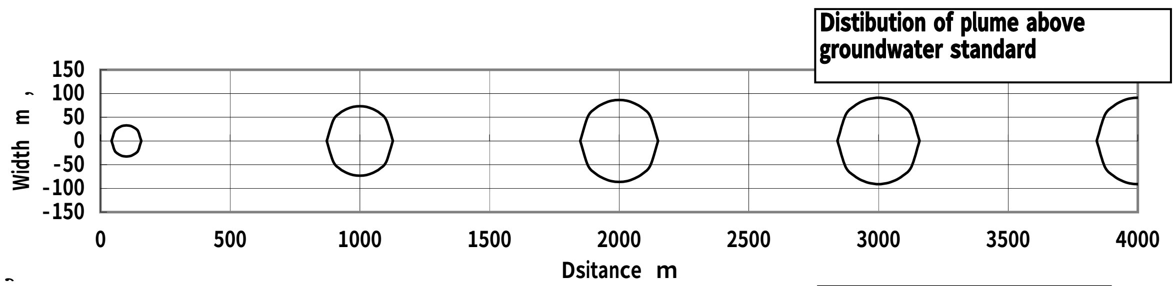


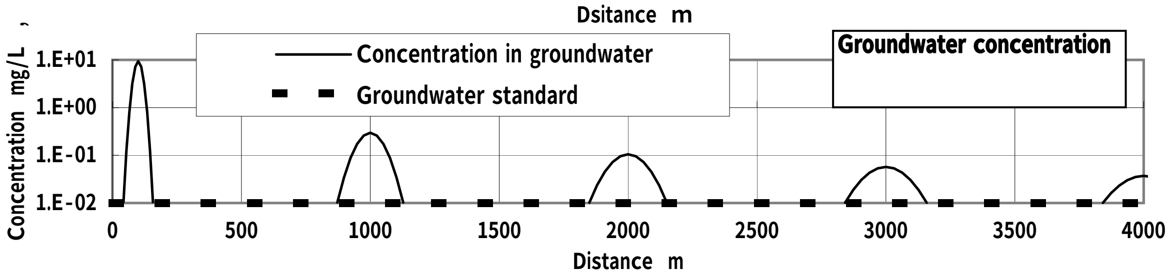


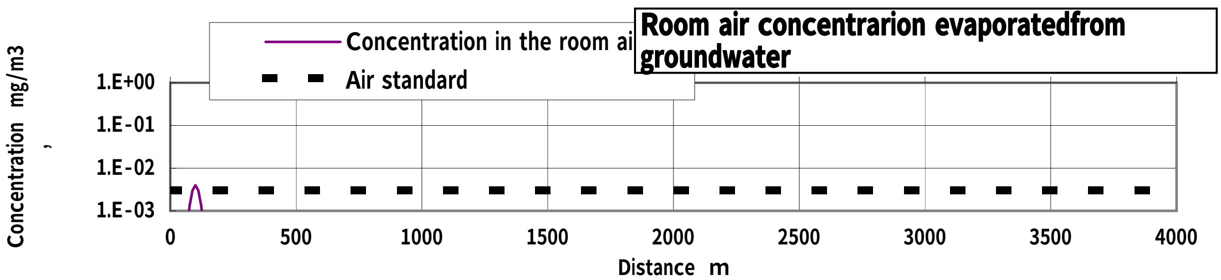
Plume (Point loading) and Environmental Standards：Baetsle's Model

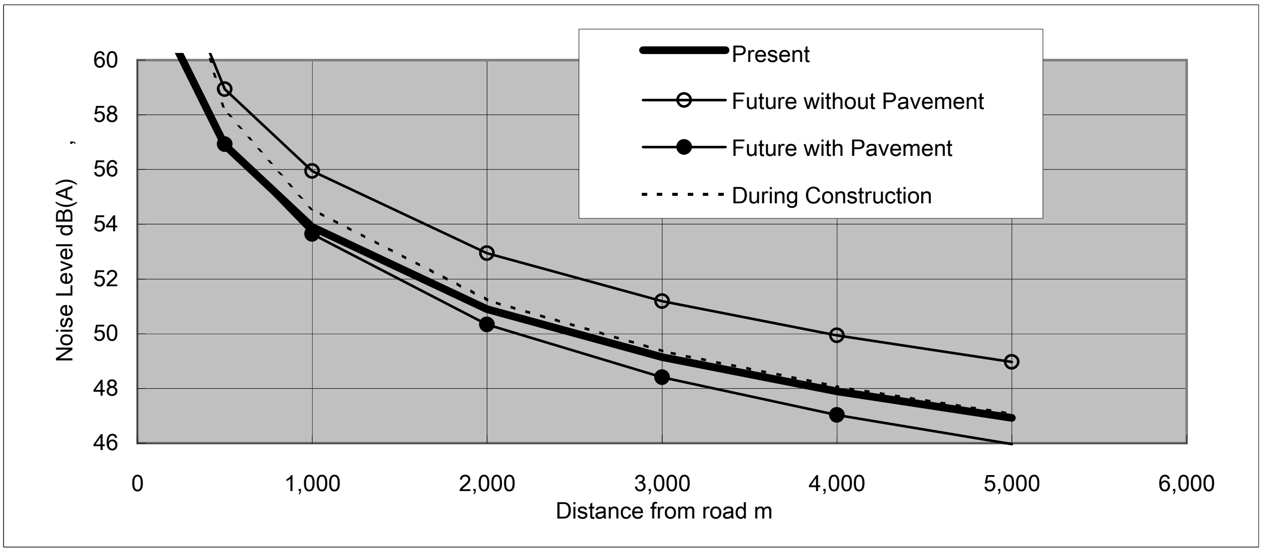
						Recommended	
						Benzene	Trichloroethylene
Groundwater velocity		cm/day	10,000				
Groundwater standard	Benzene	mg/L	0.01	To be changed		0.01	0.03
Air standard	Benzene	mg/m^3	0.003			0.003	0.2
Half life	Benzene	1/day	0.0001			0.001〜0.01	
Henry's Coeffi	Benzene	air	0.003			0.22	0.77
Amount spilled		kL	1.E-01				
Dispersion factor		cm	120				
Detectable limit		mg/L	0.010				

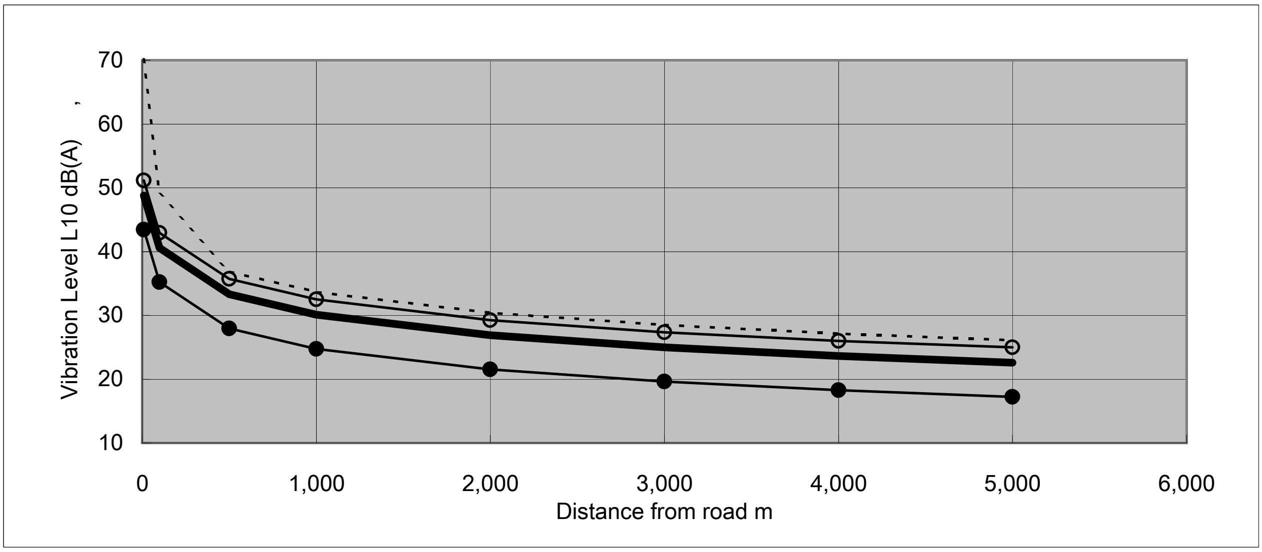
Pulume	Groundwater bevlocity	Elapsed day	Distance	Dispersion factor			Concentration at the center	Demension of plume above standards	
	u_t	t	x	Dx	Dy	Dz	c(x,0,0,t)	Length	Width
NO.	cm/day	day	m	m^2/day	m^2/day	m^2/day	mg/L	m	m
1	10,000	1	100	120	39.6	12	9.41E+00	115	66
2	10,000	10	1000	120	39.6	12	2.97E-01	255	147
3	10,000	20	2000	120	39.6	12	1.05E-01	300	173
4	10,000	30	3000	120	39.6	12	5.71E-02	317	182
5	10,000	40	4000	120	39.6	12	3.70E-02	317	182

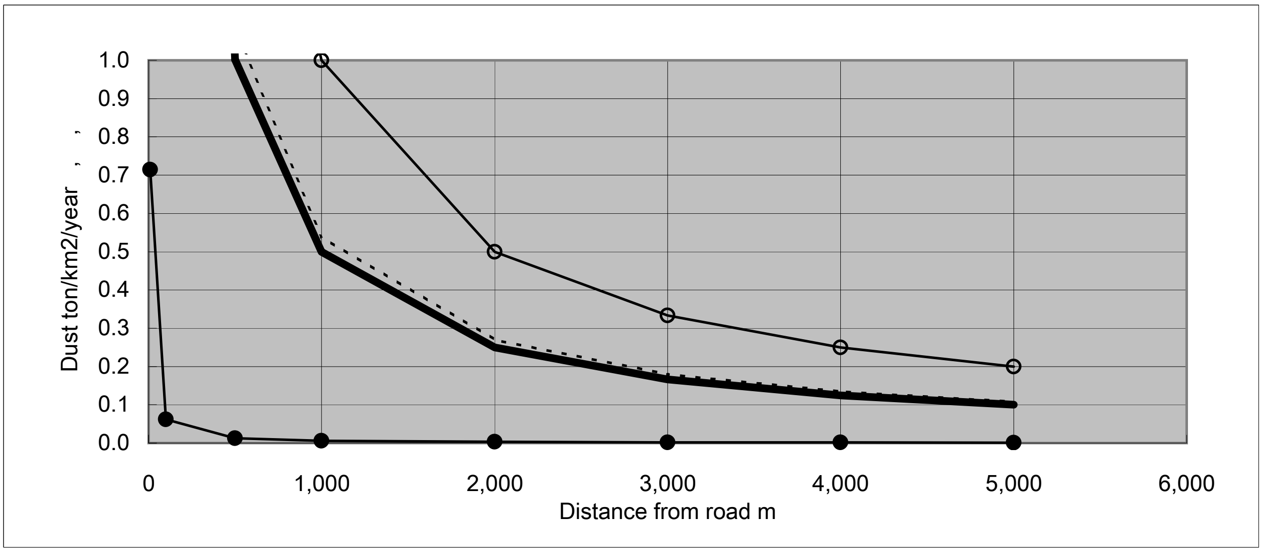


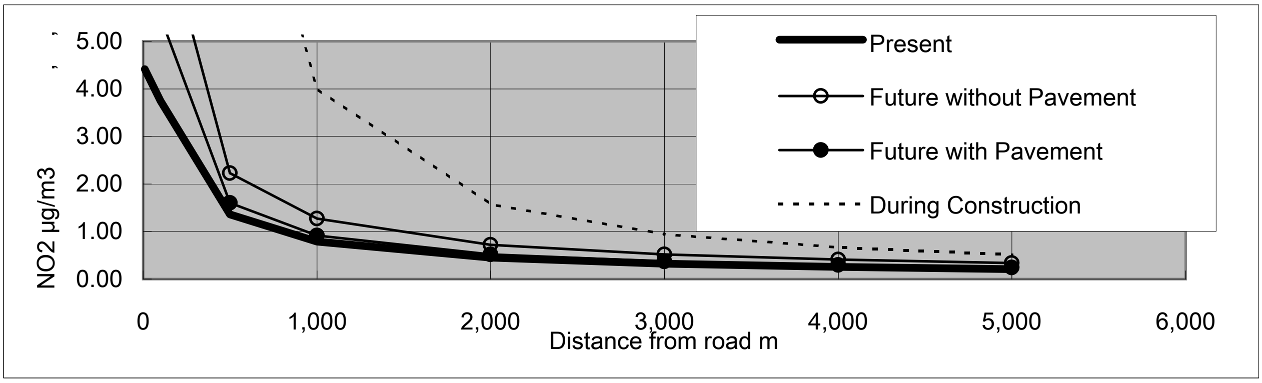


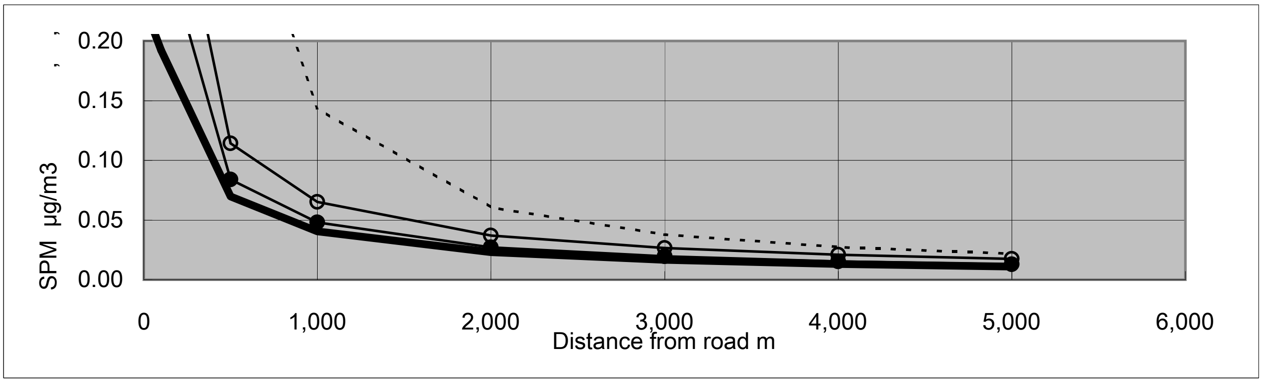


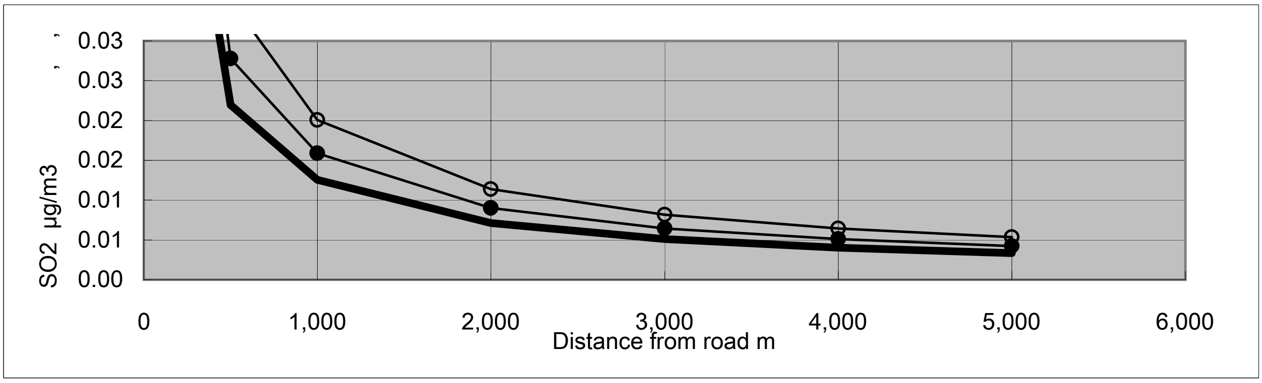

Present
Future without Pavement
Future with Pavement
During Construction
Noise Level dB(A)
60
58
56
54
52
50
48
46
0
1,000
2,000
3,000
4,000
5,000
6,000
Distance from road m

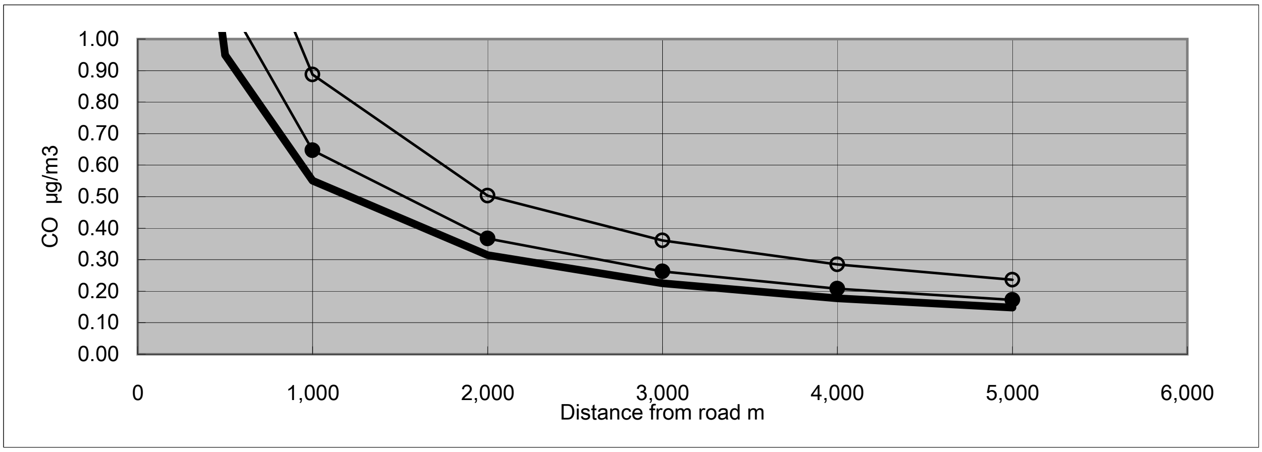

Vibration Level L10 dB(A)
70
60
50
40
30
20
10
0
1,000
2,000
3,000
4,000
5,000
6,000
Distance from road m


Dust ton/km2/year
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
1,000
2,000
3,000
4,000
5,000
6,000
Distance from road m


Present
Future without Pavement
Future with Pavement
During Construction
NO2 µg/m3
5.00
4.00
3.00
2.00
1.00
0.00
0
1,000
2,000
3,000
4,000
5,000
6,000
Distance from road m


SPM µg/m3
0.20
0.15
0.10
0.05
0.00
0
1,000
2,000
3,000
4,000
5,000
6,000
Distance from road m


SO2 µg/m3
0.03
0.03
0.02
0.02
0.01
0.01
0.00
0
1,000
2,000
3,000
4,000
5,000
6,000
Distance from road m


CO µg/m3
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
1,000
2,000
3,000
4,000
5,000
6,000
Distance from road m

Cumulative and Induced Impacts Assessment

1. Introduction and Scope of Assessment

1. This assessment covers reasonably foreseeable cumulative and induced impacts attributable to the proposed road rehabilitation Project from Km 478 to the Torugart Customs post at Km 539 (the proposed Project). This is the final segment of the Bishkek-Torugart road rehabilitation program which is being support by ADB and other donors. Work has commenced on the sections from Km 0 to Km 365, with funding from the China Export-Import Bank and other donors; and from Km 400 to Km 439, with funding from ADB. ADB has committed funding for the sections from Km 365-400 and Km 439 to Km 478, but construction has not commenced as of October 2010.

2. Induced impacts are those from activities and projects that would not proceed without the ADB-funded investments. Cumulative impacts are defined as potential environmental effects from activities and projects that take place in parallel in the same project area with possible economic linkage to the core project. The impact of a single project on an environmental factor may not be significant, but the impacts of induced and parallel projects may combine to produce irreversible damage. The purpose of assessing the cumulative and induced impacts is to identify combined effects and identify limiting and mitigating factors to ensure that the cumulative impacts will not exceed the carrying capacity of the environment.

3. For this assessment, the spatial context is the Bishkek-Tourgart road corridor including the Chatyr Kul basin. The temporal context is the near- to medium-term development period from year 2010 to 2020. Potential impacts are considered on the basis of economic dependency, and degree of certainty that collateral activities will proceed. Impacts and effects are categorized as additive, compensatory, synergistic, and masking. Additive impacts increase environmental stress, e.g., additional pollution loads from new industrial development. Compensatory effects offset negative impacts, and might include specific environmental management and ecological preservation activities implemented on a regional or sectoral basis, e.g., common effluent treatment and waste management plants in industrial estates. Synergistic effects mutually reinforce effects of the core project and could be positive or negative. Masking effects arise from activities that are not obviously linked to the core project, but may occur partly as a result of the core projects; e.g., access roads to a new hydropower plant may facilitate uncontrolled entry to environmentally sensitive areas.

4. In the context of transport sector in the Kyrygz Republic (KR), most of the [donor-funded] projects are addressing regional cooperation for trade-related transport improvements. Transport sector development is partly “demand-pull” and partly “supply-push.” The need for improved transport access and services is being induced to some extent by growth in regional trade between Central Asia and the PRC (“demand pull”). At the same time, transport investments are being used to promote economic growth in the region (“supply push”). In this case, the economic viability of the Bishek-Torugart road rehabilitation program is enhanced by

completion of the proposed Project. Increased trade is seen as certain and foreseeable. Mineral resource development, increased agricultural production, and expansion of tourism activity can be reasonably foreseen based on current development planning, although growth in these sectors is expected to be modest in the near term. Aside from potential investments in the mining sector, there are no known industrial development investments related to the Bishkek-Torugart road corridor. Agricultural growth will be inherently limited by water supplies and land capacity to support grazing. Tourism development may be the potentially largest growth opportunity; tourism growth in the near term will be concentrated around Issyk Kul.

5. The scope of this assessment covers the following potential developments:

(i) Complementary investment in the Bishkek-Torugart road corridor, which has already been committed by ADB and other financing partners; the other sections of the road are not economically dependent on the proposed Project, and therefore are not considered to be associated facilities[1]; no other associated facilities have been identified in the project area;

(ii) Proposed future investment in a regional rail line linking Uzbekistan, the KR, and the PRC;

(iii) Mineral resource development which is dependent on improved transport access and services;

(iv) Increased agricultural activities facilitated by improved transport access and services; and

(v) Increased tourism activities facilitated by improved transport access and services.

2. General Benefits and Environmental Implications

6. Development indicators are included in the Design and Monitoring Framework to evaluate the overall economic impact of the proposed Project. In terms of overall environmental impact, the key issues for evaluation of cumulative and induced impacts are: (i) whether ambient environmental quality objectives will be maintained within KR standards, and (ii) whether the Chatyr Kul and other protected areas would be degraded.

7. As discussed in Section 5 of the main report, the proposed Project is expected to have some positive benefits in the form of reduced dust, noise, and vibration. Emissions models indicate that SPM, NOX, SOX, and GHG emissions will increase slightly with the project, but

[1] In practice, if a facility is economically dependent on ADB's direct investment, then it is considered to be an "associated facility" and may be subject to due diligence. In the context of safeguards compliance, due diligence is limited to a determination of whether the facilities are in compliance with the host country regulatory requirements. ADB standards are not imposed on the associated facilities. The safeguards categories of the ADB-supported investments are determined independently. The ADB Rapid Environmental Assessment checklists do not include associated facilities. Determination that an associated facility is present does not change the category of the ADB-supported investments.

less than in the "no project" scenario. Similar benefits and impacts can be expected for the other sections of the Bishkek-Torugart road. The total pollutant load from vehicle emissions and contaminated runoff water will increase, but ambient air and water quality objectives are expected to be maintained (see main text Section 5 and Appendix 3 for quantitative emissions analyses). Potential impacts are presented schematically in Figure A4.1, summarized in Table A4.1, and discussed below.

Figure A4.1: Bishkek-Naryn-Torugart Road: Cumulative and Induced Impacts

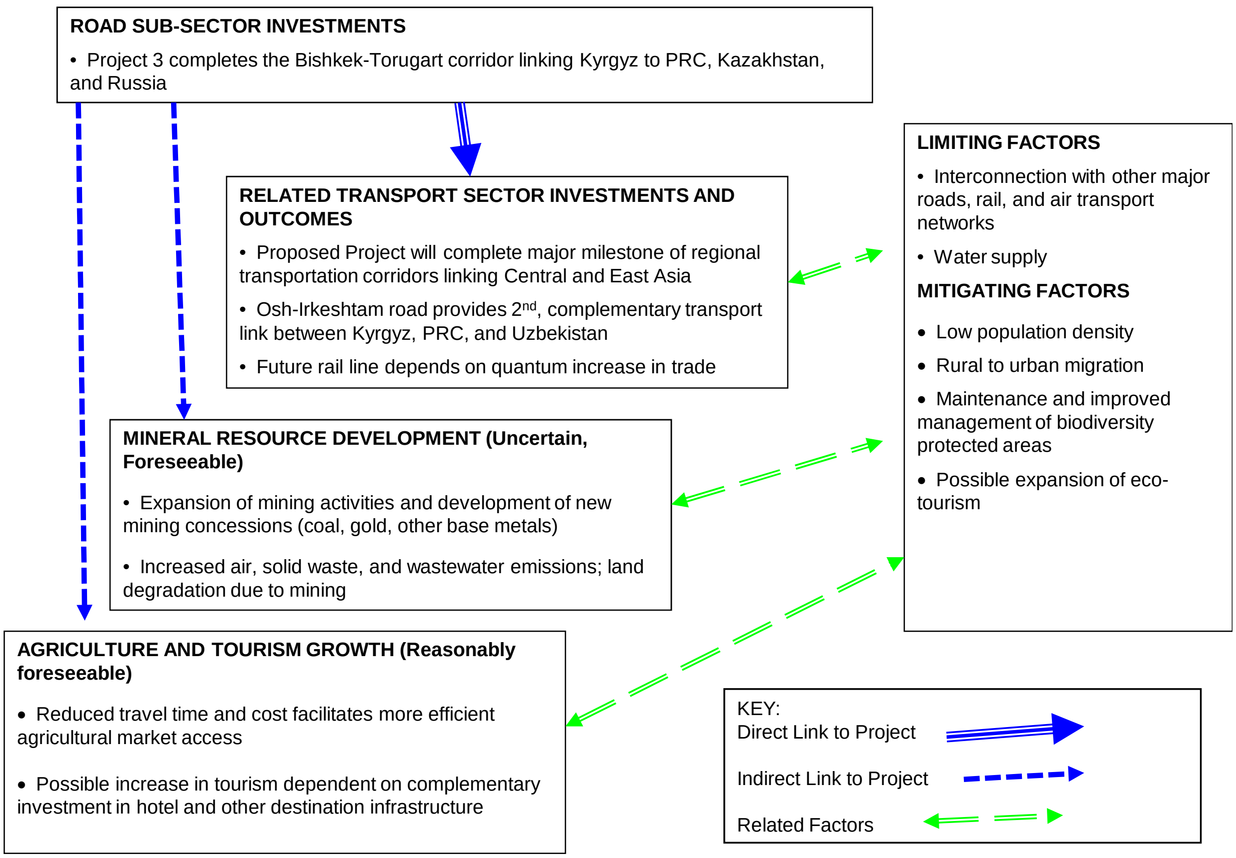


TABLE A4.1: IMPACT CHARACTERIZATION

Project or Sector	Impact Characteristics				Comments
	Additive	Compensatory	Synergistic	Masking	
Related transport sector investments	Completion of Bishhkek-Naryn-Torugart road will increase flow of traffic and vehicle emissions, but ambient environmental quality objectives are expected to be maintained.	Improved transport efficiency will reduce emissions intensity (pollutant load per ton-kilometer and per passenger-kilometer).	Improved transport access will indirectly facilitate other infrastructure improvements.	Proposed rail line is being developed independently of the road network.	Improved transportation access should benefit future development of social infrastructure (e.g., hospitals and schools).
Mining Development and other Industrial Activity	No major industrial development planned, but enhanced transport access may facilitate future development of mineral resources in the southern Kyrgyz region.	Value-added employment opportunities could foster social benefits for workers and their communities.	Future emissions growth could degrade soil and water quality and negatively impact human health.	As of mid-2010, the rail project viability is based on mineral resource development agreement between KR and PRC governments.	Pollutant emissions can be minimized with advanced, cleaner process technologies.
Agriculture	Enhanced access to markets could facilitate an increase in livestock and crop production.	Use of chemical fertilizers expected to be limited in favor of organic fertilizers due to relative costs.	Increase in chemical fertilizer use could contaminate surface and shallow groundwater.	Expanded agricultural output will contribute to overall economic growth.	Increased agricultural income is consistent with economic growth and poverty reduction objectives.
Tourism	New initiatives on tourism development would increase demand for transport services.	Eco-tourism development could support improvements in protected area management.	Eco-tourism development requires complementary investment in waste management infrastructure.	Improved road network will facilitate increased tourist access along the Bishkek-Torugart corridor, e.g., at Song Kul and Tash Rabat.	Increased tourism income is consistent with economic growth and poverty reduction objectives.

3.1 Related Transport Sector Investments

8. The transport sector investments directly related to the proposed Project are the other sections of the Bishkek-Torugart road, for which funding has been committed by ADB and other financing partners. Construction has commenced on most of the road from Bishkek to At-Bashi. Other transport investments include: (i) possible relocation of the Torugart customs facilities to a lower elevation site, possibly near the Checkpoint at Km 478; (ii) construction of a freight trans-shipment facility; and (iii) construction of a regional rail line connecting the KR with the PRC and Uzbekistan.

9. Relocation of the customs post and construction of trans-shipment facility are reasonably foreseeable, but uncertain. Both of these projects have been discussed extensively within the government, but neither project is proceeding as of late 2010. Construction of the trans-shipment facility commenced at a site between At-Bashi and Km 478, but the construction has been suspended as of mid-2010. There has been no decision to relocate the Torugart customs facility. Assuming these projects do proceed in the foreseeable future, they would be located outside of the Chatyr Kul area. Environmental impacts would be limited and related principally to incremental increases in truck traffic due to trans-shipment (smaller Kyrgyz trucks would take cargo from larger Chinese trucks).

10. The proposed rail line linking the Ferghana Valley in Uzbekistan with the PRC via Jalalabad and the Torugart Pass has been under discussion and conceptual development since 1996. A preliminary feasibility study commissioned by the EU TACIS program was completed in 2010, including a preliminary environmental assessment. The conceptual design capacity is to handle 10 – 15 million tons per year of freight. Assuming 20 tons of freight per truck, this would be equivalent to 500,000 trucks per year, or 1369 trucks per day. The proposed ADB-funded road project envisions an increase in traffic across the Torugart Pass from about 80 trucks per day to about 200 trucks per day. If the rail line break-even feasibility is 10 million tons per year, then projected freight traffic would have to increase more than 6 times beyond current traffic projections (assuming larger trucks carrying 40 ton loads, the traffic increase would be more than 3 times current projections). The feasibility of the rail line is further complicated by different track gauges in the PRC and Kyrgyz, which will require a transfer station.

11. Given the traffic projections for the proposed road project, it is not obvious that the proposed road project would create sufficient economic growth to justify the rail line. Rather, some other economic development would be required. During 2009, a preliminary agreement was reached between the KR and PRC governments to finance the rail line via “resource exchange for investment.” KR government order Number 168-p, date 18 April 2009, suspended the holding of tenders, direct negotiations, and issuing of licenses for mineral development on the following prospects (which presumably would be reserved for resource exchange): the "Terekkan" and "Perevalnoe" gold deposits in the Jalal-Abad region; the "Chechekty" deposits of nepheline syenite (aluminum) in the “Sandyk” area of the Naryn region; and the "Dangy" iron ore deposits in the "Jetim too" area of the Naryn region. Thus, it appears that the rail line would be driven mainly by extractive resource development, <u>independently of the proposed road project</u>.

3.2 Mineral Resource Development

12. Other than the prospective “rail for mining” developments noted above, there are no known industrial development projects proposed in the Bishkek-Torugart corridor. Development of coal resources in southern KR could be influenced positively by the road project, but such development would depend primarily on: (i) the type of coal resources identified (coking coal or coal for steam boilers), (ii) market prices for coal, coke, and electricity, and (iii) a favorable investment framework for coal production and new coal-fired power plants. After independence, coal production in the KR declined from about 3,753,000 metric tons in 1990 to 332,000 metric tons in 2005.[2] There are no indications that local market conditions will change in the foreseeable future which would result in new coal mining ventures in the KR, but coal use for power generation in the Asia region is projected to grow during the next 2 decades, so this is a foreseeable but uncertain development scenario.

13. *The Mineral Resources Map of the Kyrgyz Republic*, 2002 (compiled by Vikoronov, et al), shows identified coal deposits near the Torugart Pass with estimated reserves in the range of 200 – 500 million tons. In the area between Naryn and Jalalabad, there are 7 other identified coal deposits with the same range of estimated reserves. It is important to note that these estimates are for “potential” reserves, which would require further quantification by exploratory mapping, drilling, and analyses, which would then allow an estimate of economically recoverable reserves to be made. None of these deposits have been developed. The only developed coal deposits marked on the 2002 map are near Karakul (east of Issyk Kul) and near Sylykta in extreme southwestern KR.

14. Assuming that the coal reserve estimates are correct, the potential market value is considerable: 200 million tons produced over a 20 year operational lifetime (10 million tons per year) with a market price of $70 per ton represents undiscounted gross revenue of $700 million per year. The logical destination for coal mined near the Torugart Pass would be the PRC; this export scenario would not be dependent on the proposed road project. The cost of mine development and operations would have to be recovered, and a long-term off-take contract would need to be secured.

15. Simultaneous development of several of the coal deposits in the Jalalabad-Naryn-Torugart region presents a more attractive scenario: if all 8 deposits with 200 million tons were developed at the same time, producing over a 20 year period at $70 per ton represents undiscounted gross revenue of $5.6 billion per year. This coal development scenario (80 million tons per year) suggests the need for a rail line, which would be economically independent of the proposed road project. As is the case for a single mine noted above, substantial capital would need to be committed to coal mine development prior to securing an off-take contract.

[2] ADB. 2007. *The Kyrgyz Republic Natural Resource Sector Study*. Manila; Table 1, page 5. The original sources cited are: *ADB Key Indicators 2006*, and *Selskoe khozyaisto KR 1999 – 2003*, NCS 20004.

16. A more economically attractive scenario for coal exploitation would be for mine-mouth electric power production, which could complement seasonal hydropower output and offset the need for electricity imports (mainly from Uzbekistan). Assuming 350 tons coal per gigawatt-hour of electricity generation, 10 million tons per year of coal production could theoretically produce 28,571 gigawatt-hours per year of electricity. Assuming $0.05 per kilowatt-hour off-take price (which is a rule-of-thumb reference price for coal-fired power), 28,571 gigawatt-hours per year of electricity represents about $1.4 billion per year in potential value-added revenue, or 2 times the revenue associated with the simple sale of coal noted above. The development of coal for electric power generation would be highly dependent on the off-take price, and independent of the proposed road project. This scenario is considered to be unforeseen and highly uncertain. However, aggressive development of coal for in-country power generation and export via high-voltage transmission lines would be a more valuable economic development prospect than simple exports of coal.

3.3 Agricultural Development

17. Agricultural productivity increases are reasonably foreseeable, as the Bishkek-Torugart corridor provides improved transport access to markets. Increases in crop production are limited by water resource constraints. Synergistic effects could result from increase in chemical fertilizer applications, but the incremental expense to farmers is a limiting factor. Increased cropping should improve farmers' incomes, which is consistent with economic development objectives. Increases in livestock production are limited by the available grazing area, unless feed crops are utilized for animal feed operations.

3.4 Tourism Development

18. The other sections of the Bishkek-Torugart Road provide improved access to the Issyk Kul and Song Kul protected areas. Issyk Kul is a major tourism destination, attracting more than 1 million visitors a year from the Bishkek area, Kazakhstan, and Russia (rather than the PRC). Rehabilitation of the road between Bishkek and Balykchy will support increased tourist arrivals at Issyk Kul, independently of the proposed road Project. ADB is supporting development of environment-friendly infrastructure for the Issyk Kul area through the *Issyk Kul Sustainable Development Project* approved in late 2009; the water supply and wastewater treatment investments supported by this project are intended to mitigate the impacts of expanded tourism.

19. Improved transport access to the Song Kul and Tash Rabat areas may also result in an increase in tourism, but this potential tourism growth is not dependent on the proposed Project as most tourist arrivals are expected to originate from the Bishkek and Naryn regions rather than the At-Bashi valley and the PRC. Potential impacts on Song Kul may be more significant than in the case of Issyk Kul, as there is no comparable sustainable development investment program.

20. The Tash Rabat site is currently the only significant tourist destination between Naryn and the Torugart Pass. The proposed Project will facilitate tourist traffic between Naryn and Kashi in the PRC, with Tash Rabat being a logical destination for overnight stops. However, most of the projected traffic increase on this route will be freight rather than tourists. Tourist

arrivals from Naryn would not necessarily depend on the proposed Project. Tourist arrivals from the PRC would be facilitated by the proposed Project.

21. As discussed in the main report, the proposed Project is adjacent to the Chatyr Kul protected area, which is off-limits to tourists at present. There are no plans to open this area for routine tourism. Potential impacts on Chatyr Kul are discussed in detail in the main report.

4. Conclusions

22. The proposed ADB-funded project will complete the Bishkek-Torugart road rehabilitation program, which will improve transport access throughout the corridor. Cumulative and induced impacts can be expected to result from completion of this overall program, but most of the potential impacts would not be dependent on completing the proposed Project (from Km 478 to the Torugart Customs post). Tourism growth is expected to be more likely than agricultural and industrial growth, and would be concentrated at Issyk Kul where compensatory infrastructure investments are being supported by ADB and other donor agencies. Agricultural growth is inherently limited by land and water resource constraints. Mineral resource development is foreseeable, but would not obviously depend on the road corridor.

23. The ADB-funded investments for the Bishkek-Torugart road will have cumulative impacts related to increased emissions in proportion to increased traffic flow. Ambient environmental quality objectives are expected to be maintained; therefore the cumulative impacts are considered to be insignificant. Induced impacts are foreseeable, but limited in scale and dependency on the proposed road project, and are therefore considered to be insignificant. Potential environmental impacts to the Chatyr Kul area will be mitigated under the proposed Project environmental management program.

Appendix 5. Summary Consultations Conducted by JOC Team in 2009 and 2010

Minutes of Meeting of the First Public Consultation

Date: September 18, 2009

Place: Naryn City, Naryn City Administration (meeting hall)

Organizers:

- Vice Mayor of Naryn City Administration – Mr. Marazinov Ulan Turatbekovich
- PIU Environmental and Social Specialist – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japanese Overseas Consultants: JOC.) – Mr. Shoji Takeo
- International Social Specialist (JOC) – Mr. Yoshitoshi Kobayashi

Attendants: A total of 40 participants including:

- Naryn Ecological local NGOs
- Local City Administration
- Management of Architecture and Transport,
- Karatal-Japyryk State Preservation
- RMU
- University
- Mass media

Subject:

- Collection of Stakeholders' opinion, advice and questions for the project and EIA report of section (km 479- 536) of Chatyr –Kul lake beyond the check point.

Outline of discussion:

- More than 35 people took part in Stakeholder Meeting in Naryn City Administration (meeting hall). Stakeholders Meeting was officially opened by Vice Mayors' introduction of Japanese and local consultants to the participator of the meeting. All the participators were paying attention in ADB Grant 0123- KGZ (SF): CAREC Transport Corridor 1 (Bishkek- Naryn-Torugart Road) Project. Mr. Shoji Takeo and PIU Ms. Sveta Keldibaeva had introduced EIA of Project 3, Outline and Benefits, Environmental Impact and Mitigation Measures regarding to Chatyr-Kul Lake as a particular protected area, which is ratified in Ramsar Convention.

- Mr. Bakyt Rysbekov (chairman of Ombudsman Local Representation in Naryn) has raised the question about unemployment. (Working place for local people, there are unemployment people in Naryn, its necessity them to offer by job during the rehabilitation of the road). Require of Information about the overall project in detail
- Mr. Bakyt Egemberdiev – Naryn City Administration worker, complained to the:
  - ➢ No accurate information about Project Bishkek-Naryn-Torugart Project
  - ➢ Necessity to involve to the project local people and workers
  - ➢ Necessity to be provided to local mass media about activities of the Project
- Mr. Bagysh Toktosunov – Head of Naryn Pubic Service, he complained and insisted in:
  - ➢ Lack of detailed and accurate information of the project section 1,2,3
  - ➢ Exact and transparent budget of the project
- Mr. Rahat Toktorbaevich – Local municipal government complained and insisted in:

Necessity of Environmental survey before the commence of the project

- ➢ Necessity to control the overweight of the load of Chinese trucks on the Bishkek-Naryn –Torugart, because Chinese trucks are destroying the road
- ➢ Strict law enforcement not to over speeding and overloading

- Mr. Maksat Joldoshbekov – Coordinator of the local project, he insisted in:
  - ➢ Local people should be more involved in and more informed in activities of the project
  - ➢ Announce accurate and transparent budget of the project to local people.
- Mr. Bolot Jandyraliev –senior research worker in the Scientific and Research Department of Karatal- Japyryk State Preservation. He complained and insisted in:
  - ➢ Maintain and preservation the bio variety of flora and fauna in Catyr-Kul Lake

- To avoid noise, duster, land and water pollution
- To minimize the construction period at hatching/breeding season of the birds

- Mr. Ermek Baibagyshev – Head of International Department of Naryn State University. He insisted in:
  - Accurate and clear Power Point Presentation regarding to EIA for the Bishkek-Naryn-Torugart Project in next Stakeholders Meeting
  - Update about activities of the Project

List of Participants (Only for those who made signatures)

№	First and Last Name	Title	Organization
1.	Egemberdiev B.J	Mayor adviser	Naryn City Administration
2.	Toktosunov B	-	Management of Architecture and Transport
3.	Kaptanbetov Ulanbek	Senior Architect	Management of Architecture and Transport, Naryn
4.	Kojomkulov Turdubek	Guard	Naryn City Administration
5.	Baigaziev Toktobek	Engineer	Naryn Sewage System
6.	Orokov A.D.	Main Specialist	Naryn City Administration
7.	Kayimov Usonbek Maadanbekovich	Director	Naryn City Administration
8.	Jumaev Tologon Mambetkulovich	Chairman	Naryn City Administration
9.	Babaev O.	Manager of cultural department	Naryn City Administration
10.	Toktomamyt uulu Zamir	Project Coordinator	Naryn City Administration
11.	Osmonaliev Jumabek	Chief of RMU	Naryn City Administration
12.	Ibraev Abdylda	Leading Specialist	Naryn City Administration
13.	Toktaliev R.	Director	National Park “Salkyn-Tor”
14.	Ermek Baibagyshev	Head of International Department	Naryn State University
15.	Bolot Jandyraliev	Senor Researcher of Scientific and Research Department	Karatal- Japyryk State Preservation, Naryn
16.	Takeo Shoji	International Environmental Specialist	Japan Overseas Consultants Co., Ltd. (JOC)
17.	Yoshitoshi Kobayashi	International Social Specialist	Japan Overseas Consultants Co., Ltd. (JOC)
18.	Keldibaeva Svetlana	Environmental and Social Specialist	Project Implementation Unit, Ministry of Transport and Communication of Kyrgyz Republic
19.	Jusupbekov Shyrdakbek	National Environmental Specialist	Chuy- Bishkek-Talas inter-regional management of preservation of the environment the State EPA and to a forestry
20	Sultanova Burulsun	Translator	Japan Overseas Consultants Co., Ltd. (JOC)

Kyrgyz Republic: CAREC Transport Corridor 1 (chatyr Kul Section)
Public consultation handout
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Name of the Project: Kyrgyz Republic: CAREC Transport Corridor 1 (Project 3)

Outline of the 1st Stakeholder Meeting

Coordinated by: Project Implementation Unit and Consultants
Schedule of EIA: Table 1 (Please note the second public consultation)
Place of meeting:
Date and time:

Attendants:
(1) Environmental protection office
(2) Ecological department who recommended as Ramsar site
(3) Local government
(4) MOTC
(5) University / Institute
(6) Local NGO
(7) Press / media
(8)

Topic
1. Outline of the project
2. Project benefit
3. Environmental impact
4. Alternatives
5. Mitigation Measures
6. Analyses proposed

Appendix: Major Fauna and Flora described in the Summary of Declaration Paper of Chatyr Kul Lake as Ramsar Site

Kyrgyz Republic: CAREC Transport Corridor 1 (chatyr Kul Section)
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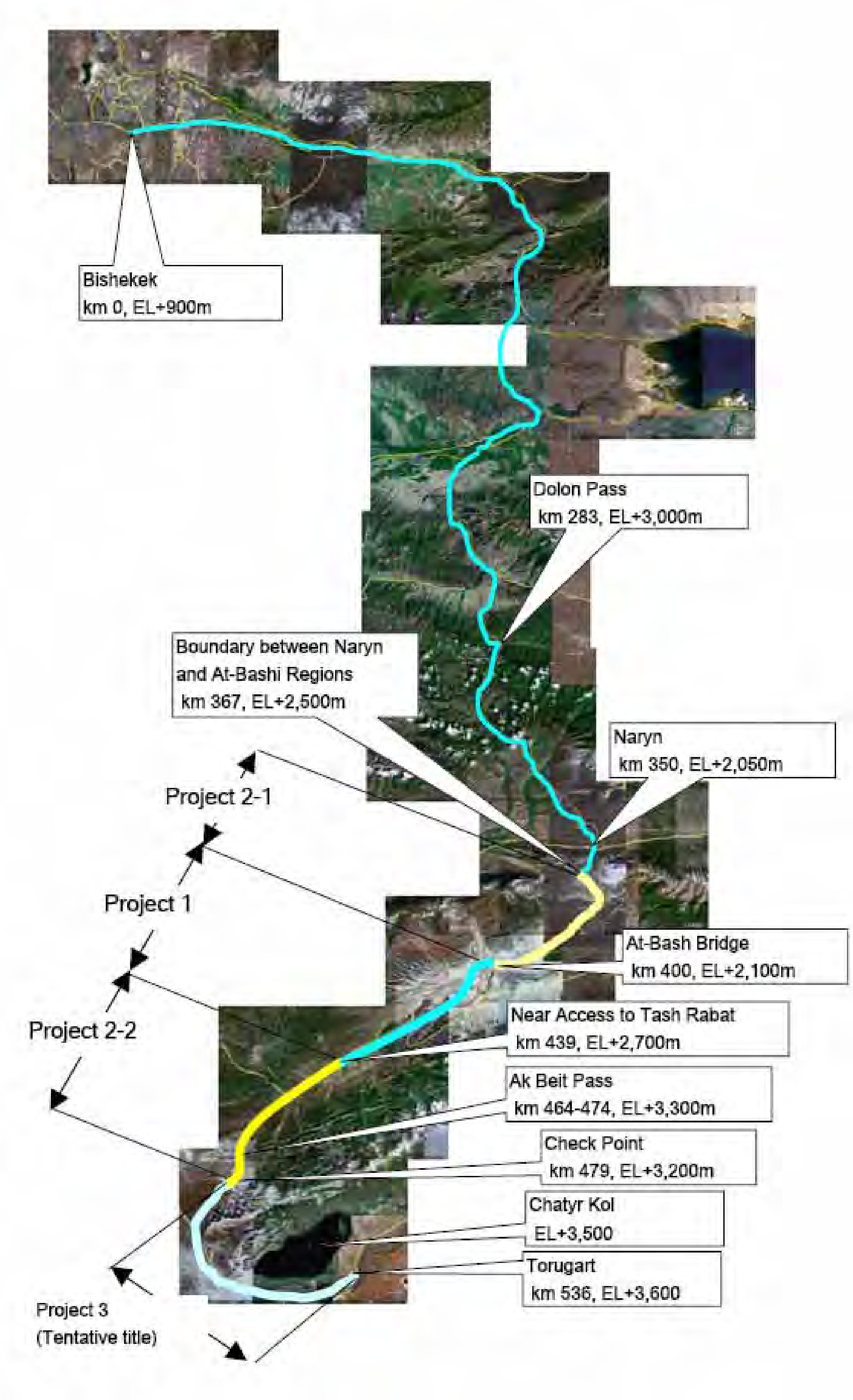

Location of Project 3 (Tentative Title)

Kyrgyz Republic: CAREC Transport Corridor 1 (chatyr Kul Section)
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Table Schedule of Full EIA for Chatyr Kul Section

Activities	Responsible	2009				2010			
		September	October	November	December	January	February	March	April
Site Reconnaissance at Chatyr Kul	Consultant								
Information Collection*	Consultant								
EIA Report Preparation	Consultant								
Public Consultation**	PIU / Consultant	Presentation of IEE		Presentation of draft EIA Report					
Public Comment	PIU / Consultant								
Examination of EIA	Kyrgyz Government								
Public Disclosure as per ADB rule (120 days)	ADB								
Approval of EIA by ADB	ADB								

* Visiting to the followings of central and local offices respectively:
(1) Environmental Protection office
(2) Ecological/Natural Reserve Office
(3) Hydrological Office
(4) Meteorological Office
(5) Statistic information center

**Note on public consultation:
(1) Public consultation shall be chaired by MOTC/PIU assisted by the Consultants
(2) Participant list and minutes of meetings shall be made
(3) Invitation letters shall be sent to stakeholders

Stakeholders to be invited includes:
(1) Environmental protection office
(2) Ecological department who recommended as Ramsar site
(3) Local government
(4) MOTC
(5) University / Institute
(6) Local NGO
(7) Press / media

30th October	Depart of Shoji from Japan
10thNovember (Tuesday)	Draft final report (English) will be sent and translate into Russian before 20th November
16th November	Summary of draft final EIA report will be sent and shall be tans rated to Russia before 20th November
20th November	Presentation of draft EIA report at second stakeholders meeting attended by representatives of MOTC and local governments
30th November	Submit final report to Kyrgyz Government
15th December (Wednesday)	Get approval of EIA from Kyrgyz Government and submit to ADB

Kyrgyz Republic: CAREC Transport Corridor 1 (chatyr Kul Section)
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Outline of the project

1. The 540 kilometer (km) Bishkek-Torugart road is part of the CAREC corridor 1linking the Kyrgyz Republic with the People's Republic of China (PRC) and other Central Asian countries. The Torugart post is a major border control and customs facility between the Kyrgyz Republic and the PRC. The road condition is poor; border-crossing facilities and procedures are outdated and inefficient, and the obstruct international traffic and trade. Improved road and customs infrastructure will remove the obstruction and open up this corridor for wider regional trade and economic cooperation. It will reduce travel and transit time from the current 3-4 days to 2 days.

T<u>he section of Project (Chatyr Kul Section) </u>is rehabilitation of gravel road of about 60km long from the Checkpoint (km479) to Customs (km536) as shown below:

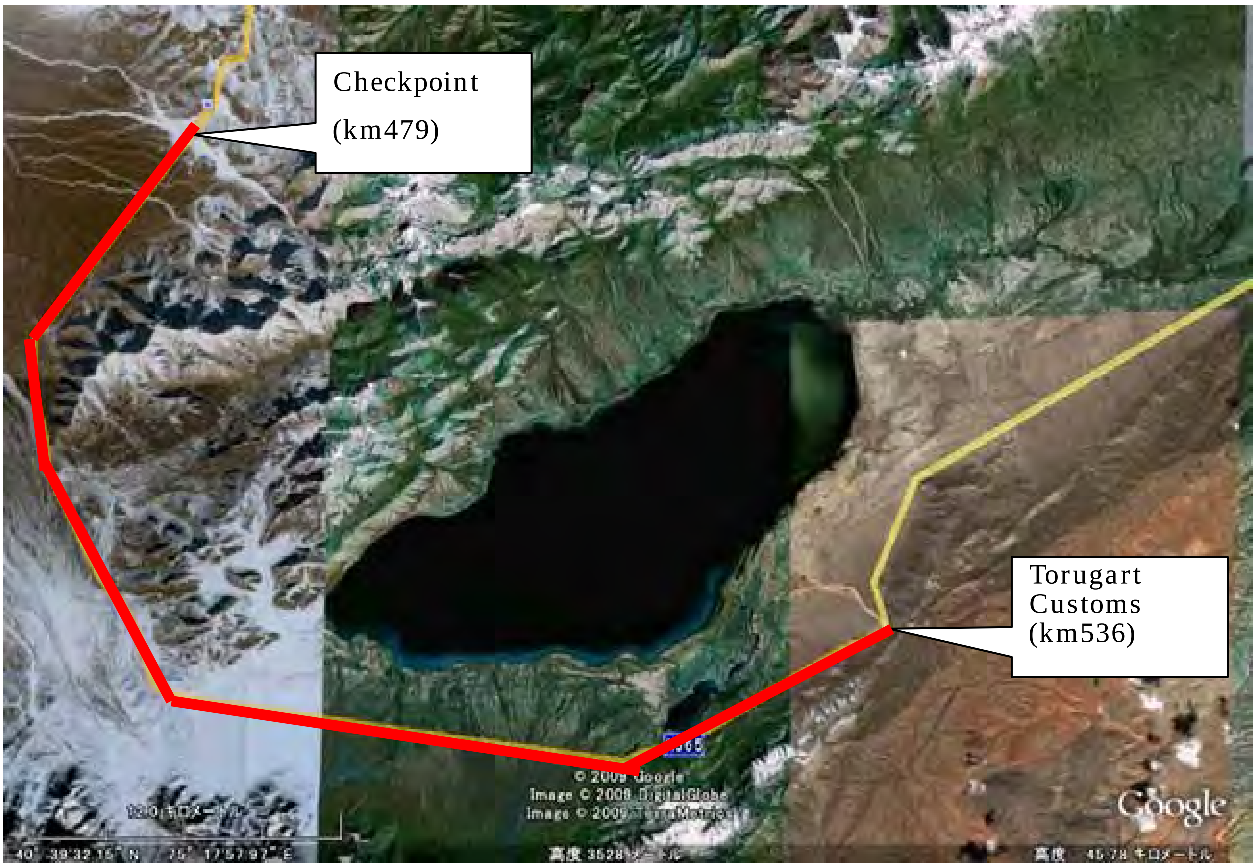

Figure Location of Road to be Rehabilitated

Project benefit

2. Reduction of Transportation cost. By improving the Bishkek -Torugart road, the Project will substantially reduce the existing obstruction to trade and foster regional economic cooperation. The entire region will benefit from the Project, while the project area will gain through economic development and increased access to markets and social services. Improving the project road will reduce transport cost, contribute to commercial and industrial development opportunities. The overall economic internal rate of return of the Project is 14.7%, and the net present value is about $37.8 million. The project is expected to help boost trade between the Kyrgyz Republic and the PRC. The total volume of bilateral trade is expected to grow from 0.5 million tons in 2007 to 3 million tons in 2015, of which the Kyrgyz Republic-PRC border at Torugart is expected to contribute more than half.

3. Poverty Reduction. The Project is not a targeted poverty intervention. Nevertheless, by, stimulating economic development, it will have poverty reduction impact and benefits. While the Project aims to facilitate regional trade and thereby benefit major businesses and those involved in trade and commerce, it will also significantly benefit rural communities and especially rural poor. Speciffically, the Project will indirectly benefit 2.3 million people living along the project road, 51% of whom are women dominant in intra- and inter-oblast (province) trade and commercial activities in the Kyrgyz Republic, Two of the three oblasts where the project road passes have poverty levels below the national average of 46%. Extreme poverty in these two oblasts is almost double the national average of 13.5%.

4. Reduction of Present Adverse Environmental Impacts to Chatyr Kul. Presently, the Chatyr Kul is registered as Ramsar site. However due to acceleration of deterioration of road, disturbance such as noise, vibration and exhausted gas generated by heavy trucks, to the ecosystem of Chatyr Kul are being worsen year by year. In addition, the number of passing trucks will be increased year by year. Therefore, to minimize the impact by these vehicles, it is necessary to improve/rehabilitate the present shabby road. However it also is noted that there is a risk that the unforeseen excessive increase of traffic volume may cancel the merit of road rehabilitation.

Environmental impact

5. Based on the data collection from existing reports and internet, the impact to environment is summarized as in Table 1. As shown in the table major impacts will be arisen during construction.

Kyrgyz Republic: CAREC Transport Corridor 1 (chatyr Kul Section)
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Table Su mmary of IEE

<table>
<tr><td></td><td></td><td colspan="6">Environmental impact during construction</td><td colspan="3">Environmental impacts during operation</td><td rowspan="2">Scoping</td><td rowspan="2">Possible mitigation measures</td></tr>
<tr><td></td><td>Endangered Biodiversity Site / Species</td><td>Borrow pit / quarry</td><td>Waste dumping</td><td>Workers' camp</td><td>Noise, vibration and emission</td><td>Oil leakage</td><td>Detour construction</td><td>Noise, Vibration and emission</td><td>Increase of traffic volume</td><td>Oil leakage</td></tr>
<tr><td rowspan="4">Fauna</td><td>Pamir Brown-headed gulls</td><td>Serious</td><td>Serious</td><td>Serious</td><td>Potentially serious</td><td>Potentially serious</td><td>Serious</td><td colspan="2" rowspan="7">Likely not seriously impacted since the lake is 3km away from the existing road, except around auxiliary ponds which are not included as Ramsar Site</td><td>Potentially serious</td><td rowspan="4">Collection of data on hatching / breeding period and area together with studies of mitigation measures</td><td rowspan="7">1) No borrow pit / camps located around Chatyr Kol, no discharge of liquid waste including muddy water into the lake
2) Construction of road side drainage for oil leaking and regular patrol,
3) Regulate the traffic volume while breeding and migration period etc, overloading / overspeeding
4) Maintenance check of vehickles before passing (especially check of oil leakage)
5)Noise barrir near auxillary ponds / sensitive area
6)Cleaning of vehicle to prevent import of alien flora/fauna from PRC</td></tr>
<tr><td>Bar-headed geese</td><td>Serious</td><td>Serious</td><td>Serious</td><td>Potentially serious</td><td>Potentially serious</td><td>Serious</td><td>Potentially serious</td></tr>
<tr><td>Tadorna ferrunginea with other 8 ducks</td><td>Serious</td><td>Serious</td><td>Serious</td><td>Potentially serious</td><td>Potentially serious</td><td>Serious</td><td>Potentially serious</td></tr>
<tr><td>Argali sheep (Red Book listed)</td><td>Serious</td><td>Serious</td><td>Serious</td><td>Potentially serious</td><td>Potentially serious</td><td>Serious</td><td>Potentially serious</td></tr>
<tr><td>Flrora</td><td>Patamogeton</td><td>Serious</td><td>Serious</td><td>Serious</td><td>Negligeable</td><td>Potentially serious</td><td>Serious</td><td>Potentially serious</td><td rowspan="3">Data collection</td></tr>
<tr><td>Plankton</td><td>Gammurus krevetiki</td><td>Serious</td><td>Serious</td><td>Serious</td><td>Negligeable</td><td>Potentially serious</td><td>Serious</td><td>Potentially serious</td></tr>
<tr><td>Human</td><td>Nomad</td><td>Serious</td><td>Serious</td><td>Serious</td><td>Potentially serious</td><td>Potentially serious</td><td>Serious</td><td>Potentially serious</td></tr>
</table>

Alternatives

6. We studied following alternatives studies:

- No action alternatives. This baseline action will continue to be barriers to transport section and, especially to environment of Chatyr Kul ecosystem
- Transport mode alternatives. There is no railway or waterway in this section
- Alternative alignment. An east bounded route from Torugart through Ak-Sai Valley to Naryn is available. However this route also disturbs the ecosystem of Chatyr Kul more or less and construction cost becomes quite expensive compared to the proposed route through At-Bashi valley.

Mitigation Measures

7. Most serious environmental impact is caused during construction. Operation of borrow pit/quarry/asphalt batching plants will rise noise, vibration and dust. To minimize these impacts, these facilites will be located much enough away from the habitats of fauna not to scare them. All the construction waste will be move out of the protected area and properly treated. Equipments shall be always well maintained not to cause oil leakage. Construction period shall be limited at other than breeding time of migrating birds.

8. Strict law enforcement, in addition to construction of ditch/noise barrier when necessary, shall be proposed to reduce environmental impact to Chatyr Kul Lake including:

- Inspection of trucks at Customs/Checkpoint if they are properly maintained not cause oil leakage, generation of excess noise and/or emission
- Regulating overloading/overspeeding
- Some traffic control while breeding period
- Environmental education

Analysis Proposed

9. Following analyses are proposed for to analyze environmental impacts and planning mitigation measures:

- Confirmation of breeding time and locations for migrant birds
- Comparison of adverse environmental impacts incases with and without Project 3
- Hydraulic Study
- Vehicle noise transmission analysis,
- Exhausted gas dispersing analysis
- Bio-disintegration rate of oil

Appendix: Major Fauna and Flora described in the Summary of Declaration Paper of Chatyr Kul Lake as Ramsar Site

Brown-headed Gull

Bar-headed Geese

Tadorna ferrunginea

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Argali sheep (Red Book listed)

Patamogeton

Gammurus krevetik

Name of the Project: Kyrgyz Republic: CAREC Transport Corridor 1 (Project 3)

Outline of the 1st Stakeholder Meeting

Ladies and gentlemen,

Thank you very much for coming to this First Stakeholder Meeting for the Project. My name is Shoji, an environmental specialist coming from Japan working on behalf of Kyrgyz Government.

The purpose of this meeting is to get your opinion, advises and questions from you about the Project and Environmental Study we are going to do for the Section (km479-536) of Chatyr Kul beyond the checkpoint.

Project Outline and Benefits

ADB, Asian Development Bank, will give money to Kyrgyz Government to rehabilitate the road from Torugart, border with China to Checkpoint, length of about 70km at the southside of Chatyr Kul Lake.

This road is one portion of Bishkek-Torugart Route and, by rehabilitation, the trade between China through Torugart Customs, will be boosted to grow from 0.25 million (2007) tons to 1.5 million tons (2015), since the traveling time from Torugart to Bishkek will be halved from 3-4 day to 2 days only.

Thus, the project activates the total national economy, contributing poverty reduction. Specially, the project will indirectly benefit many people who reside the road side engaging trade and commercial activities in below poverty level.

In addition, rehabilitation of road will reduce the present adverse impacts caused by heavy trucks from China, noise, vibration, dust and exhausted as are excessively emitted due to poor road condition. (at the same time, there is a risk that the improved road may increase of traffic volume as may again worsen the environment.)

Environmental Impact

The problem is that Chatyr Kul Lake is registered as Ramsar site since many important migrating birds such as Brown-headed Gulls, Bar-headed Geese, and Tandorna ferrunginea, flies to here for breeding at summer. Also there are Red Book listed Argali sheep are there at the shore of the lake. The Kyrgyz Government is committed to protect them

Environmental impacts predicted at this stage are as follows:

During construction

- Dust, smoke, noise, vibration caused from Asphalt Batching Plan/Quarry site/Borrow pit may drive away fauna (birds, animal)
- Noise, vibration and bad odor while earthwork and asphalt pavement
- Mudwater from embankment, leakage of oil from oil, bituminous liquid, liquid waste from workers' camp damage lake water ecosystem.

Operation stage

- Noise, vibration and exhausted gas emitted from heavy trucks from China may drive away the birds.

Mitigation measures

During construction

- Asphalt batching plant, quarry, Borrow Pits shall not located close to Chatyr Kul and Its surrounding protected zone
- To minimize the construction period at breeding season of migrating birds
- Generally the shoreline of Chatyr Kul Lake is 3km away or more than that. So, although road work will not seriously affect the ecosystem, effort shall be made so that no liquid waste, mudwater or bituminous liquid will from into the lake or protected land around the lake.

After operation

- Noise barrier may be constructed, when necessary, for the portion where auxiliary ponds south of Chatyr Kul beside the road.
- Strict law enforcement not to overspeeding or overloading
- Check the condition of maintenance of heavy vehicle thoroughly so that no excess noise, gas are emitted or leakage of gasoline
- Furthermore, traffic volume control may be necessary at breeding season or in case

the volume are likely being increased too much.

Scoping (what to study from now on)

- Monitoring of migrating birds has been conducted yearly from 2003. Collection of data about hatching and breeding for migrant bird to identify the most sensitive seasons for them
- Site reconnaissance to confirm above
- Analysis of environmental adverse impact, such as noise, vibration and emission with the case of Project and without Project to estimate the advantage of the road rehabilitation

As is not directly related to EIA, we are going to make baseline survey consisting of socio-economic conditions at before, while and after construction to see the change of life-level and you cooperation is highly appreciated in that survey time.

Above are our plan and we appreciate you if you can advise us:

- You are happy with the project or not
- If you say so what is the reason
- Or any comment or question is welcome.
- Do you think following issues can be arisen:
    - Gender
    - HIV/AIDS
    - Human trafficking

Thank you very

CAREC Transport Corridor 1, (Bishkek-Torugart Road) Project 3

Minutes of Meeting of EIA Second Public Consultation

December 11, 2009

Naryn City

Organizer:

1. Mamaev K. – MOTC Permanente Secretary, Chairman
2. Chimchikov K. – PIU Director
3. Jumakadyrov M. – Naryn Oblast (Province) First Vise Governor
4. Takeo Shoji – International Environmental Specialist «Japan Overseas Consultants Co., Ltd.»
5. Sultanova Burulsun – Translator «Japan Overseas Consultants Co., Ltd.»

Minutes of Meeting consists of following questions:

1. Rehabilitation of Bishkek-Torugart Road
2. EIA of Chatyr-Kul area
3. Mitigation Measures of Chatyr-Kul Lake

Following was explained:

1) General view of Project by Mr. Mamaev
2) EIA Draft and Final Report about Project 3 and, among all, benefits, present condition, environmental impact and mitigation measures by Takeo Shoji, Environmental Specialist, Japan Overseas Consultants.

Questions and suggestions made:
Suggestion from Mr. Jandyraliev B.- senior researcher of Karatal-Japyryk State Preservation:

1) It's necessary to build stationary laboratory for analysis and research of water and soil quality at the administration building of Karatal-Japyryk State Preservation.
2) Necessity of providing with binocular, digital and video cameras for strengthen the protection area while construction
3) Increase ecological education to hold seminars, discussions with constructors and local people.

Answer of Mr. Mamaev K.: According to Kyrgyz Government Standard, it's necessary before road construction to conduct EIA report of Chatyr-Kul protected area, also follow the proceed of ADB, where provided to carry out public consultations for comments and changes in EIA. All your comments and proposition will be accepted.

Questions of Mr. Kulmatov A. (Mayor of Naryn City):

1) International Environmental Consultant's Privileges
2) Environmental impact to Naryn city ecosystem and mitigation measures, plant trees and lawn along the streets, sidewalks and parks, where located close to Bishkek-Torugart Road.

Answer of Mr. Shoji Takeo:

ADB has already made EIA report of Naryn city ecosystem, then classified category B, it means there are not serious environmental impact, therefore not necessity of mitigation measures.

Answer of Mr. Mamaev K.:

1) ADB announces large entry for construction companies all over the world, and appropriate consultants and specialists were corresponding to requirements of ADB. For a moment consultation company «Japan Overseas Consultants Co., Ltd.» provides with service, but Mr. Shoji Takeo as a environmental specialist is engaged in Chatyr-Kul area.
2) What about your second question, regarding to planting trees and gardens and mitigation measures of impact of Naryn city ecosystem, specialist and consultants from Arab coordination group will be in charge in it. Their section from 272-365 km, where Naryn City is included, they are responsible and empowered for EIA and mitigation measures to protect city ecosystem.

Mr. Mamaev explained in detail the whole project Bishkek-Naryn-Torugart including its period, cost and international donors. The first project has to be implemented from April 2010 from km 400- km 439 At-Bashi bridge until Tash-Rabat section, extension is 39 km. Project 3 without ADB approval won't get finance for construction. Every year the cost of project is getting higher and higher, therefore we need to start existing road rehabilitation immediately.

Question of Mr.Jumabekov T. (architector):

1) As above said, one of the way to prevent water pollution is oil separator device construction along the road. As you know that is permafrost area, so how the device will work in winter period?
2) While construction could do damage to houses located near the road. What sort of compensation will be provided and assume appropriate measures?

Answer of Mr.Takeo Shoji:

In winter period oil separator doesn't function, just in summer only period. However, also other versions of mitigation measures will be proposed such as strict inspection of maintenance of car, oil absorber materials to be prepared by RMU and so on.

Answer of Chimchykov K.:

1) Oil separator will be erected for permanently, and work systematically just in summer season.
2) If existing road rehabilitate appropriately by construction standard, then negative affect to houses located near the villages are exception.

Question of Arakeev T. (Parliament Member Naryn City Hall):

To prevent negative construction affects to local villages as: Kara-Suu and Kara-Bulung at At-Bashi region, is it possible to build bypass?

Answer of Mr.Mamev K.:

ADB allocates finance only the existing road, but as you mentioned bypass isn't included in project.

Question of Mr. Tolgoev K. (General Director of Joint-Stock Company Naryn Telecom):

How many workers from PRC come to work during the construction for this project?

Answer of Mr. Mamaev K.:

At the moment still has not yet held tender for this project and how many people work from where isn't confirmed.

Question of Mr. Duishonaliev A.:

There are main streets Lenin and Sovetskaya in Naryn city, rehabilitation of these streets will be included in the project?

Answer of Mr. Mamaev K.:

The project Bishkek-Naryn-Torugart these streets are not included in the project, but the President of KR Bakiev K.S has issued decree of rehabilitation of these streets in the future.

Question of Mr. Moldokadyrov N. (First Vice- Mayor of Naryn):

There are two bridges at the entrance of the Naryn. One of them Jangy-Je, other one Moskovskaya, and how much money need to rehabilitate these bridges?

Answer of Mr. Mamaev K.:

This road is only one road where are bridges will be included as well as others also. The project rehabilitates all the bridges as: Kuaky and Kyzyl-Kopuroo.

EIA report presentation and discussions regarding to road Bishkek-Naryn-Torugart at the end of second public consultation

Decided:

Elimination of negative impact to ecosystem by Project 3 Chatyr-Kul protected area:

1. Accept recommendations of Mr. Mamaev K. and Mr. Takeo Shoji, mitigation measures of negative impacts to protected area Chatyr-Kul, while construction.
2. Modify EIA report (if it necessary) according to stakeholders comments and proposals.

LIST OF PARTICIPANTS OF SECOND PUBLIC CONSUTATION

No	FIRST AND SECOND NAME	ORGANIZATION AND TITLE	CONTACTS
1.	Kalmambetov U.	City Architecture Management	03522 51634
2.	Kurmanov D.	Park Maintenance and Plantation Section	03522 55540
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10.	Kudaibergenov	RMU 957	
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19.	Moldokadyrov N.	First Vise Mayor of Naryn City	03522 50829
20.	Mambetakunov	Main Specialist at Naryn Oblast (Province) State Administration	
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23.	Jeenalieva Jypara	Chief of Organization Department	03522 50747
24.	Amanov Jumabek	Chairman of Court of Alderman	03522 52581
25.	Asanbaev Duishenbek	Edition Newspaper «Kyzyl-Tuu»	0555670412
26.	Jumakadyrova Gulaiym	Lead Specialist at Naryn Oblast (Province) State Administration	03522 50058
27.	Omuraliev Bakyt	Lead Specialist at Naryn Oblast (Province) State Administration	03522 51465

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33.	Bapiev T.	Kara-Suu Village Head, Economist	0773508402
34.	Jumakadyrov T.	Resident of Kara-Suu Village	0773 438847
35.	Akmatbekov E.	Municipal Economy	03522 53357
36.	Shaiypov Seitaly	Court of Elderman	03522 50727
37.	Omuraliev T.	Karatal-Japyryk Sate Preservation	03522 51628
38.	Taiyaliev S.	Karatal-Japyryk Sate Preservation	0773115859
39.	Isaev M.	Karatal-Japyryk Sate Preservation	0773621802
40.	Turdubekov K.	Karatal-Japyryk Sate Preservation	03522 53728
41.	Musaev	Senior inspector of Traffic Safety State Management	03522 51579
42.	Sultanaliev M.	Inspector of Traffic Safety State Management	03522 51580
43.	Duishonaliev A.	Joint-Stock Company Naryn Telecom	03522 51412
44.	Tolgoev M.	Joint-Stock Company Naryn Telecom	03522 51000
45.	Omuraliev E.	Naryn City Administration	03522 50676
46.	Beishebaev	Edition Newspaper «Erkin-Too»	0555764810
47.	Jumabekov Tolkunbek	Oblast (Province) Architecture Department	03522 50778
48.	Bekturganov	PLUAD-3	03522 53061
49.	Abdykadyrov	RMU	03522 50833
50.	Okiev T.	Edition Newspaper «Tenir-Too»	03522 53728
51.	Arakeev T.	Naryn City Parliament Member	03522 51920
52.	Eshkulov A.	Naryn KG Media Center	03522 52614
53.	Toktogulov Ch.	Naryn KG Media Center	03522 52614

Handouts delivered at the meeting are

1) Executive summary
2) Power point presentation
3) Full EIA report for who is especially interested in EIA.

Power point presentation is attached at nest page

EINVIRONMENTAL IMPACT ASSESSMENT

DRAFT FINAL REPORT

BISHKEK- NARYN-TOURUGART ROAD

PROJECT 3
CHECKPOINT-TORUGART CUSTOMS
(KM478-531)

1

Project Location
From Checkpoint to Torugart Customs
(km478-531)

2

Outline of Presentation

1. Purpose of this public meeting
2. Project description
3. Project Benefit
4. Present Condition at the site
5. Environmental impact
6. Mitigation measure
7. Contact details

3

1. Purpose of the meeting

To follow the rules of Kyrgyz Government and ADB (donor) for the approval of the project as:

- To have comment from stakeholders on our EIA study results
- To modify EIA report considering the comment and submit to the Government and ADB

4

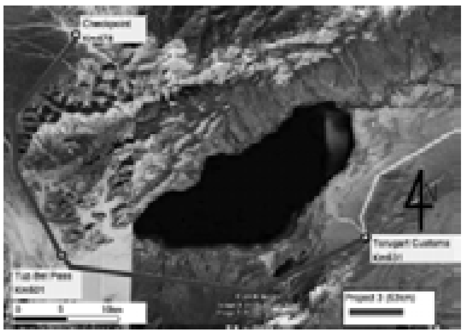
2. Project Description

2.1 Outline/objective

- Rehabilitation (paving) of section between Checkpoint-Torugart Customs(km478-531)
- Economic and environmental benefits

5

Aero-photo of Chatyr Kul



6

Hole on the Road

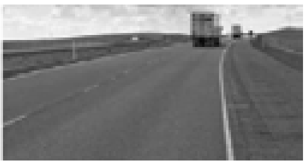
7

Pollutants Emitting Trucks

8

Road Conditions

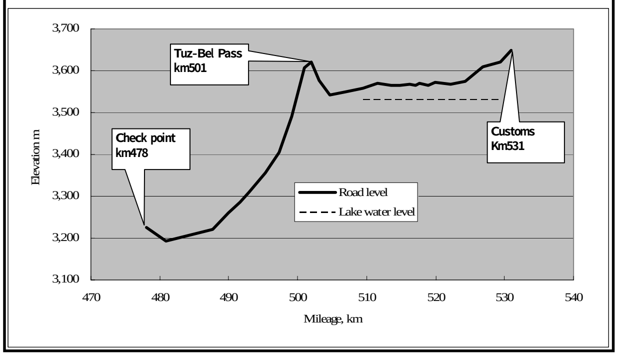
- Before Paving



- After Paving

9

2.4 Road Profile



2.5 Cost and Period (tentative)

●Cost

1. Checkpoint to Tuz-Bel Pass (from km478-501) in case of asphalt pavement: $10,000,000 (tentative)

2. Tuz-Bel Pass to Customs (from km501-531) in case of oil impervious pavement :$15,000,000 or more

●Period:

36 months, starting April 2011 in the most earlier case

11

3. Project Benefit

- Economy

  To reduce the traveling time and cost of between Bishkek and Kashi in the PRC

- Environment

  To improve present environmental impact to the ecosystem of Chatyr Kul Protection Area

12

4. Present Condition

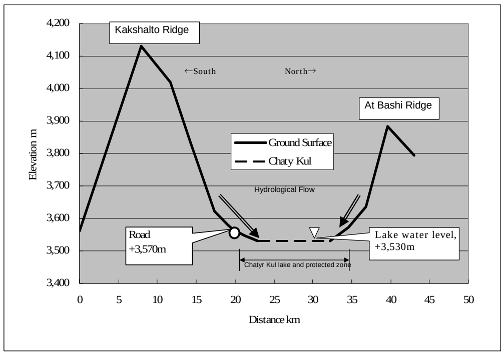
4.1 Chatyr Kul Protection Area

Chatyr Kul Lake + Surrounding Area 2km from shoreline is:

- A national wildlife refuge
- An international Ramsar Convention Site

13

4.2 Topographic and Hydrological Features



14

Surface water (Pond)

15

Small stream

16

Spring Water (groundwater)

17

4.3 Ecosystem

- Breeding area of rare/number decreasing birds in the Kyrgyz Republic
- Habitats of IUNC Red listed Argali Sheep in the summer
- Colony of internationally important Potamogeton (submerged pond weed)
- Resource of yet fully revealed aqua lives in the lake water

18

Larus Ichthyaetus

19

Anser Indicus

20

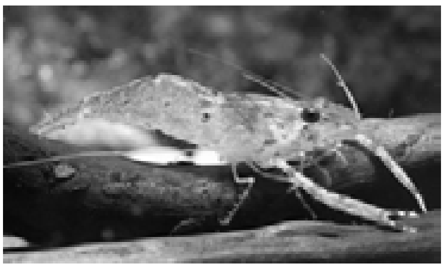
Argali Sheep

21

Potamogeton

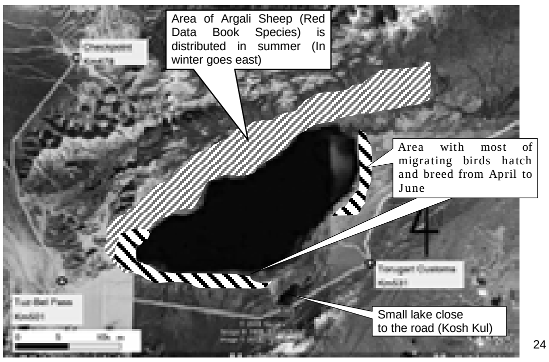
22

Gammurus krevetki



23

Ecosystems in the Area



24

5. Environmental Impacts

5.1 Environmental Impact by the Project in the Future

- Risk of spilled oil by passing vehicles flown in the vulnerable lake water ecosystem
- Potential of increment of noise, dust and other emissions from increased number of vehicles
- Menace from poachers and domestic animals of nomads (sheep, shepherds)

25

6.1 Mitigation measures during construction (1/1)

- Bituminous liquid: Oil impervious pavement for the section facing Chatyr Kul (Km501-531)
- Muddy water: Not to put additional earth on the road but by trimming and compaction only before concrete pavement
- Noise, vibration etc: Batching plants and workers camp shall be located out side of sensitive Chatyr Kul section and, especially breeding seasons of April to June, construction work in the sensitive section suspended

26

6.2 Mitigation measures during operation (1/2)

- Spilled oil: Pave the road with side trenches and oil traps to prevent the spread of oil
- Noise levels: Reduce by smoother driving with a higher gear together with enforcement driving speed limit
- Poachers and domestic animals: Erection of watch posts, tighter control and providing a vehicle for better mobility around the lake with a accommodation facility attached for the protection office during construction and, as well as operation

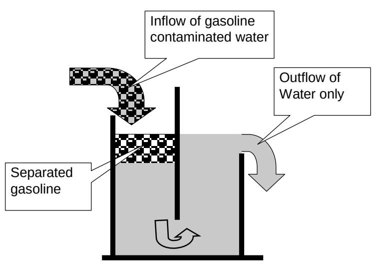
27

6.3 Mitigation measures during operation (2/2)

- Difficulties for animals crossing the higher road embankment: To minimize embankment height
- Deterioration of Pavement: Sufficient soil investigation, proper design based on it and strict construction supervision shall be done
- HIV/AIDS: Safety goods are provided for workers and seminar shall be held.
- Gender: There should be no wage difference between man and woman, and contractor shall monthly report number and salary for man and women

28

Oil Separator



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8. Contact Details

Within 2 weeks, Please send your opinions, if any, to:

Mr. Shoji Takeo, Environmental Specialist

e@mail: btn-road@hotmail.com

Telphone:

Address:

Thank you very much

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List of stakeholders discussed with

№	First and Last Name	Title	Organization
1.	Kozubekov Timur Jusaevich	Deputy of local administration	At-Bashi Regional Administration
2.	Tentimishov Jumakul	Head of economy development department	At-Bashi Regional Administration
3.	Tokon uulu Jenishbek	Office Management	At-Bashi Regional Administration
4.	Abdylov Kuban	Chief Engineer	At-Bashi RMU
5.	Mamytbekov Duyshonbek	Leading Specialist	At-Bashi Regional Administration
6.	Kabyl uulu Nurbek	Local Ecologist	Karatal-Japyryk State Preservation, Naryn
7.	Abdraev Baksh	Village resident	Kara-Suu village, At-Bashi Region
8.	Tashtanbekova Astra	Village resident	Kara-Suu village, At-Bashi Region
9.	Askat Kysanov	Head of Forestry Ecosystem Development Department	State Agency of Environmental Protection and Forestry under the Government of KR, Bishkek
10.	Kubanychbek Noruzbaev Mukashevich	Chief of Environmental Impact of Assessment Department	State Agency of Environmental Protection and Forestry under the Government of KR, Bishkek
11.	Kylychbek Jundubaev	Chief of Maintain of Bio- diversity of Protected Areas, Ecological Education and Press Service Department	State Agency of Environmental Protection and Forestry under the Government of KR, Bishkek
12.	Asanbai Kyrchybaev	Head of Karatal - Japyryk State Preservation	Karatal-Japyryk State Preservation, Naryn
13.	Salamat Tayaliev	Chief of Scientific and Research Department	Karatal- Japyryk State Preservation, Naryn
14.	Talant Omuraliev	Deputy Director of Scientific and Research Department	Karatal- Japyryk State Preservation, Naryn
15.	Ulan Marazinov Turatbekovich	Vice-Mayor	Naryn City Administration
16.	Ermek Baibagyshev	Head of International Department	Naryn State University
17.	Bolot Jandyraliev	Senor Researcher of Scientific and Research Department	Karatal- Japyryk State Preservation, Naryn
18.	Emil Ibraev	Leading Specialist of State Preservation	State Agency of Environmental Protection and Forestry under the Government of KR, Bishkek
19.	Askar Davletbakov	Zoologist and ornithologist	National Academy of Science, Bishkek
20.	Esen Jusumatov Jusumatovich	Deputy of Director	Water Industry of KR, Bishkek
21.	Abdraev Rudbek	Head of NGO “Eco-Joomart”	Naryn
22.	Kubanychbek Turdubekov	Junior researcher of Scientific and Research Department	Karatal- Japyryk State Preservation, Naryn
23.	Anatoliy Nikolaevich Ostashenko	Zoologist and ornithologist	National Academy of Science, Bishkek
24.	Ulan Namatbekov	Director of NGO “Bugu- Maral”	Naryn
25.	Kurmanbek Chimchikov	Head of PIU	MOTC
26.	Priianka Nalin Seneviratne	Principal Transport Specialist ADB mission	ADB
27.	Eshenaliev Mirdin	Project Implementation Officer/ Resident ADB Mission in the KR	ADB

№ 1 Minutes of Meeting with State Agency of Environmental Protection and Foresting

Date: September 15, 2009

Place: State Agency of Environmental Protection and Forestry under the Government of Kyrgyz Republic, Bishkek City

Attendants:

- Head of Foresting Ecosystem Development Department – Mr. Askat Kysanov
- PIU Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject:

- Courtesy Call to the head of State Agency of Environmental Protection and Foresting

Outline of discussion:

- Mr. Shoji has made a visit to announce that he will start EIA study for Project 3 at Chatyr Kul section.

№2 Minutes of Meeting with Chief of Environmental Impact of Assessment Department

Date : September 15, 2009

Place: State Agency of Environmental Protection and Foresting under the Government of Kyrgyz Republic, Bishkek City

Attendants

- Chief of Environmental Impact of Assessment Department – Mr. Kubanychbek Noruzbaev Mukashevich
- PIU Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji
- International Social Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Yoshitoshi Kobayashi

Subject

- Discussion of Environmental Impact Assessment

Outline of discussion

- Mr. Kubanichbek Noruzbaev Mukashevich has explained the contemporary condition of Chatyr-Kul Lake and advised to get EIA from their department for the Bishkek-Naryn-Torugat Road Project. Before the completion of EIA has to be done the IEE for this he addressed to the “Maintain of Bio- diversity of Protected Areas, Ecological Education and Press Service” section.

№ 3 Minutes of Meeting Chief of Maintain of Bio- diversity of Protected Areas, Ecological Education and Press Service Department

Date: September 15, 2009

Place: Maintenance of Bio- diversity of Protected Areas, Ecological Education and Press

Service Department, State Agency of Environmental Protection and Foresting under the Government of Kyrgyz Republic. Bishkek City

Attendants:

- Chief of Maintain of Bio- diversity of Protected Areas, Ecological Education and Press Service Department – Mr. Kylychbek Jundubaev
- PIU Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji
- International Social Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Yoshitoshi Kobayashi

Subject:

- Discussion of Environmental Impact Assessment and current situation in Chatyr-Kul, consulting and advice of mitigation measures during the construction.

Outline of discussion

- Mr. Kylychbek Jundubaev described the present condition of the lake and maintenance of the “Chatyr- Kul Lake” was ratified to the International Ramsar Convention as a protected area. The reason is Bar-headed Goose as threatened and disappearing birds, more sensitive and more protected area. Mr. Kylychbek Jundubaev proposed some ideas of mitigation measures, they are:
  - to construct noise protection walls during the construction of the road
  - Necessary to meet the local workers and scientific researchers at the Karatal-Japyryk State Preservation in Naryn City, because they know better the existing condition.

№4 Minutes of Meeting with Head of Karatal - Japyryk State Preservation

Date: September 17, 2009

Place: Naryn City, Karatal- Japyryk State Preservation office in Naryn City.

Attendants

- Head of Karatal - Japyryk State Preservation – Mr. Asanbai Kyrchybaev Sydygaliev, Chief of Scientific and Research Department in Karatal- Japyryk State Preservation in Naryn City – Mr. Salamat Tayaliev
- Deputy Director of Scientific and Research Department in Karatal- Japyryk State Preservation in Naryn City – Mr. Talant Omuraliev
- National Environmental Specialist – Mr. Jusupbekov Shyrdakbek
- PIU Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji
- International Social Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Yoshitoshi Kobayashi

Subject

- Environmental Impact Assessment and data of Chatyr-Kul Lake, consulting and suggestion of mitigation measures during the construction.
- Outline of discussion
  - Mr. Kyrchybaev Asanbai had indicated that the area is a protected and ratified as a Ramsar Convention, there are more than 130 species of birds. A hatching/nesting

stage is end of May till end of June; those months are very sensitive and need careful attention because disturbing birds is more hazardous, because we can loose them forever. A mountain goats and sheep are migrating from east to west part of the lake during the summer and autumn.

- Mr. Salamt Tayaliev added that there are transitive birds from India, Sri – Lanka and other southern countries. There are a lot of water-swamp birds, which are staying for hatching/nesting, for the period from the beginning of May to the end of June, mostly birds nesting around the lake of the southern part and also in the lake Kosh-Kul lake, where is located near the road. In October birds gather at the south-east and north-west of the lake, get ready to fly south countries.
- There are about one hundred people (nomadslive in check point in location km 501 and customs station “Torugart” in km 531; they are mostly a border guards, custom officers and public service (café, restaurants and hotels) workers. There are small fish in Chatyr-Kul lake “Osmonchik”.
- There are two scientists from National Scientific Academy in Kyrgyz Republic Mr. Anatoli Ostashenko and Mr. Askar Davletbakov, who are in charge of Chatyr-Kul lake make study and watch verity of birds. Three hunters monitor and protect the area. The head of preservation proposed these ideas:
    - ✓ to construct towers for monitoring of the birds
    - ✓ to acquire mobile house vehicle during the construction work
    - ✓ to acquire equipments for observation (binoculars, clothes, etc.)
- At the end of meeting all the staff of Karatal- Japyryk State Preservation office in Naryn City were not against to the project of rehabilitation Bishkek-Naryn-Torugart Road. They uttered concord to the project for common wealth of the country.

№ 5 Minutes of Meeting with Naryn City, Naryn City Administration

Date: September 17, 2009

Place: Naryn City Administration

Attendants

- Vice-Mayor of Naryn City – Mr. Ulan Marazinov Turatbekovich
- PIU Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji
- International Social Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Yoshitoshi Kobayashi

Subject

- Assistance to organize stakeholders meeting invites representatives from Ecological NGOs, Local Government, Management of Liner Production of Roads, Management of Architecture and Transport, State Preservations, RMU and Universities.

Outline of Discussion

- Vice mayor has promised to invite stakeholders to meeting on 18 October, 2009 at 10 am in the meeting hall of City Administration. He was informed about project Bishkek-Naryn-Torugart and Project 3 the portion close to Chatyr-Kul Lake. Mr. Shoji informed to vice mayor about Chatyr-Kul Lake and EIA and asked to invite 25 people.

№ 6 Minutes of Meeting with University

Date: September 18, 2009

Place: Naryn City, Naryn Sate University

Attendants:

- Head of International Department of Naryn State University – Mr. Ermek Baibagyshev
- PIU Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji
- International Social Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Yoshitoshi Kobayashi

Subject:

- Exchange of knowledge and experience about EIA

Outline of discussion

- Mr. Ermek Baibagyshev as an agriculture and livestock specialist had told his view about Chatyr –Kul Lake and exchanged his experience of Global Ecology Found project few years ago had carried out. This project's aim consisted to monitor and survey of wild birds in the small lake near in the Ak-Talaa region in Naryn oblast.

№ 7 Minutes of Meeting with Scientific and Research Department in Karatal- Japyryk State Preservation

Date: September 18, 2009

Place: Scientific and Research Department in Karatal- Japyryk State Preservation. Naryn City,

Attendants:

- -Senor Research worker, Scientific and Research Department in Karatal- Japyryk State Preservation in Naryn City – Mr. Bolot Jandyraliev
- PIU Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji
- International Social Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Yoshitoshi Kobayashi

Subject:

- Collecting data of Chatyr-Kul Lake, consulting and advice of mitigation measures during the construction.

Outline of discussion:

- According to Senor Research worker – Mr. Bolot Jandyraliev,
  - altitude of Chatry-Kul Lake is 3.517 m. There are a lot of culverts and fertilized ground water.
  - Birds gather on the south-east and west-north parts of the lake in September and all the bird leave to south countries in October.
  - They hatch and breed from end of May to end of June. **This is the most sensitive period for birds.**
  - They leave Chatyr Kul in October
  - Arigali sheep, one of Red Book Species, stay at the west and north of the lake in the summer and go to east in winter

- As mitigation measures, he proposed:
  - Avoidance from noise pollution close to shore on the south-east and west-north parts of the lake
  - Avoidance from water pollution, mud water, leakage of oil from bituminous liquid
  - To implement regular and full monitoring
  - To endow this division with mobile house (a four wheel vehicle mounted with accommodation facility)
  - To make enclosure the core zone with fire fence 1km from the shore and to put some posts and marks in buffer zone
  - To construct some embankments to avoid water pollution
  - To make noise reduction aid (noise reducer wall)

№ 8 Minutes of Meeting

Date: October13, 2009

Place: State Agency of Environmental Protection and Foresting under the Government of Kyrgyz Republic. Maintain of Bio- diversity of Protected Areas, Ecological Education and Press Service Department, Bishkek.

Attendants:

- Leading Specialist of State Preservation – Mr. Emil Ibraev
- Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject:

- Outline of the Institute

Outline of Discussion:

- Increased or decreased of numbers of migration birds (reasons, difference between figures in 2004 and preceding years in Reports A and in Report B in 2008)
- Structure of Agency, its sections, departments, employees, functions of each department
- Agency's policy (e.g. budget, manpower, control illegal actions such as: egg taking, birds hunting etc.)
- Present problems (lack of budget, man power, illegal birds hunting and smuggling)
- The ways of solution, what shall be done?
- Information about Red Book Sheep
- Name of ecological NGOs especially interested in Chatyr-Kul Lake flora and fauna

Leading Specialist Mr. Emil Ibraev said that the numbers of the birds fluctuate every year, there are not exactly numbers, sometimes they increase, and sometimes they decrease. He promised to answer questions in written form at the end of October. According to his opinion, Mr. Emil advised Mr. Shoji to make an appointment with zoologist and ornithologist National Academy of Science, Kyrgyz Republic.

№ 9 Minutes of Meeting with zoologist from National Academy of Science

Date: October13, 2009

Place: National Academy of Science, Kyrgyz Republic. Institute of Biology, Bishkek.

Attendants:

- Zoologist and ornithologist – Mr. Askar Davletbakov
- Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject:

- Opinion about mitigation measures and Chatyr-Kul Lake

Outline of discussion:

- Mr. Askar Davletbakov has carried out research on water-swamp birds investigated, observed and conducted monitoring with other researchers from Karatal-Japyryk State Preservation in Naryn. According to his information there are a lot of geyser waters and ground waters, also near the lake there are some ponds, where are birds are hatching/ breeding swamp places around the lake.
- He proposed to:
  - ➢ stop construction activity from April to June when bird are breeding at the section from km 501 to km 531 where the lake is directly facing with road
  - ➢ prevent water pollution of underground water, geyser water. It would be better concrete pavement is constructed, not asphalt pavement. Oil leakage would danger of polluting water.
  - ➢ Especially not construct asphalt pavement to prevent the seepage of bitumen into subsoil and groundwater by which the bitumen may finally reach to the lake, at least for the section where the road is close to the lake (km 501 to km 531), since Chatyr Kul, has no outflow and pollutant remains forever once flown in, where many types of valuable and vulnerable fauna and flora are.
  - ➢ To prevent the land erosion and other disturbance, it's prohibited to quarry and borrow pits from close to Chatyr-Kul Lake.
  - ➢ To prevent noise, it may be necessary to install noise reducer device or wall

- Mr. Shoji Takeo wants to figure out the velocity of ground water, unfortunately Mr. Askar Davletbakov did not have a data, he advised to obtain from the Water Industry Department of Kyrgyz Republic. Also there is no water quality data for Chatyr Kul at all.

№ 10 Minutes of Meeting with Water Industry Department

Date: October13, 2009

Place: Water Industry Department of Kyrgyz Republic, Bishkek

Attendants:

- Deputy of General Manger of Water Industry – Mr. Esen Jusumatov Jusumatovich
- Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject:

- Data of groundwater velocity around the Chatyr-Kul Lake

Outline of Discussion:

- Mr. Esen Jusumatov claimed no exploration has been hold concerning to velocity of underground water around the Chatyr-Kul Lake. Regarding to his statement, nobody has made survey or measurement of velocity department and even in Republic.
- Mr. Esen Jusumatov, concerning water pollution had proposed, if possible better to construct concrete pavement from the km 501- km 531.

№ 11 Minutes of Meeting with Local NGO in Naryn

Date: October 14, 2009

Place: Karatal- Japyryk State Preservation office in Naryn

Attendants:

- Director of Karatal- Japyryk State Preservation – Mr. Asanbai Kyrchybaev
- Chief of Scientific and Research Department in Karatal- Japyryk State Preservation – Mr. Salamat Tayaliev
- Head of NGO “Eco-Joomart” –Mr. Abdraev Rudbek
- Environmental and Social Specialist (PIU) – Ms. Keldibaeva Svetlana
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject:

- Mitigation measures.

Outline of discussion:

- According to Mr. Asanbai Kyrchybaev’s current condition of the Chatry-Kul Lake is very cold and covered by snow about 15-20 cm and almost all the birds are flew away. The lake is freezing. Director of preservation recommended a few ideas to prevent reduction of disappearing and threatened as follows:
  - Construction of monitoring and observation tower (two units)
  - Provision of equipments (binoculars, clothes etc.)
  - Mobile house for hunter (four wheel vehicle)
- According to director of NGO “Eco-Joomart” Mr. Rudbek Abdraev,
  - Some animals migrate from one side of the road to another side, therefore it’s necessary (1) to make the height of embankment as low as possible or (2) to install square box culverts, which can help migration of animals.
  - Before putting concrete pavement it’s necessary to examine soil quality, because some place is hard, some place is soft, just after confirmation of soil test, would be better concrete pavement, otherwise it will be broken.
  - There are around 18 ecological NGOs, which are merged into the Association “Collaboration Eco Fair” and Mr. Rudbek Abdraev is director.
  - As well he proposed to strengthen the capacity and facility of Karatal - Japyryk State Preservation.

№ 12 Minutes of Meeting with Junior Ecologist at Naryn

Date: October 15, 2009

Place: Karatal- Japyryk State Preservation in Naryn

Attendants:

- Junior research worker of Scientific and Research Department in Karatal-Japyryk State Preservation in Naryn City - Mr. Kubanychbek Turdubekov
- Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject:

- Chatyr-Kul Lake Survey

Outline of Discussion:

- Regarding to Mr. Kubanychbek Turdubekov proposed following ideas of mitigation measure:
    - to install protection fence from the shore of the lake (1 km) far till the buffer zone (protection of livestock and dogs)
    - to set post signs or marks in buffer zone
- In addition he complained that the money allocate to the state preservation is not enough for:
    - transportation (site visit)
    - accommodation (during the site visit)
    - equipments (hunting gun, binoculars and clothes)

№ 13 Minutes of Meeting with a Customs Officer

Date: 15 October 2009

Place: Customs Office at Torugart

Attendant:

- A Senior Customs Officer
- Junior research worker of Scientific and Research Department in Karatal- Japyryk State Preservation in Naryn - Mr. Kubanychbek Turdubekov
- Environmental and Social Specialist (PIU) – Ms. Svetlana Keldibaeva
- International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject: Miscellaneous

Outline of Discussion:

- Function of customs is to register the trucks coming from China
- The number of trucks coming from China decrease to 200 these days from 500 trucks per week before. This may be caused by the increment of import tax.
- Facility is very poor and they want followings to be improved:
    - Waterline
    - Communication system especially such as internet, TV etc
    - Building
    - Food

- Simplified HIV check for every diver

№ 14 Minutes of Meeting with National Academy of Sciences

Date: November 5, 2009

Place: Bishkek City, National Academy of Science, Kyrgyz Republic. Institute of Biology

Attendants: Zoologist and ornithologist of birds – Mr. Anatoliy Nikolaevich Ostashenko
Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject: Opinion of EIA Executive Summary and some proposals regarding bird protection of Chatyr-Kul Lake

Outline of discussion:

Mr. Anatoliy Ostashenko has carried out research on water –swamp birds investigated, observed and conducted monitoring with other researchers from Karatal-Japyryk State Preservation in Naryn.

- According to his objection regarding to barbed wire fence around the lake is not safety for birds. During the night, some types of the birds are fly lower so that they could hit the fence as well it makes some obstacles to migrate wildlife and mountain sheep.
- He proposed to strengthen facilities of ecological staff of Karatal Japyryk State Preservation, that they can be able to provide strict control around the lake. Only strong control by manpower could protect area from the poaching

№ 15 Minutes of Meeting with NGO

Date: November 6, 2009

Place: Bishkek City, JOC office

Attendants: NGO “Bugu- Maral” director – Mr. Ulan Namatbekov
Environmental Specialist (Japan Overseas Consultants Co. Ltd) – Mr. Takeo Shoji

Subject: Opinion of EIA Executive Summary and some proposals regarding of Chatyr-Kul Lake

Outline of discussion:

Mr. Ulan Namatbekov was under research of Chatyr- Kul Lake’s environmental protection. His NGO cooperate with the staff of Karatal-Japyryk State Preservation. He suggested:

- He will cooperate with JOC in information exchange and arranges a round table discussion with ecological NGOs in Naryn City, before stakeholders meeting on 20th November in Naryn City.
- He complained land pollution by Chinese truck drivers, along the road from Torugart custom post till the Bishkek City. To decide the problem he proposed following:
- To improve driver’s manner, organize seminars or trainings for the custom officers and check point officers about driver manner to the Chinese drivers.

№ 16 Minutes of Meeting with PIU and ADB Mission

Date: November 12, 2009

Place: PIU Office at Ministry of Transport and Communications

Attendants: Head of PIU – Mr.Kurmanbek Chimchikov
Principal Transport Specialist ADB mission – Mr. Priianka Nalin Seneviratne

Environmental and Social Specialist (PIU) – Ms. Keldibaeva Svetlana

Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji
Project Implementation Officer/ Resident ADB Mission in the Kyrgyz Republic – Mr. Eshenaliev Mirdin

Subject: Concrete pavement's cost for 501-531 km in the Chatyr-Kul section

Outline of discussion:

- Compare the cost of the concrete and asphalt pavement's costs.
- Scientific data of underground and surface water.

Concrete pavement was proposed by the scientists and ecological department because it can reduce oil leakage through the underground water. Concrete pavement is more expensive than asphalt because it will sustain for a long time, but asphalt could be repaired again and again, at least not much cost difference has explained Mr. Shoji Takeo.
Scientific analysis velocity of groundwater should be done, visual aid (pictures, posters, handouts etc.), they help to provide with information stakeholders and local people according to Mr.Prianka
Mr. Chimchiov Kurmanbek promised to negotiate with Kyrgyz authorities from MOTC regarding to concrete pavement for 30 km in the Chatyr-Kul area.

№ 17 Minutes of Meeting with PIU and ADB Mission

Date: November 13, 2009

Place: JOC office at Ministry of Transport and Communications

Attendants:
Principal Transport Specialist ADB mission – Mr. Priianka Nalin Seneviratne
Project Implementation Officer/ Resident ADB Mission in the Kyrgyz Republic – Mr. Eshenaliev Mirdin
Environmental and Social Specialist (PIU) – Ms. Keldibaeva Svetlana
International Environmental Specialist (Japan Overseas Consultants Co., Ltd) – Mr. Takeo Shoji

Subject: EIA draft report discussion

Outline of discussion:

Executive summary should be changed into positive introduction and consider about concrete pavement, more pictures have to placed for explanation people, posters of present

and future condition of the road. Data of underground water velocity, calculation of noise, vibration etc has to be provided. Invitation for stakeholders meeting should provided by PIU recommended by Mr. Prianka.
"During the survey we try to find information from the Water Industry Department, regrettably velocity research didn't conduct at the Chatyr-Kul area" – said Mr. Shoji. Mr. Prianka proposed alternative ways of construction; he suggested consulting with the head of Design Institute as a competent person of all the roads in Kyrgyz Republic. Also in the summary necessary to put list of people who were involved into every meeting and discussion mentioned Mr. Prianka.

Results of Public Consultation at Kala-Bulung

Prepared by: T. Shoji

Date and Time: 10 August 2010 14:00-15:00

Location: Yard of community house

Chaired by: Mr. Habib(SRE), Mr. Kedibek(DRE), Mr. Shoji(Environment)

Attendants: 27 residents (8 females)

The proposed work was explained and questions/requests were raised. Participation of women to the project is also requested. Opinions/replies obtained include:

Opinion raised by residents	Reply by us
What kind of job is there?	Labor work if he is not qualified.
What kind of job is there for lady?	Cleaner, Watchman, Flagman etc
If the sidewalk will be constructed?	Yes
If a side drained will be dug in front of his house, he wants it covered by lids	No
Please make humps at entrance, middle and exit of village since they drive so fast.	First, we make sign boards only and monitor. If the boards are found not effective, we plan alternatives including humping
Noise and vibration may be worse after pavement?	Noise and vibration will be reduced after paved
Dust is serious. Please complete pavement in August	Paving will start next year. We will instruct the contractor to repair potholes and spray water
They need removed pavement waste for their small roads in the village.	We try to follow your request
They need removed old culvert of precast concrete pipes.	
Thickness of asphalt?	12cm
Life of the pavement	This is an international trunk line and always maintained/overlaid time to time.
How much cost per 1 km?	US$500,000/km
Who pays?	Asian Development Bank
5 shops are told to move out of ROW. Compensation will be made?	We study and reply you later

Results of Public Consultation at Kara-Suu

Prepared by: T. Shoji

Date and Time: 11 August 2010 10:00-11:00

Location: Yard of house near the main street

Chaired by: Mr. Habib(SRE), Mr. Kedibek(DRE), Mr. Shoji(Environment), Mr. Jing Chaohong (Project Manager)

Attendants: 27 residents (6 females)

The proposed work was explained and questions/requests were raised. Participation of women to the project is also requested. Opinions/replies obtained include:

Opinion raised by residents	Reply by us
What kind of job is there?	Labor work only if he is not qualified.
Cracks and damages of buildings compensation, caused by vibration	Open question, if it was caused during the construction works, then they will be compensated
If the sidewalk will be constructed?	Yes
Please make humps at entrance, middle and exit of village since they drive so fast.	First, we make signboards only and monitor. If the boards are found not effective, we plan alternatives including humping
Noise and vibration may be worse after pavement?	Noise and vibration will be reduced after paved
Dust is serious. It causes many disease and car accidents.	Paving will start next year. We will instruct the contractor to repair potholes and spray water two times in the evening and morning.
They need removed pavement waste for their small roads in the village.	We try to follow your request
Thickness of asphalt?	12cm

Kara - Bulun

 10 August 2010

No.	Name	Phone No.
1	Бобукеев Виталий Кадырбаевич	0777744135
2	Айипов Асылбек Жумабекович	0779035383.
3	Самнамиев Эркинбек	0770 ~~[illegible]~~ 646474
4	Исмаилов Эрмек	144 уч. 5-06
5	Нажматов Токтобек	0778 931613
6	Колдошев Жоокинтур	15514.
7	Чермуков Жолумаман	0772 14 55 71.
8	Исаев Жолдошбек	0552128917.
9	Чусакова Замира	0773 51-53-23
10	Симинимова Назгул.	0773 96-87-40.
11	Гуланова Мээрим	0773 52-70-33
12	Орзобаева Толкун	0778 71 65. 41.
13	Токтакунова Жийда	0773 77-94 98.
14	Айдакова Жылдыз	0777 52 49-79
15	Дононбаев Чайнат.	0773 48-42-06.
16	Саматов Азат	0772 20-69-42.
17	Абдыкалыков Эрмат	0558 51 52 91
18	Абдыбаев Азамат	0558515299
19	Сурабаев Анарбек	0773-63-96-46
20	Наргизбаев Мухамбет	0773 12 73 XX
21	[illegible]	0552 055200
22	Айдаров [illegible]	1946 25
23	Токтоназаров Жекшенбек	0777 37 12-98.
24	Эрмек уулу Алмангул.	
25	Сурабаев Мирзабек	0772 74 54 85
26	Адылов Тургунбек	-
27	Токтогул уулу Нурболот	-
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Kara - Suu

11th August 2010

10:00 – 11:00

No.	Name	Phone No.
1	Абдылдаев Жакытбек А	
2	Тоштонов Руслан А	0779028433
3	Сулаев Бактыбек	0778 71 32 03.
4	[illegible]	0772 25 34 28
5	Абдраимов Бакас.	
6	Асанакиев [illegible]	0771 19 92 62
7	Бердигулов Конокбай	
8	[illegible]	
9	Кулушбек [illegible]	0772 25 36 71
10	Жумашукур [illegible]	
11	Садыкова Фатима	655654742
12	Бердигулов Жоргалбек	
13	Кулиев Жаныбек.	
14	Кулиев [illegible]	
15	Бабаев [illegible]	0779 03 64 07
16	[illegible]	
17	Ибраимов Бакытбек.	
18	[illegible]	
19	[illegible]	
20	[illegible]	
21	[illegible]	
22	Камытова Кызбубу	0779 04 01 10
23	Жумагулов Талант	0770 28-65-98.
24	Урустемова Гулмира	
25	Паншабекова Астра	
26	Жумагулова Анара	
27	Камытова Замира	
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Photo 1 Public Consultation at Kara-Bulung

Photo 2 Public Consultation at Kara-Suu

Minutes of Meeting of Draft EIA Third Public Consultation

CAREC Transport Corridor 1, (Bishkek-Torugart Road Rehabilitation) Project 3

Date: September 24, 2010

Place: ADB meeting hall, Bishkek

Organizers:

1. Nurlan Djenchuraev - Environmental Specialist, ADB
2. Dan Millison - Environmental Specialist, ADB
3. Sveta Keldibaeva - Environmental and Social Specialist, MOTC
4. Asylbek Keshikbaev - Social Specialist, MOTC
5. Burulsun Sultanova - Assistant of Environmental Specialist, JOC

Aim of Public Consultation:

Collect from Stakeholders' opinion, advice, ideas, questions and answers to improve Draft EIA Report Project 3 Checkpoint –Torugart customs (km 478- 531)

Outline of discussion:

1. Draft EIA of Chatyr-Kul Lake
2. Analysis of Alternatives
3. Mitigation measures during the construction

Public Consultation was officially opened by State Secretary Mr. Mamaev K. and he has informed about CAREC Transport Corridor 1 (Bishkek- Naryn-Torugart Road Rehabilitation), Project 3 to be financed by ADB, Outline and benefits, Environmental Impact and Mitigation Measures regarding to Chatyr-Kul Lake as a particular protected area, which is ratified in an international Ramsar Convention.

Mr. Dan Millison made Power Point presentation of draft EIA. He covered wide range of questions such as: overall project Bishkek-Naryn-Torugart Road Rehabilitation, project description; location; road profile; cost and period; project benefits; present condition of the lake; topographic and hydrological features; ecosystem; analysis of alternatives; environmental impacts; physical/environmental, social, ecological mitigation measures during the construction and next steps to improve EIA. Mitigation measures include the possibility of a biodiversity "offset" as noted in ADB Environment Safeguards.

Question of Ms. Maya Eralieva “NGO on Forum ADB”:

- How will you complete EIA without deep study of lake?

Answer of Mr. Dan Millison, ADB Environmental Specialist:

- ADB is planning to provide technical assistance to conduct further baseline monitoring and surveys at Chatyr Kul, and determine what measures could be taken to enhance biodiversity at Chatyr Kul or and if need be of a similar ecosystem. This biodiversity offset approach has been used in the US wetlands “banking and trading” system. Banking and trading is a similar concept to emissions trading systems, such as the Kyoto Protocol Clean Development Mechanism. Using the “Banking and Trading” system should not impact ecological function of the lake. This system is the option of measures mitigation. It has been experiencing for 30 years in US legislation it works very well. The system works on fully compensating the negative impacts at “one place” by improving the environmental conditions at similar “other places”.

Question by Mr. Asylbek Keshikbaev:

- How do you think how long time and finance would be taken by using the system “Banking and Trading”?

Answer of Mr. Dan Millison, ADB Environmental Specialist:

- We will try to understand in more detail the impact of the project on water quality, ecosystem and biodiversity of the lake through monitoring and with the assistance of experienced ecologists integrate sound ecorestoration/enhancement measures in project design and mitigation actions.

Answer of Dr. Shukurov (Independent Ecological Expert):

- I have been surveyed Chatyr-Kul lake at the end of 1950s, during that time most of areas were covered by hatching/nesting areas. The road has been existing for 50-60 years. Nowadays traffic is heavy, compare that time and is has been affecting to whole ecosystem of the lake. So in the future, the impact would be very high. In addition, there is a world experience in such situation; we can prevent negative impact from the road. The project directorates are considering and have been paying more attention for this question, which is very important. . The Team Leader and Consultants need to acknowledge that there is existing data and knowledge about Chatyr Kul sufficient to design mitigation measures. In case of negative impact, there is a way of compensation to the Song-Kul lake. Song-Kul and Chatyr-Kul have similar ecosystem of water birds. But there is negative output that we could reduce account of water birds in Chatyr-Kul lake. It's better carry out detail study of both lakes. In yesterday meeting with ADB mission, we have already mentioned detail study of Chatyr-Kul lake before construction, we have to include Song-Kul also. In addition, nesting mountain gees in Song-Kul lake is reducing every year, it needs measures of mitigation as well. Concluding my speech, I want to say that if we really want to do something, we won't say that less information or no data, everything is possible, if you strongly want.

Question of Ms. Zulfija Marat (Bureau of Human Rights and Rule of Law):

- EIA has been undertaken only for this section of project, what about other sections?

Answer of Mr. Asylbek Keshikbaev (Social Specialist):

- This section (km 478-531) is under the category A, which is sensitive area. The problem is that Chatyr Kul Lake is registered as Ramsar site since many important migrating birds, which are in Red Book listed. According to ADB procedures for this section has to be done EIA in an appropriate way. The other sections are under category B and only Initial Environmental Examination are required to be carried which was done and Contractors suppose to conduct Environmental Management Plan (EMP), which is supervised an implementation by Consultants.

Answer of Mr. Vijay Joshi (ADB Environmental Specialist):

- According to ADB procedures, environment category "A" projects requires an EIA which is being prepared for Project 3 (Km 478 – Km 531) and is being discussed today. The project has been classified as category "A" because its potentially negative impacts on the sensitive ecosystem of Chatyr-Kul Lake. The objective of EIA is to avoid and where avoidance is not feasible minimize and mitigate the anticipated negative impacts.

Question of Ms. Zulfija Marat:

- The question is on the correctness of funds allocation to the mitigation measures. It is assumed that the 2-3% of Project sum will be allocated to mitigation measures? Let me express the concern of society about the priority of this road and debt burden decrease. The focus is made on human factor rather than environmental factor.

Answer of Mr. Asylbek Keshikbaev, Safeguard Specialist:

- The mitigation measures will not worsen the existing condition of ecosystem. During design-estimate documents working out we include all mitigation measures, particularly that measures required to minimize risks. Hence all measures are included to the bidding documents. Some simple measures as dust suppression, noise level decrease are included in EMP which is worked out by the Contractor.

Question of Ms. Zulfija Marat:

- What it the ADB position if other donors have no such kind of EIA?

Answer of Mr. Prianka Seneviratne(Principal Transport Specialist):

- Standard FIDIC contracts are used by international donor agencies [including China EXIM?]. The standard contract includes Environmental Management Plan (EMP) and responsibilities for contractors to implement the EMP. The environmental measures of mitigation included in Bills of Quantity, tender documents. There is written environmental measures of mitigation during the construction, such as: keep environment in construction camp, recultivation of borrow pits etc. FIDIC contract has an international environmental responsibility for all the banks, they follow policy of procedures even it is ADB, China bank, European Bank etc.

Answer of Mr. Asylbek Keshikbaev, Safeguard Specialist:

- There are some standard procedures, goods, works and services procurement. Consultant is supervising Contractor’s job and PIU MOTC is supervising Consultant and Contractor’s job. So the sufficient control is made.

Comment of Mr. Askar Davletbakov:

- Chatyr-Kul areas has not just water birds, there are also wild life/ wild animals. It’s necessary conduct complex monitoring before construction, which helps to determine exact measures mitigation.

Comment of Ms. Maya Eralieva:

- May be first of all, it’s better clarify, what exact objects has to be mitigated, deeply study and research, conduct all the monitoring, definitely find the problem and take mitigation measures, before the project approval.

Comment of Mr. Vijay Joshi:

- ADB’s safeguards require that the ecosystem of Chatyr-Kul Lake is not negatively affected as a result of the project. We know what the main impacts are and can design mitigation measures according as suggested by Dr. Shukurov, in parallel with additional baseline surveys of Chatyr Kul. We know the potential ecological impacts are mainly from noise and potential hazardous materials spills. We are taking a “preventive” approach, for example preventing noise increase without necessary knowing impact on all species, and preventing spills so that negative impacts from such events are avoided. Mitigation measures will include measures to stop poaching, and prevent use of borrow pits near the protected area. The EIA will also include monitoring to establish effectiveness of mitigation measures to prevent increase in noise and dust, emissions, control impacts of accidental spills and the state of health of biosphere of wild and water life. Yesterday we have visited Design Institute and had exchange of opinions how to include spill control and management measures by design interventions in road drainage. We understand the importance of the lake and take all the possible measures to improve and save habitants of the lake.

Question of Ms. Maya Eralieva:

- To reduce noise, will be constructed noise barriers during the hatching period?

Answer of Mr. Vijay Joshi:

- Noise barrier needs to be installed near such places like Kosh-Kol small lake from the road and some other vulnerable places along the alignment where nesting areas of the bird are close to the road and may be negatively impacted due to noise. Next spring we will start to study to identify such areas and keep a provision in the project design to build noise barriers at the required location. We are discussing with Design Institute regarding noise barriers location and necessary places need to be constructed.

  ADB also has a requirement to constitute a Grievance Redress Committee (GRC) for the project. The committee will have participation of NGOs representatives and other stakeholders who will have opportunity to ensure that the proposed mitigation measures are adequately implemented. This project being a sensitive project, EIA will also propose constitution of an Environment Monitoring Committee that will provide feedback on EMP implementation.

Question of Ms. Maya Eralieva:

- Is it possible to include civil society participation in Committee environmental monitoring?

Answer of Mr. Vijay Joshi:

- All stakeholders are welcome to Environment Monitoring Committee . Final EIA will suggest a proposed composition for such committee. It will be available in English and Russian languages in ADB website your review, recommendations and suggestions. Maintaining ecological integrity of Chatyr-Kul Lake is a high priority for ADB and suggestions from stakeholders in this respect are highly appreciated.

Recommendation of Mr. Bolot Jandyraliev (Senior Researcher of Karatal –Japyryk State Prservation):

- We would like that all our office's suggestions and recommendations have to be into consideration as much as possible. As local experts, we know everything of the lake and we want to be involved in the monitoring process and assist you in preserve bio-diversity of the unique lake.

Comment of Mr. Prianka Nalin:

- ADB assist and cooperate with you to preserve the lake. EIA includes your recommendations and suggestions, which you had recommended and suggested.

Question of Mr. Ulan Naamatbekov (CEO of NGO "Bugu-Maral"):

- Where will be located construction camps and will they keep sanitarian norms?

Answer of Mr. Vijay Joshi:

- Construction camp will be not be located within the sensitive stretch (water shed of Chatyr Kul lake. Construction camps will be required to adopt appropriate sanitary measures.

Question of Mr. Kalicha Umuralieva (Social Found "Nashe pravo"):

- I heard information regarding construction of new terminal in the checkpoint at km 478, checkpoint will move from km 531 to km 478. If it will happen then man and traffic impact will be huge. How do you mitigate in such case?

Answer Mr. Nurbek Jumaliev (Coordinator BNT Project 1,2 MOTC):

- Yes, this question was raised up in parliament, but government rejected the construction of new terminal. New terminal started to build, but not completed. Government decided to put weight scale in the checkpoint instead to construct new terminal. The cargo should not overload more the 40 tones per vehicle, it has ratified by government.

Question of Mr. Anatoliy Ostashenko:

- You had mentioned construction of noise wall, if it you construct it, it will interfere the wild animals migration from one side of the mountains to another side. How can you provide them free movement?

Answer of Mr. Dan Millison:

- In Draft EIA nothing finalized, mitigation measure is not final, even the construction is not yet designed. Design Institute will take into consideration construction of noise barriers in appropriate locations and provide free movement of wild animals as well.

Question of Ms. Maya Eralieva:

- What are the economical and social benefits for Naryn province? Did you make any analysis for these issues?

Answer of Mr. Asylbek Keshikbaev:

- Project benefits is another round table discussion, it's another item to discuss, because it includes many themes such as: poverty reduction, tourism and trade development, social impact, work with civil society, compensations etc. which will be conducted in the future and all of you will be invited for these questions will answer competent specialists. We will design program of BNT project, which will be available on the MOTC website and inform you beforehand.

Comment of Mr. Prianka Nalin:

- We have around US$ 50-60 million for the Project 3 right now. It will cost US$ 400-500 thousand per km., even we are able to reach up to US$ 1 million, but people will pay it off. Taking into consideration, we have to allocate money appropriately. So we and you cannot be able to write absolutely perfect EIA include everything, anytime will occur and arise issues, we will appreciate your cooperation, your recommendations and ideas.

List of Third Public Consultation Participants

ADB Grant 0123-KGZ (SF): CAREC Transport Corridor 1,(Bishkek - Torugart) Project 3

№	First and Last Name	Title	Organization	Contact numbers
1.	Kalicha Umuralieva	Director	Social Found “Nashe pravo”, NGO Forum on ADB	0543916702 kalicha56@mail.ru
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4.	Levan Markovich Alibegashvili	Deputy Director	Kyrgyzdortransproekt	0312 567873 0312 561112 0312 562177
5.	Erik Shukurov	Engineer ornithologist	Airport “Manas”	0312 693063 blackbird@salam.kg
6.	Emil Japarovich Shukurov	Director	Independent Ecological Expertise “Oleine”	0312 680418 shukurovemail@mail.ru
7.	Zulfija Marat	Officer	Bureau of Human Rights and Rule of Law	0312 311599 zm05hrb@elcat.kg
8.	Talant Omuraliev	Deputy Director of Scientific and Research Department	Karatal-Japyryk State Preservation in Naryn	0555211884 03522 51980 03522 51981
9.	Bolot Jandyraliev	Senior Researcher of Scientific and Research Department	Karatal-Japyryk State Preservation in Naryn	0772142119
10.	Ulan Naamatbekov	CEO of NGO	NGO “Bugu-Maral” in Naryn	0778040920 03522 53046 narynulan@rambler.ru
11.	Askar Davletbakov	Zoologist and ornithologist	National Academy of Science , Bishkek	0550965108 0312 243369
12.	Anatoliy Ostashenko Nikolaevich	Zoologist and ornithologist	National Academy of Science , Bishkek	0550697440
13.	Kubanychbek Mamaev	State Secretary	Ministry of Transport and Communications	0312 314385 0312 314313
14.	Sveta Keldibaeva	Environmental and Social Specialist	Investment Projects Implementation Group, MOTC	0312 314356 sveta_keld@mail.ru
15.	Asylbek Keshikbaev	Safeguard and Social Specialist	Investment Projects Implementation Group, MOTC	0312 314356 asylbekak@gmail.com
16.	Erkingul Kasymova	Social expert	Investment Projects Implementation Group, MOTC	0312 314356

№	First and Last Name	Title	Organization	Contact numbers
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Public hearings on mitigation measures, BNT-3, KM 479-539 Road Section.

Date: April 30, 2013
Venue: Naryn town, conference hall, Naryn Oblast State Administration
Time: 11.00-13.00

Attendees:

Local authorities:
1. Minazarova N, Issyk-Kul – Naryn Territorial Environmental Department.
2. Assanova A. – Karatal-Japyryk State Reserve.
3. Kabylbek uulu B - Issyk-Kul – Naryn Territorial Environmental Department.
4. Dzhamgyrchieva A., PO Coalition for Osh.
5. Zhaichiev K.T., State rayon administration of At-Bashy rayon.
6. Abylgaziev M., Kazybek aiyl okmotu, At-Bashy rayon.
7. Zhakypov T. - Kazybek aiyl okmotu, At-Bashy rayon.
8. Mambetakynov A.- Kazybek aiyl okmotu, At-Bashy rayon.
9. Mambetov O.- Kazybek aiyl okmotu, At-Bashy rayon.
10. Zhusopov - Kazybek aiyl okmotu, At-Bashy rayon.
11. Aliev B. - Kazybek aiyl okmotu, At-Bashy rayon.
12. Istan uulu K. - Kazybek aiyl okmotu, At-Bashy rayon.
13. Kozhoniyazov Sh.- Kazybek aiyl okmotu, At-Bashy rayon.
14. Zhamansartov A. - Kazybek aiyl okmotu, At-Bashy rayon.
15. Zhumakadyrov T.- Kara-Suu aiyl okmotu, At-Bashy rayon.
16. babiev T. - Kara-Suu aiyl okmotu, At-Bashy rayon.

MoTC and IPIG:
17. Mammaev K.A., IPIG DirectorP
18. keshikbaev A.A., MoTC environmental specialist
19. Abdygulov A.
20. Aralbaev Z. , DEP-957 Chief Engineer.

TERA International Group Inc.
21. Aitmatova Dj, Environmental expert
22. Krivoruchko S, Environmental experts.
23. Kalil uulu S, translator/interpreter.

Mass media:
24.Toktogulova Ch, SNIA Kabar.
25. Essenalieva K. Tenir-To'o newspaper.
26. Kozhoev U, (local correspondent).

Verbatim Record

(public hearings were held on Kyrgyz language)

K. Mamaev: Greetings, presentation of the attendees IPIG, Tera Intl.). Short information on the Project: executive agency – MoTC, donor agency – ADB, consultant - Tera International Inc., implementation period - 2013-2015.
This is ADB Project of category “A” on environmental parameters, therefore, ADB pays special attention to environmental impact by the Project road on Chatyr-Kul Lake Protected area which is the Ramsar site. The Consultant employs Environmental Monitoring Specialist; the EMP is prepared by the Contractor under strict environmental guidelines.
MoTC and Tera Inc implemented a series of environmental baseline studies withing the KJSR. Based on the results the preliminary data of the EIAs of 2010 and 2012 were updated and in the beginning of 2013 a BLS Report was prepared.
The reason for such surveys were as follows: protection of the unique environment of Chatyr-Kul Lake; KR international obligation within the signed conventions, in particular, the Ramsar

Convention. Objective is to establish the existing environmental level and its components and lay the grounds for the monitoring system.
The slides show the schematic chart of the Bishkek-Naryn-Torugart motor road.
To develop the system of monitoring during 2011 and 2012 were obtained and processed data on quality of water, air, soils, noise, flora, fauna and aquatic fauna. This data was collected by a group of scientists of the Institute of Biology and Soils, KR National Academy of Sciences of 7 specialists (the slides show their names and studies areas). Main directions of the studies: ornithology, zoology, flora, ichthiology, soils, enthomology and environmental monitoring. Prepared mapping materials with indication of sampling locations with the use of GPS and other data which allows to monitoring the environmental dynamics, assessing negative impacts and propose mitigation measures.
The main requirements to the designed system of monitoring – simplicity, comprehension and accessibility. The system is designed in the visualized table format.

The studies split by environmental components allowed to identify vulnerable areas and factors of negative impact, both natural and perspective anthropogenic. The results have shown the following: the main contribution to environment pollution is done by motor transport. There are registered exceeds of concentrations of sulfuric dioxide (10,28 MPC) and inorganic dust (1,037 MPC). The level of environmental tension on nitrogen dioxide does not exceed the allowed levels, dust – is a bit over the MPC, while it is critical as regards to sulfur dioxide. In this regard the monitoring program will be expanded and in addition to the existing parameters (SPM, sulfur dioxide and nitrogen oxide) will include requirements to also monitor concentrations of soot, benz(a)pirene, cadmium, led and strontium.

The monitoring indicators were designed for each sectors under study with all the necessary data in the table forms which allows easy-to-understand format for each of the KJSR specialist, with all process for samplings is well structured. In addition, the KJSR specialists involved will have to demonstrate appropriate professional level to working with samples, species registration in certain habitats. These specialists will be trained to operate special monitoring equipment which will be used for samples taking and their preliminary analysis. Such established monitoring system will serve to protect fragile ecosystem of Chatyr-Kul Lake.

The end users of the analytical information will be three organizations: SAEPF, MoTC (IPIG) and the Consultant. The same organization will have form up the environmental monitoring group at the earlier stages of the scientific department of KJSR; the latter have to have appropriate basic education and skills and readiness to working in the elevated conditions in the mountains in the KJSR territory. Also will be developed a Program to implement this monitoring system, specifically, to train the KJSR specialists and joint submission of the data from the first two stages of monitoring. The selected specialists will be trained to using the methodologies for sampling of air, water and soil; registration of birds and mammals species and registration of the initial data in the ad hoc database. This information will be published on the dedicated website for open general access. Financing issues of this activity will be decided together with SAEPF, MoTC (IPIG), and with the Consulting company during the first several years. Finally, the monitoring results will be used for the EIA updates and appropriate decisions, if appropriate. The monitoring system itself will be improved and updated based on the new data and information.

EIA. The first EIA was drafted in 2010, the second updated draft appeared in 2012 and the 3-rd, final EIA draft will be prepared by 2013. It incorporates the Environmental Baseline Level (BLS) and Environmental Management Plan (EMP).

The EMP identifies mitigation measures for the period of construction and operation for each of the studied components (as shown on the slides): air, water, soil, ground, mammals, hydrobiology, insects, avifauna, flora and solid wastes.

By taking onto account the importance of the Project area around Chatyr-Kul Lake, remoteness of the region, cost and environmental efficiency Consultant, following the ADB guidelines, suggested to using the *no regret* approach. This approach presumes that the initial economic costs will exceed environmental benefits in the short-term perspective. This approach was proposed in the EIAs of 2010 and 2012 and supported in 2013. In the frames of this approach it is proposed to arranging a geoecological barrier in the most sensitive areas along the road sides (КМ520-КМ531), and in the parking areas for trucks at the customs point (the slide shows its allocation). Slides also show its technical data and efficiency to neutralize effect of toxic and heave metals. Its lifetime is 20 years, the working temperatures range is wide (from -50 to +90C), the axle and total per square meter load capacity is 20 and 350 tn respectively, and other data. The other slides show examples of the use of components of geoecological barrier (parking lots, cargo terminals etc).

Mamaev К.А. noted that the last EIA version of 2013 is still not yet approved by ADB and following the approval it will be published on the websites of ADB and MoTC for general access.

Deputy Director of Issyk-Kul –Naryn Environmental Protection Department Kabylbek uulu Bolotbek:
You say that in 2011 samples of air and water were taken, same was done in July 2012, and what samples were taken in January 2013? And as per tests results in 2011 there were exceeding MPC on arsenic. We officially applied to Tera and did not get any answer. This sampling process took place without our representatives.

MoTC Environmental Specialist Aylbek Keshikbaev:
Our specialists were on site in 2011-2012 to take samples of air, water and soil. No water samples were taken in January. For soil samples we need small amount of material – a couple of spoonfulls. The results of analysis integrated in the EIA Report which is not published officially. You mention the 2011 results on the arsenic. This is already for 3 years as KJSR representatives state that the MPC on arsenic are high, yet construction is not in progress yet. Please note that the identified arsenic concentrations are in their gross form. We have alkaline soils in the Project area, it pH range is neutral to alkaline, and it is safe. It becomes dangerous in the acid soils. The method of Obukhov-Clarc was used, and this incorrect for the alkaline soils, since this method is applied only to acid soils. The MPC on arsenic in its gross forms in KR is,05mg/kg. With the use of another method the arsenic concentrations appeared as 0,0005 mg/kg. Note that the gross form of arsenic remains stable and is not included in trophic chains. In its mobile form, the results show concentrations less than 300 mg/kg. How much is it, specifically – we do not know yet, but this is less than the MPC. One such sample costs some $600 USD. Also the monitoring system within the Project is in place and samples will be taken every 3 months.

S. Krivoruchko. As for the heavy metals content and toxic elements, this is rather serious. The soils in the Project area are alkaline (show the pH interval), therefore, the road impact by the oxidation elements (N, S, C etc) may shift the pH balance of soil and water towards acid. As a result this may trigger the salination process and then it will not be possible to stop it. In alkaline soils ecotoxicants are dangerous in their mobile (aqueous) forms, yet their gross concentrations, in certain period of time, even on the background of MPC excess, bear no negative impact. The mentioned MPC exceeds were on the gross forms for acid soils. In our case the indicator will be concentrations in their mobile forms, as true for the alkaline soils. Soil sample results do not show any MPC exceed in the water-soluble forms for alkaline soils. In order to avoid irreparable environmental consequences in the future we are proposing to geoecological barrier.

K. uulu B: If monitoring will be done at all the BNT road sections, or is it only for the road section traversing the KJSR territory?

A.Keshikbaev: We are following the “Guidelines to develop and assess environmental impact”, and full impact assessment will be done only for environmentally sensitive areas. This is the “Standard 300” document. For the other road sections we apply abridged environmental assessment.

We are working since 2009 and plan to continue in May-June 2013. Right after the EIA adopted by ADB it will be available on the websites of ADB, MoTC and IPIG. Once again would like to remind that all such analysis are expensive and there will be no detailed analysis at the other sections of the road. Also, for KJSR we are procuring expensive monitoring equipment to monitor water and soil quality. In general, the entire monitoring system, including equipment, will cost over $100.000 USD. It is also planned to include the KJSR staff training and with the beginning of construction season they will be engaged in the monitoring practice. in July there will the first stage, and the second stage of training will take place in September.

Head of Kazybek aiyl okmotu, Abylgaziev Maksat: Question about the new method of protection form the road negative impact – geoecological barrier. Please, explain.

Sergey Krivoruchko:

This method is designed in Kyrgyzstan, and it is patent-pending. It is called geoecological barrier. It provides for high protection level of soil and water from contamination by heavy and toxic metals, contact waters form motor road, oil spills and other aggressive elements. It is planned to arrange the road sides 2/5 meters wide on the both sides of the road along the 11 km stretch along the Small Lake and the parking lot at the customs point. Insignificant alterations to the road design might be required (the roadside), arrangement of the fixing grid called EcoRaster and natural geochemical filler – galuconite. All the ecotoxicants will be captured within the roadside, chemically converted into meta-stable salts of the toxicants and will not be included in trophic chains. This barrier, with account to the climatic conditions of the Project area, operates in wide diapason of temperatures, holds high loads (heavy trucks and equipment) and is designed to serve as long the lifecycle of the road itself – 20 years. Arrangement of the geoecological barrier highlights attention of ADB to environmental safety in the Project area.

Head of Kazybek aiyl okmotu, Abylgaziev Maksat:

We see some cracks on the road, right on the middle. What is the road construction quality 9technical supervision)? The low seasonal temperatures on Naryn oblast were taken into account?

K. Mamaev: The construction quality is being supervised by both local and international experts. As the result of surveys we established that cracks appeared not only on the road dressing, but also in the road base down to 1.80 meters.

We engaged international cracks exerts, their opinion will be presented to us by May 5. Based on this results we will learn where the mistake was made; was it in the road design and calculations, or this is the result of the climate change phenomenon in this locality. The same we observed during the Bishkek-Osh construction in Suusamyr, but there the cracks were across the road. We also engaged experts and some corrections to the road design were made.

The main “enemy” as we understand, is the melt and rainwater and already now we start thinking on how to best divert this water from the roadside drainages.

Kabylbek uulu Bolotbek: On the borrow pits locations and increase of the financial cost. I thought that all the cost should have been accounted to prior to construction. Such as the

territory has to be inspected beforehand, to see gravel sources and transportation costs. Then why do you need additional money?
K. Mamaev: At the project design stage they mark the areas for borrow pits, geological parameters being studied (for compliance to technical specifications). Secondly, feasibility documents also include costs breakdown, including transportation. However, since we were prohibited to opening borrow pits within the protected area, we had to carry gravel from the other locations. As a result we face the increase of transportation costs due to longer distances. The ADB policy is such - not only to build the road but to also reduce negative impact both onto environment and social factors. Environmental and social factors are the priorities during the Project implementation. There is a Department for ADB Policies Implementation. This Department does not even follow instructions by the ADB President. So, its representatives carried out their own analysis and stated that no residential building will be demolished. On the national law the KR Gosstroy has to demolish all the residential structures, if wrongfully located, but the ADB policy does not allow this to happen. So, we had to draft special Governmental decision on this account. Once again, during this Project implementation social and environmental aspects dominate over technical.

M. Abylgaziev: You are right. The Project impact onto local flora and fauna shall be reduced. So, there will be no borrow pits beyond Tuz-Bel pass?
K.Mamaev: In order to reduce the cost for this road section we traversing the KJSR territory we have solicited a Governmental decision to permit to opening 10-15 small borrow pits there. In the beds of small rivers there are amounts of the alluvium material. Provided the lab analysis allow us to using it for the road construction, and provided the Forestry Department of the SAEPF will issue their permits, we will make use of them. By the and of May, as soon as snow is down, we will invite representatives of aiyl okmotu and akimiat and together inspect the areas for probable borrow pits.
A borrow pit location beyond the customs point already selected. But there is one "but": proximity of the state border.as for the borrow pits in general, this issue is still not resolved yet. As for their rehabilitation – this is the responsibility of contractors. State Committee on Geology shall issue its license to MoTC.
S. Krivoruchko:
In the availability of official permits, this approach is still possible provided there is strict observation of all the precaution measures. The random alluvium excavation from the river beds at small depth is, in general, acceptable. Yet, this is still being discussed.

M. Abylgaziev: The problem is pastures: will the borrow pits opening reduce grazeland areas and how do we deal with this?
K. Mamaev: We reject the idea to open large borrow pits and plan to work on smaller areas, which are quicker to self-restoration. In the protected areas borrow pits will be opened up in the river beds 9there is no soils, only barren gravel etc). There should be a borrow pits management plan on rehabilitation. Note that the rehab costs are included in the total amount. So, it is very important to duly prepare borrow pits recultiavation plans. Again, environmental issues are the priority for ADB.

M. Abylgaziev: on the problem of heavy trucks: earlier they have permitted the 55-tonners. What kind of equipment will be used now for the road construction?
K. Mamaev: The use of the 55-tonners was prohibited following our request; the maximum permitted machines were not over 44 tons. I do not know what kind of equipment they will use now – this is the matter of the new MoTC department, and they are still discussing the types of the equipment to be used.

Representative of Kazybek aiyk aimak: You say that the Project is social, and now we loose almost 70 ha of pastures for borrow pits. Can we, as local residents, hope for any compensation at the cost of the Project, including for construction of local roads etc?
К. Mamaev: We cannot be specific about it at the moment, but you can write and official letter to the Government. But I want to say that the problems with local population will come up sooner or later, so the sooner you apply to the Government, the sooner this issue can be resolved. The same problem has already been discussed in the other construction areas.

M. Abylgaziev on the legal collisions.
К. Mamaev: According to the KR Constitution international law prevails over national.

M. Abylgaziev: with account to that our aiyl aimak is the border-related territory we would like to get some support from the Government on the issues of borrow pits and on the other aspects.
К. Mamaev: The government will do its best to deal with your concerns, including social.

M. Abylgaziev thanked for the information provided and organization of public hearings.
К. Mamaev: Please inform local population on possible employment by subcontractor companies. Pay special attention to the clauses of the contract to avoid any further problems. Let them sign employment agreements following the opinion and recommendations of the specialists of labor inspection.
К. Mamaev at the end of the conversation thanked the participants for their active participation and greeted with the upcoming May Holidays.

1

Экологическое воздействие в районе озера Чатыр-Куль и по всей протяженности дороги (км 479-539) при проведении реабилитационных работ

г.Нарын **30** апреля **2013** г

2

Общая информация о Проекте

- Исполнительное агентство по реализации Проекта – Министерство Транспорта и Коммуникаций КР
- Донорское Агентство – Азиатский Банк Развития
- Сроки реализации: 2013-2015

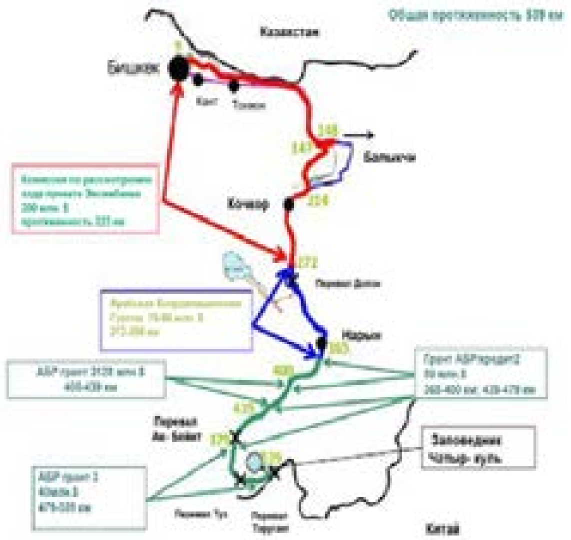
3

Проведенные исследования по Чатыр-Кулю, ОВОС

- Министерство транспорта и коммуникаций и Консультационная компания TERA провели исследования фонового состояния участка КЖГЗ в проектной зоне.
- Причины:
- Необходимость сохранения уникальной незатронутой антропогенным воздействием экосистемы оз. Чатыр-Куль,
- Обязательства Кыргызстана по международным Конвенциям, в частности, по Рамсарской Конвенции.
- **Цель:**
  - Зафиксировать существующее состояние окружающей среды и ее компонентов в исследуемом районе и
  - Обеспечить основу для разработки долгосрочной системы ее экологического мониторинга.

4

Дорога - Бишкек- Торугарт



5

ОТЧЕТ БУЭМ/ОВОС

- Результаты экологического исследования по базовому уровню мониторинга (2011 и 2012), состоящие из данных и результатов анализов воды, воздуха, почв, шума и вибраций, флоры и фауны были собраны, проанализированы, и использованы для разработки системы мониторинга.

6

Исследовательская группа

- Группа ученых, выполнявших работы по определению базового уровня экологического мониторинга, состояла из 7 человек была сформирована в июле 2011 года:
- Давлетбаков А.Т. орнитолог, руководитель Группы;
- Кустарева Л.А. ихтиолог-гидробиолог;
- Милько Д.А. энтомолог;
- Лазьков Г.А. флорист (ботаник);
- Остащенко А.Н. териолог (зоолог);
- Мамытканов С. почвовед;
- Аманбаев У. эколог-специалист по мониторингу

7

- Техническое задание разработано в июле 2011 года МТиК (ГРИП)
- <u>Главные направления исследований</u>:
  - орнитология,
  - зоология,
  - флора,
  - ихтиология,
  - почва,
  - энтомология, и
  - мониторинг окружающей среды.
- ТЗ определило необходимость разработки
  - Плана работ (1),
  - изучения научной литературы и фондовых/архивных материалов (2),
  - проведения анализа современного состояния ОС в зоне Проекта (3),
  - картографирования мест отбора проб и полевых маршрутов (4),
  - анализа действующих, вновь появившихся, а также будущих факторов окружающей среды (пост-проектная стадия) (5), и
  - системы экологического мониторинга в исследуемой зоне (6).

8

- Исследовательские работы проводились в несколько этапов:
  - осенью 2011 г. были отобраны пробы воды и почв, воздуха;
  - в июле-августе 2012 г. и
  - в январе и июне 2013 года,
  - Это позволило охватить все 4 сезона года и зафиксировать базовый уровень состояния окружающей среды в Проектной зоне в различных погодно-климатичеких условиях.

9

Результаты

- Разработка картографических материалов, где все точки отбора проб (с координатной привязкой на местности по GPS) и другие значимые факторы исходного состояния окружающей среды позволят отслеживать динамику ее состояния в долгосрочной перспективе, оценивать негативные воздействия и, в конечном итоге, выработать соответствующие смягчающие меры.

10

Методики

- Работы проводились по национальным и международным методикам и в соответствии с существующими руководящими принципами АБР.
- Эксперты исследовательской группы разработали систему индикаторов и их показателей, которые станут основой для проведения замеров и наблюдений в различных секторах экологического мониторинга на данном участке дороги БНТ.
- <u>Основное требование:</u> простота, понятность и доступность.
- Система мониторинга разработана в наглядной табличной форме.

11

РЕЗУЛЬТАТЫ

- Исследования по компонентам ОС позволили определить уязвимые места и негативные факторы воздействия: природные и перспективные антропогенные факторы.
- В данном отчете приводятся только основные положения работы и выводы ученых.

12

Результаты определения содержания загрязняющих веществ в атмосферном воздухе (продолжение)

- Основной вклад в загрязнение атмосферного воздуха вносит диоксид серы (10,28 ПДК) и неорганическая пыль (1,307 ПДК).
- Степень экологической напряженности по диоксиду азота не превышает допустимых пределов, по запылённости – немного выше допустимых пределов, а по диоксиду серы является критической.
- Параметры измерения качества воздуха, в дополнение к стандартным (взвешенные частицы, диоксид серы и диоксид азота) будут расширены и включать параметры по содержанию в воздухе сажи, бенз(а)пирена, свинца и кадмия.

13

Индикаторы

- Для каждого сектора исследования разработаны индикаторы и показатели, со всеми необходимыми данными в табличном виде, что для ответственного сотрудника КЖГЗ, на который будет возложена эта работа, должно создать хорошо структурированное представление о процессе отбора проб.

14

ВНЕДРЕНИЕ И ПОДДЕРЖКА СИСТЕМЫ МОНИТОРИНГА

- **Главные направления:**
- Профессиональный уровень подготовки сотрудников, которые будут заняты сбором данных и проб, подсчетом особей в популяции в данном ареале обитания.
- Сотрудники будут обучены навыками работы со специальной аппаратурой, которая будет использоваться при отборе и первичном анализе проб.
- Определение методов формирования базы данных всех проб и полученных полевых материалов, ответственные за ее поддержку, анализ, и получатели результатов анализов, официальных владельцев, и пользователей полученной информации.
- Необходимо иметь соответствующее оборудование и программные продукты, по уровню соответствующие потребностям и задачам Проекта, а главное – целям сохранения хрупкой экосистемы озера Чатыр-Куль.

15

ВНЕДРЕНИЕ И ПОДДЕРЖКА СИСТЕМЫ МОНИТОРИНГА

- Конечными получателями аналитической информации будут три организации: ГАООСиЛХ КР, МТиК (в лице ГРИП), и компания -Консультант по надзору строительных работ.
- Они же должны на начальной стадии проводить отбор и сформировать группу специалистов в области мониторинга из числа сотрудников научного отдела КЖГЗ, которые должны иметь соответствующее базовое образование, навыки работы в данной сфере и готовность работать в высокогорных условиях Заповедника.
- Должна быть разработана Программа внедрения системы мониторинга и особенно – по обучению сотрудников КЖГЗ и совместному проведению первых двух этапов наблюдений.

16

ВНЕДРЕНИЕ И ПОДДЕРЖКА СИСТЕМЫ МОНИТОРИНГА

- Выбранные сотрудники пройдут подготовку и обучены методикам отбора проб воздуха, воды и почвы, подсчета популяций птиц и животных в зоне проекта, а также регистрации полученных первичных данных в специализированной базе данных.
- Информационные ресурсы за много лет должны быть выложены на специализированном Интернет-сайте и иметь открытый доступ для всех заинтересованных лиц и организаций.
- Вопросы финансирования данной деятельности должны решаться совместно ГАООСиЛХ КР и МТиК (ГРИП), а также в первые несколько лет компанией-консультантом по надзору за строительством автодороги БНТ.

17

БУЭМ

- Результаты мониторинга будут в конечном итоге использованы для обновления ОВОС обозначить существующие проблемы и выработке путей их решения.
- Сама система мониторинга, как «живой» документ, будет совершенствоваться и дополняться с учетом новых данных и информации.

18

ОВОС

- 1 версия ОВОС была разработана в 2010 году
- 2 обновленная версия – 2012 г.
- 3 финальная версия – 2013 г.
- 3 версия содержит исследования базового уровня состояния ОС, ПУОС и Приложения.

19

ПУОС: Воздух

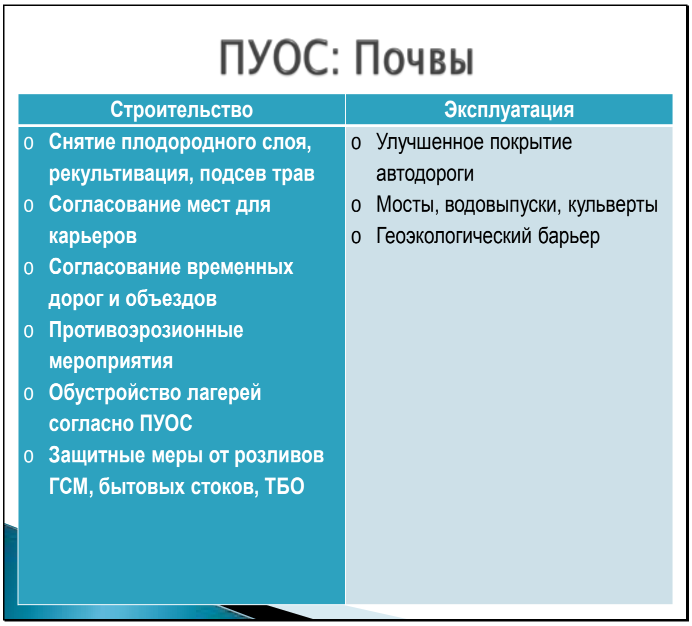
Строительство	Эксплуатация
o Тех. состояние машин и оборудования o Звукоизоляция моторных отсеков o Разбрызгивание воды o Стандартные процедуры ПУОС	o Улучшенное покрытие автодороги

20

ПУОС: Вода

Строительство	Эксплуатация
o Дренажные системы o Сбор бытовых и промышленных стоков o Согласование мест для карьеров и объездов o Стандартные процедуры ПУОС	o Улучшенное покрытие автодороги o Мосты, водовыпуски, кульверты

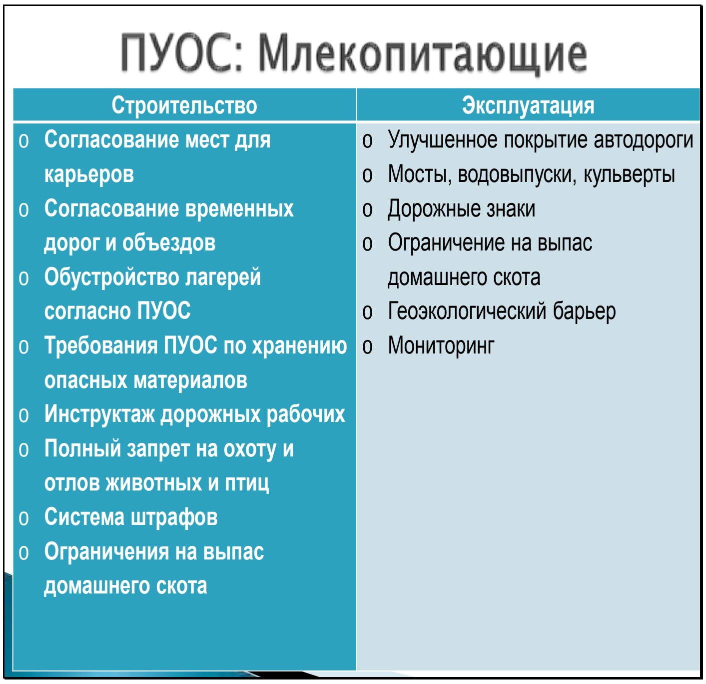
21


ПУОС: Почвы
Строительство
Эксплуатация
Снятие плодородного слоя, рекультивация, подсев трав
Согласование мест для карьеров
Согласование временных дорог и объездов
Противоэрозионные мероприятия
Обустройство лагерей согласно ПУОС
Защитные меры от розливов ГСМ, бытовых стоков, ТБО
Улучшенное покрытие автодороги
Мосты, водовыпуски, кульверты
Геоэкологический барьер

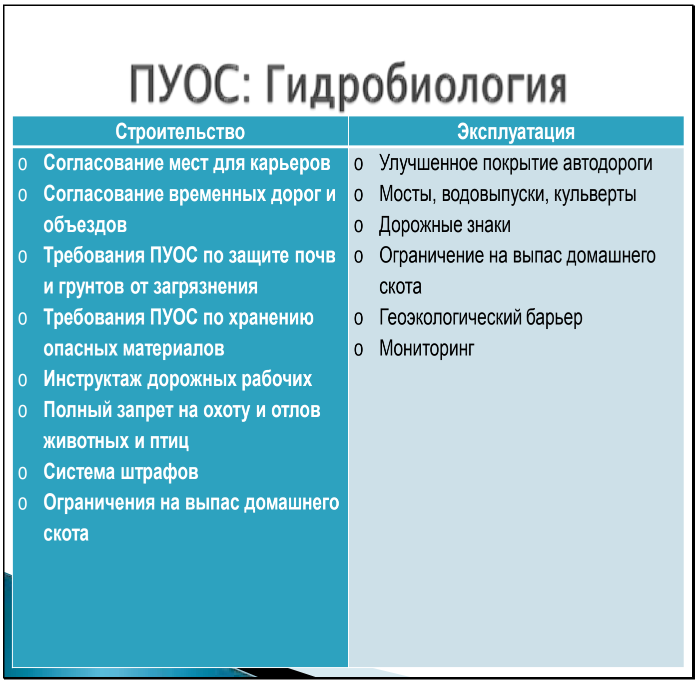
22


ПУОС: Грунты
Строительство
Эксплуатация
Согласование мест для карьеров
Согласование временных дорог и объездов
Противоэрозионные мероприятия
Обустройство лагерей согласно ПУОС
Требования ПУОС по хранению опасных материалов
Улучшенное покрытие автодороги
Мосты, водовыпуски, кульверты
Геоэкологический барьер

23


ПУОС: Млекопитающие
Строительство
Эксплуатация
Согласование мест для карьеров
Согласование временных дорог и объездов
Обустройство лагерей согласно ПУОС
Требования ПУОС по хранению опасных материалов
Инструктаж дорожных рабочих
Полный запрет на охоту и отлов животных и птиц
Система штрафов
Ограничения на выпас домашнего скота
Улучшенное покрытие автодороги
Мосты, водовыпуски, кульверты
Дорожные знаки
Ограничение на выпас домашнего скота
Геоэкологический барьер
Мониторинг

24


ПУОС: Гидробиология
Строительство
Эксплуатация
Согласование мест для карьеров
Согласование временных дорог и объездов
Требования ПУОС по защите почв и грунтов от загрязнения
Требования ПУОС по хранению опасных материалов
Инструктаж дорожных рабочих
Полный запрет на охоту и отлов животных и птиц
Система штрафов
Ограничения на выпас домашнего скота
Улучшенное покрытие автодороги
Мосты, водовыпуски, кульверты
Дорожные знаки
Ограничение на выпас домашнего скота
Геоэкологический барьер
Мониторинг

25

ПУОС: Насекомые

Строительство	Эксплуатация
o Согласование мест для карьеров o Согласование временных дорог и объездов o Требования ПУОС по хранению опасных материалов o Требования ПУОС по защите почв и грунтов от загрязнения o Инструктаж дорожных рабочих o Полный запрет на охоту и отлов животных и птиц o Система штрафов o Ограничения на выпас домашнего скота	o Улучшенное покрытие автодороги o Мосты, водовыпуски, кульверты o Дорожные знаки o Ограничение на выпас домашнего скота o Геоэкологический барьер o Мониторинг

26

ПУОС: Орнитофауна

Строительство	Эксплуатация
o Согласование мест для карьеров o Согласование временных дорог и объездов o Обустройство лагерей согласно ПУОС o Требования ПУОС по защите почв и грунтов от загрязнения o Требования ПУОС по хранению опасных материалов o Инструктаж дорожных рабочих o Полный запрет на охоту и отлов животных и птиц o Система штрафов o Ограничения на выпас домашнего скота	o Улучшенное покрытие автодороги o Мосты, водовыпуски, кульверты o Дорожные знаки o Ограничение на выпас домашнего скота o Геоэкологический барьер o Мониторинг

27

ПУОС: Флора

Строительство	Эксплуатация
o Согласование мест для карьеров o Согласование временных дорог и объездов o Требования ПУОС по хранению опасных материалов и контролю стоков o Требования ПУОС по защите почв и грунтов от загрязнения o Инструктаж дорожных рабочих o Полный запрет на сбор растений и трав o Система штрафов o Ограничения на выпас домашнего скота	o Улучшенное покрытие автодороги o Дорожные знаки o Ограничение на выпас домашнего скота o Геоэкологический барьер o Мониторинг

28

ПУОС: ТБО

Строительство	Эксплуатация
o Стандартные процедуры сбора и утилизации ТБО согласно ПУОС o Инструктаж рабочих подрядчика o Мониторинг	o Система управления ТБО будет разработана на уровне Ат-Башинского айыл окмоту (ГАООСиЛХ / КЖГЗ, МТК) o Дорожные знаки

Communities' recommendations on ecological aspects of BNT 3 Project, considered for their inclusion in new edition of EIA.

First public hearings, September 18 2009 Naryn city		
1	There is no information about the budget of project.	This information was delivered during the next Public hearings.
2	Need for environmental study prior to commencement of construction works.	In 2011-2013 Environmental Monitoring Baseline Survey was conducted.
3	It is necessary to control exceeding weight of heavy trucks.	Comments were taken into consideration and issues were discussed with Customs Service, responsible for this sector.
4	Speed limit enforcement control.	Within the implemented projects importance is given to the installation of road signs.
5	Preservation of fauna and flora biodiversity of Chatyr Kul Lake.	For this purpose Environmental Monitoring Baseline Survey was conducted.
6	Avoid noise, dust, soil contamination and water.	This is included in attached EMP in EIA.
7	Reduce to minimum construction period during breeding and nestling seasons.	Recommendations were taken into consideration in Environmental Monitoring Baseline Survey was conducted.
Second Public Hearings, December 11 2009 Naryn city		
8	Construction of stationery laboratory in administrative building of Kratal Japirik Reserve to carry out investigation and analysis of water and soil.	All needed equipment will be procured for KJSR to conduct environmental monitoring. Construction of laboratory is SAEPF's responsibility.
9	It is necessary to provide KJSR with binoculars, digital video camera and camera.	This isincluded in procurement plan for KJSR.
10	Enhance environmental awareness via conducting seminars for builders and local people.	For builders this is provided in EMP, and for local people KJSR and environmental NGOs are responsible.
11	What is the competence of International environmental Consultant.	Ensure to implement the best worldwide environmental practices.
12	How will separators, separating oil and water, separate along the road work, since the area is permafrost?	Separators will not work during winter period.
Management of biodiversity maintenance in protected area, environmental awareness and press service, September 15 2009.		
13	Construction of anti noise walls during construction.	Experts' opinions: at night time some bird species fly lower, therefore they might hit the walls, as well it is a barrier on the migration way of wild animals and argalis.
Karatal Japyryk state Reserve, September 17-18 2009		
14	Construction of tower for watching birds.	The issue is not completely resolved, as some experts believe that the tower is an artificial barrier to wild fauna.
15	The procurement of a mobile caravan (all-wheel drive car with a living compartment).	This question is open.
16	The procurement of equipment for observation (binoculars, clothes ant etc.)	Currently the list of equipment to be procured is agreed with SAEPF under Kyrgyz Government and KJSR except clothes, field bags and home cinema and others.
17	Prevent noise pollution nearby lake shore in the south-east and north-west part of the lake.	Appropriate measures are provided in developed monitoring system.
18	Prevention of water contamination, oil spill.	Appropriate measures are provided in developed monitoring system.
19	Carry out regular and complete monitoring.	Monitoring system is developed, partly implemented, it is necessary to involve KJSR staff.
20	Install wire fence 1 km from lake shore and some control points and signs in the buffer zone.	Zoologist's and ornithologist's opinion: he is against wire fence around the lake which poses threat to birds. Moreover, at night time some bird species fly lower, therefore they might hit the walls, as well it is a barrier on the migration way of wild animals and argalis.
21	Construct some embankments to prevent water contamination.	This is included in borrow pit management plan.
Meeting with zoologist from National Academy of Science, October 13 2009.		
22	Prevent contamination of ground water and hot	Appropriate measures are provided in developed

	spring water. It would be better to concrete the surface, not asphalt. Oil leaking will result in water contamination.	monitoring system and EMP, MOTC refused concrete surface due to high costs of works.
23	It is recommended not to pave asphalt to prevent penetration of bitumen to subsoil and ground water, and eventually bitumen can reach the lake, at least at the section where road is near to the lake (km501 - km531), since Chatyr Kul lake is closed, outflow and pollutants having reached the lake remain there for good, and is habitat for many valuable and fragile fauna and flora species.	Appropriate measures are provided in developed monitoring system and EMP.
24	To prevent soil erosion and other violations development of borrow pits nearby Chatyr Kul lake is prohibited.	Increase in the cost of project forces the Government to use borrow pits in lake basin.
Department of water sources, October 13 2009		
25	Proposed concrete surface from km501 to km539 in relation to water contamination.	Appropriate measures are provided in developed monitoring system and EMP, MOTC refused concrete surface due to high costs of works.
NGO in Naryn city, October 14 2009.		
26	Some animals migrate from one side to the other side of the road, therefore it is necessary (1) to make height of embankment as low as possible and (2) install box culverts which will facilitate animal migration.	Considered in design solutions.
27	Enhance capacity building and objects of KJSR.	This is provided in EIA and EMP.
Third public consultations (Bishkek), September 24 2010		
28	How eill EIA be completed without profound investigation of the lake?	In 2011-2013 Environmental Monitoring Baseline Survey was conducted.
29	How much time and money will be needed under introducing the system of "credits"? Does this mean that you initiate additional environmental studies? Can all this be done on the basis of the existing reserve?	Additional research will be conducted to get clear idea of project impact on water quality, ecosystem and biodiversity conditions of the lake via monitoring, and with the help of experienced ecologists to integrate sustainable ecosystem restoration measures/enhance during project design stage to mitigate its effects.
30	What is the budget of environmental management and restoration measures?	Information will be provided in EIA.
31	Was EIA conducted only for this section of road or for other projects also?	Section (478-531 km) belongs to the category «A», since project is implemented in a sensitive area. The problem is that the protected area around the lake Chater-Kul falls within the Ramsar Convention, as reported here, many migratory birds are entered into the Red Book. According to ADB procedures for this section EIA must be conducted appropriately. Other areas are classified as «B», and only Environmental Monitoring Baseline Survey should be carried out (IES-Simplified version of EIA), which was done, and the Contractor is to make the Environmental Management Plan (EMP), fulfillment of which will be monitored by the Consultant.
32	The issue of the rational allocation of funds for mitigation measures. Is it assumed that 2-3% of the total project budget will be spent on measures to mitigate the impact? Let me express the public concern about the priority of the road and reducing the debt burden. Attention is drawn to the human factor and not a environmental factor.	Mitigation measures will not deteriorate current ecosystem condition. During the development of design estimates, we include all possible safety measures, in particular measures to minimize the risks. Therefore, all possible measures must be included in the tender documents. Some simple measures, such as dust suppression, noise reduction are included in EMP, which is implemented by the Contractor. The issue of external debt is a matter for the Ministry of Finance and the Government of the Kyrgyz Republic, but not MOTC.
33	Before approval of the project maybe, first of all, it is better to specify which objects should be	ADB Safeguard measures require exclude any impact on ecosystem in Chatyr-Kul lake. The potential environmental

	mitigated, investigated and studied profoundly, monitor, identify problems and take mitigation measures.	impacts may be caused mainly by the noise and potential spill/leaks of hazardous materials. The EIA included monitoring to determine the effectiveness of mitigation measures for noise and dust emissions, control of accidental spills, and the preservation of the biosphere wildlife and aquatic life.
34	Is it possible to include participation of communities in environmental monitoring committee?	For project BNT 3 Grievance Redress Group was established to consider complaints to solve appearing ecological and social issues. People can submit their complaints to GRG. Environmental monitoring should be carried out only by specialists.
35	We would like to see as much as possible all the suggestions and recommendations of our reserve have been taken into account. As local experts, we know all about the lake, also want to take part in the process of monitoring and assist in the preservation of the unique biodiversity of the lake.	MOTC (IPIG) and Consultant (TERA) work closely with SAEPF, including KJSR. Moreover one of the staff was involved in development of monitoring system. Project will procure equipment and inventory for KJSR.
36	Where will construction camp be located and will workers adhere to hygiene standards?	Contractor's camp is located at km501 on the Tuz-Bel pass. Camp layout was developed and approved. Appropriate approvals were received. The corresponding resolution. Regular sanitary and hygienic control is being carried out at camp.
37	What are the economic and social benefits of the project for the Naryn region? What is the role of local people in the project, NGOs and local government? Is there a program for tourism? What is the budget? Have you had any analysis on these issues?	Due to the improvement of the existing road, the project significantly eliminates "narrow places" during shipments which slows down the trade expansion, and will promote regional economic cooperation. The project will have a positive environmental impact. The positive environmental impacts include the reduction of current noise, dust and vibration levels in the protected area of the Chatyr-Kul lake by means of a more smooth and non-stop movement of heavy vehicles; securing safer habitats by improving the ability of surveillance to prevent poaching and the penetration of livestock into vulnerable areas of nesting birds; Strengthening ecosystem monitoring of Chatyr-Kul area, KJSR through training and the purchase of new equipment for environmental monitoring, as well as vehicles.
Fourth public consultations (Naryn city), April 30 2013		
38	You are saying that in 2011 sampling analysis of soil and air was conducted, in July 2012 sampling analysis was conducted, in January in winter 2013, what kind of sampling analysis of soil was carried out? And the second question in 2011 according to the results of the sampling analysis it was seen that content of arsenic was exceeding all characteristics, in 2012 we officially turned into the company TERA and have not received a reply from them. Sampling analysis was conducted without our representatives?	Analysis in Chatyr Kul was conducted during 2011-2013. Results of analysis are included in EIA which will be published officially. Unfortunately, Kyrgyzstan has not fully developed its own MPC for heavy metals due to the fact that heavy metals have not been fully studied in terms of scientific and technical aspects. Among the worldwide recognized methods to determine the maximum permissible concentrations of heavy metals in the soil, works of Obukhov, Clark, Ilyin and Cloquet can be distinguished. Obukhov's and Clark's methods to determine the MPC apply to non-carbonate soils with neutral and acidic soil solution. As you know, the soil of project area, BNT-3, area are carbonate, and the average soil reaction is alkaline and therefore in the course of "Environmental Monitoring Baseline survey" for Chatyr-Kul catchment area, methods of V.A.Ilin and Klock (1982, 1992 and 2007) were used to determine MPC of heavy metals in soil, which is also widely used in the CIS countries.
39	Will monitoring be conducted in all areas of the Bishkek-Naryn-Torugart or it refers to only the section of the road that passes through Chatyr-Kul Reserve?	The work is conducted in accordance with the "Instructions about the development and evaluation of environmental impact," according to it we are carrying out a complex assessment of the impact only in environmentally sensitive areas. According to the standard this document is "300". In all other areas, we are conducting short environmental survey. After approval of

		the EIA, the document was posted on the ADB and MOTC websites. Due to the high cost of analyzes, in other sections detailed analysis will not be conducted.
40	Nowadays, we can see that there is crack right in the middle of the road. How well the road construction works are conducted (technical supervision), was a low temperature during winter in Naryn taken into consideration?	International and national experts supervise the construction quality.
41	The question about borrow pit locations and increase in financial expenses? I think that at the stage of project designing the financial costs should be taken into account. For example, examine the reserve in advance, from where crushed stone will be transported and in view of this I have a question why there is need for the additional financial costs?	At the stage of project designing borrow pit locations are fixed their geology is studied (in compliance with the technical specifications). Secondly, design documentation is prepared, and all costs are identified, including transportation costs. However, given the fact that we were not allowed to develop borrow pits in the protected area, Contractor had to transport crushed stone from other borrow pits. As a result of it, distance and transport costs increased. ADB policy is not only to build a road, but also to reduce the negative impact on both the environment and the social conditions. Environmental and social factors are priority in the implementation of the project. Due to the escalation costs of the project because of transportation costs MOTC was forced to put forward a proposal to the Government to use borrow pits in Chatyr Kul lake basin.
42	It is necessary to reduce the negative impact of the project on the local flora and fauna. Does it mean that after Tuz-Bel pass no borrow pits will be developed?	To reduce the financial cost for the construction of the section of the road that passes through the protected area, we have prepared request to the Government to allow us to develop 10-15 small borrow pits in the protected area. There, on the surface (particularly in river beds) big quantity of transported materials has accumulated. Having official permits, from an environmental point of view, this approach is considered acceptable subject to strict compliance with all environmental safeguards. Distributed excavation of alluvial sediments from river beds at a shallow depth is, in principle, acceptable.
43	The problem of pasture? Development of borrow pits will reduce the area of our pastures, what shall we do?	MOTC refused to develop big borrow pits and it is planned to develop small borrow pits, which can be quickly restored. In protected area borrow pits will be developed in the rivers beds (where there is no fertile soil, only loosely lying soils (gravel, etc.). For each borrow pit recultivation plan will be developed. It should be noted that the recultivation costs are incorporated in the overall design and cost estimates.
44	You are saying that it is a social project, and we are now giving away almost 70 acres of pasture for borrow pits, can we (local population in the project zone) rely on some compensation from the project, including the construction of local roads, etc?	On this issue, local Government bodies need to send official letters to the Government, the earlier issue is raised, the faster it will be solved. The same issue was also raised in other regions during the construction of roads.

A brief outline of information disclosure

№	Activities	Date	Responsible	Remarks
1	To post developed EIA on ADB and MOTC KR websites	July 17 2013	ADB and IPIG MOTC	
2	Information disclosure about public hearings in Naryn, indicating venue and time.	July 22 2013	IPIG MOTC KR	www.piumotc.kg
3	Public consultations on revised EIA in Naryn (press-release, hand out material on CDs for each particiapnt)	July 26-27 2013	TERA, IPIG MOTC KR	Invited: local government bodies, local road service units under MOTC KR, Ombudsman for Naryn region, local MM, local people, NGOs and others.
4	Information disclosure on revised EIA in local mass media.	July 2013	TERA, IPIG MOTC KR	Perhaps, there will be an interview of IPIG MOTC on radio and TV
5	To post revised EIA on ADB and MOTC KR websites	Early August 2013	ADB and IPIG MOTC	www.adb.org www.piumotc.kg
6	Translation of EIA to Kyrgyz language	By middle of August 2013	TERA IPIG MOTC KR	Consultant is responsible for printing 50 copies of Kyrgyz version of EIA.
7	Public hearings on final version of EIA, approved by ADB in Naryn (press release, distribution of Kyrgyz version of EIA with attachments to each participant)	August 2013	TERA, IPIG MOTC KR	Invited: local government bodies, local road service units under MOTC KR, Ombudsman for Naryn region, local MM, local people, NGOs and others.
8	Information disclosure on revised EIA in central mass media	August 2013	TERA, IPIG MOTC KR	www.adb.org www.piumotc.kg

Excerpts from the study "Baseline environmental monitoring" Appendix 8

Soils Analysis

Results of soil spectral analysis (in mg/kg)

Point №	№ sample	Mn	Ni	Co	Ti	V	Cr	Mo	W	Zr	Nb	Cu	Pb	Ag	Sb	Bi	As	Zn	Cd	Sn	Ge	In	Ga
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	004	400	40	5	7000	90	40	<1,5	<30	120	<12	12	15	<0,3	<20	<2	<300	40	<30	1,5	<1,2	<5	5
	004^{1}	400	30	5	5000	70	40	<1,5	<30	120	<12	15	15	<0,3	<20	<2	<300	30	<30	1,5	<1,2	<5	7
	004^{2}	500	40	7	5000	70	40	<1,5	<30	120	<12	12	20	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	7
average		433,3	36,7	5,7	5666,7	76,7	40,0	<1,5	<30	120,0	<12	13,0	16,7	<0,3	<20	<2	<300	33,3	<30	1,7	<1,2	<5	6,3
2	009	400	40	7	5000	70	50	<1,5	<30	120	<12	20	20	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	12
	009^{1}	500	40	7	5000	70	50	<1,5	<30	150	<12	20	15	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	5
	009^{2}	400	40	7	4000	90	50	<1,5	<30	150	<12	20	15	<0,3	<20	<2	<300	50	<30	2	<1,2	<5	7
	009^{3}	400	50	9	4000	70	70	<1,5	<30	150	<12	20	30	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	7
average		425	42,5	7,5	4500	75	55	<1,5	<30	142,5	<12	20	20	<0,3	<20	<2	<300	37,5	<30	2	<1,2	<5	7,75
3	010	700	40	12	7000	70	50	<1,5	<30	150	<12	20	20	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	12
	011	400	50	12	7000	120	40	<1,5	<30	150	<12	15	20	<0,3	<20	<2	<300	50	<30	2	<1,2	<5	5
	012	700	50	9	5000	120	50	<1,5	<30	120	<12	20	20	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	5
	013	400	50	12	5000	120	40	<1,5	<30	150	<12	20	15	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	5
	014	500	40	7	7000	90	40	<1,5	<30	120	<12	20	20	<0,3	<20	<2	<300	40	<30	1,5	<1,2	<5	4
average		540	46	10,4	6200	104	44	<1,5	<30	138	<12	19	19	<0,3	<20	<2	<300	42	<30	1,9	<1,2	<5	6,2
4	018	400	40	7	7000	70	30	<1,5	<30	120	<12	15	20	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	4
	019	500	50	12	7000	120	40	<1,5	<30	150	15	15	15	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	5
	020	300	50	12	5000	90	40	<1,5	<30	120	12	15	15	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	4
	021	500	50	12	5000	90	40	<1,5	<30	150	12	15	20	<0,3	<20	<2	<300	50	<30	2	<1,2	<5	4
average		425	47,5	10,75	6000	92,5	37,5	<1,5	<30	135	13	15	17,5	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	4,25
5	030	500	70	12	5000	90	50	<1,5	<30	120	12	15	20	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	4
	031	400	50	9	5000	90	50	<1,5	<30	120	12	15	20	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	4
	032	500	40	7	7000	90	50	<1,5	<30	120	12	15	12	<0,3	<20	<2	<300	30	<30	1,5	<1,2	<5	4
average		466,7	53,3	9,3	5666,7	90,0	50,0	<1,5	<30	120,0	12,0	15,0	17,3	<0,3	<20	<2	<300	33,3	<30	1,8	<1,2	<5	4,0
6	034	500	70	12	7000	150	50	<1,5	<30	150	<12	20	30	<0,3	<20	<2	<300	50	<30	2	<1,2	<5	5
	035	400	50	12	7000	120	50	<1,5	<30	150	12	20	20	<0,3	<20	<2	<300	50	<30	3	<1,2	<5	4
	036	500	50	7	7000	90	50	<1,5	<30	150	12	15	15	<0,3	<20	<2	<300	30	<30	3	<1,2	<5	4
	037	400	50	9	5000	120	50	<1,5	<30	150	12	15	15	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	5
average		450	55	10	6500	120	50	<1,5	<30	150	12	17,5	20	<0,3	<20	<2	<300	40	<30	2,5	<1,2	<5	4,5
7	038	400	40	7	5000	120	40	<1,5	<30	150	12	12	20	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	5
	039	400	50	7	5000	120	50	<1,5	<30	150	12	12	30	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	5
	040	500	50	9	5000	90	50	<1,5	<30	150	12	12	15	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	5
average		433,3	46,7	7,7	5000,0	110,0	46,7	<1,5	<30	150,0	12,0	12,0	21,7	<0,3	<20	<2	<300	33,3	<30	2,0	<1,2	<5	5,0
8	041	400	50	9	5000	70	50	<1,5	<30	150	12	12	15	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	5
	042	400	50	9	4000	90	50	<1,5	<30	150	12	12	20	<0,3	<20	<2	<300	40	<30	2	<1,2	<5	5
	043	300	30	3	3000	70	30	<1,5	<30	90	12	15	12	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	6
	044	400	40	9	4000	90	40	<1,5	<30	120	12	20	12	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	4
average		375,0	42,5	7,5	4000,0	80,0	42,5	<1,5	<30	127,5	12,0	14,8	14,8	<0,3	<20	<2	<300	35,0	<30	2,0	<1,2	<5	5,0
9	045	400	40	7	4000	70	40	<1,5	<30	120	<12	15	15	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	4
	046	400	40	7	4000	70	40	<1,5	<30	150	<12	15	20	<0,3	<20	<2	<300	30	<30	1,5	<1,2	<5	4
	047	500	40	5	5000	70	40	<1,5	<30	120	12	20	15	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	4
	048	400	40	7	7000	90	40	<1,5	<30	120	<12	20	20	<0,3	<20	<2	<300	30	<30	2	<1,2	<5	5
average		425,0	40,0	6,5	5000,0	75,0	40,0	<1,5	<30	127,5	12,0	17,5	17,5	<0,3	<20	<2	<300	30,0	<30	1,9	<1,2	<5	4,3

Point №	№ sample	Yb	Y	La	Ce	P	Be	Sr	Ba	Li	Sc	Hf	Th	U	Pt	Au	SiO2	AlO3	MgO	Fe2O3	CaO	Na2O	K2O
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	004	3	30	<120	<300	<2000	2	300	400	30	20	<120	<30	<500	<5	<5	500	120	40	30	>120	30	<5
	004^{1}	3	30	<120	<300	<2000	<2	300	400	30	20	<120	<30	<500	<5	<5	500	>120	40	20	>120	30	<5
	004^{2}	3	30	<120	<300	<2000	2	300	400	30	20	<120	<30	<500	<5	<5	500	>120	40	20	>120	20	<5
average		3,0	30,0	<120	<300	<2000	2,0	300,0	400,0	30,0	20,0	<120	<30	<500	<5	<5	500,0	>120	40,0	23,3	>120	26,7	<5
2	009	3	30	<120	<300	<2000	<2	300	400	30	20	<120	<30	<500	<5	<5	500	120	50	30	>120	30	<5
	009^{1}	3	30	<120	<300	<2000	<2	400	500	30	20	<120	<30	<500	<5	<5	500	120	50	30	>120	30	<5
	009^{2}	3	30	<120	<300	<2000	<2	300	400	<30	20	<120	<30	<500	<5	<5	500	120	40	30	70	20	<5
	009^{3}	3	30	<120	<300	<2000	2	400	400	40	20	<120	<30	<500	<5	<5	500	120	50	30	120	30	<5
average		3	30	<120	<300	<2000	2	350	425	<30	20	<120	<30	<500	<5	<5	500	120	47,5	30	95	27,5	<5
3	010	3	30	<120	<300	<2000	2	400	400	<30	20	<120	<30	<500	<5	<5	700	90	40	30	120	30	5
	011	3	30	<120	<300	<2000	2	400	400	30	20	<120	<30	<500	<5	<5	500	120	40	30	120	30	<5
	012	3	40	<120	<300	<2000	2	400	400	30	20	<120	<30	<500	<5	<5	500	90	20	30	120	20	<5
	013	3	20	<120	<300	<2000	2	400	500	30	<20	<120	<30	<500	<5	<5	500	90	30	40	120	30	<5
	014	3	40	<120	<300	<2000	2	500	500	30	20	<120	<30	<500	<5	<5	500	120	50	30	>120	20	5
average		3	32	<120	<300	<2000	2	420	440	30	20	<120	<30	<500	<5	<5	540	102	36	32	120	26	5
4	018	3	30	<120	<300	<2000	2	400	400	30	20	<120	<30	<500	<5	<5	500	120	40	20	>120	20	5
	019	3	30	<120	<300	<2000	2	400	500	40	20	<120	<30	<500	<5	<5	500	90	40	30	>120	20	5
	020	3	30	<120	<300	<2000	2	400	500	40	20	<120	<30	<500	<5	<5	500	90	50	30	>120	20	5
	021	3	30	<120	<300	<2000	2	300	400	30	20	<120	<30	<500	<5	<5	500	120	30	30	>120	20	<5
average		3	30	<120	<300	<2000	2	375	450	35	20	<120	<30	<500	<5	<5	500	105	40	27,5	>120	20	5
5	030	3	30	<120	<300	<2000	<2	400	500	30	20	<120	<30	<500	<5	<5	500	120	40	40	>120	20	<5
	031	3	30	<120	<300	<2000	2	500	400	40	20	<120	<30	<500	<5	<5	500	90	40	30	>120	20	5
	032	3	30	<120	<300	<2000	<2	500	500	40	20	<120	<30	<500	<5	<5	500	90	40	30	>120	20	5
average		3,0	30,0	<120	<300	<2000	2,0	466,7	466,7	36,7	20,0	<120	<30	<500	<5	<5	500,0	100,0	40,0	33,3	>120	20,0	5,0
6	034	3	30	<120	<300	<2000	2	400	500	30	20	<120	<30	<500	<5	<5	500	90	30	40	90	20	5
	035	3	30	<120	<300	<2000	3	400	400	30	<20	<120	<30	<500	<5	<5	500	120	40	30	120	20	<5
	036	3	30	<120	<300	<2000	2	400	500	30	20	<120	<30	<500	<5	<5	500	90	40	30	>120	20	5
	037	3	30	<120	<300	<2000	2	400	500	30	20	<120	<30	<500	<5	<5	500	90	40	30	>120	20	<5
average		3	30	<120	<300	<2000	2,25	400	475	30	20	<120	<30	<500	<5	<5	500	97,5	37,5	32,5	90	20	<5
7	038	3	30	<120	<300	<2000	3	500	500	30	20	<120	<30	<500	<5	<5	500	90	30	20	>120	30	0,5
	039	3	40	<120	<300	<2000	2	500	500	30	20	<120	<30	<500	<5	<5	500	120	40	30	>120	30	<5
	040	3	30	<120	<300	<2000	2	500	500	30	20	<120	<30	<500	<5	<5	500	120	50	3	>120	30	<5
average		3,0	33,3	<120	<300	<2000	2,3	500,0	500,0	30,0	20,0	<120	<30	<500	<5	<5	500,0	110,0	40,0	17,7	>120	30,0	<5
8	041	3	30	<120	<300	<2000	3	400	400	40	20	<120	<30	<500	<5	<5	500	120	50	40	>120	30	<5
	042	3	30	<120	<300	<2000	2	400	400	40	20	<120	<30	<500	<5	<5	500	120	50	30	>120	15	5
	043	3	30	<120	<300	<2000	<2	700	300	30	20	<120	<30	<500	<5	<5	500	70	20	20	>120	15	5
	044	3	30	<120	<300	<2000	2	500	400	40	20	<120	<30	<500	<5	<5	500	>120	40	30	>120	20	5
average		3	30	<120	<300	<2000	<2	500	375	37,5	20	<120	<30	<500	<5	<5	500	70	40	30	>120	20	5
9	045	3	30	<120	<300	<2000	<2	500	500	40	20	<120	<30	<500	<5	<5	500	>120	40	30	>120	20	5
	046	3	40	<120	<300	<2000	2	500	400	30	20	<120	<30	<500	<5	<5	500	>120	40	30	>120	20	5
	047	3	40	<120	<300	<2000	<2	500	400	30	20	<120	<30	<500	<5	<5	500	>120	40	30	>120	20	<5
	048	3	40	<120	<300	<2000	2	500	500	30	2	<120	<30	<500	<5	<5	500	>120	40	30	>120	20	<5
average		3	37,5	<120	<300	<2000	2	500	450	32,5	15,5	<120	<30	<500	<5	<5	500	>120	40	30	>120	20	5

Results of soil spectral analysis (in weight percents)

Point №	№ sample	Mn	Ni	Co	Ti	V	Cr	Mo	W	Zr	Nb	Cu	Pb	Ag	Sb	Bi	As	Zn	Cd	Sn	Ge	In	Ga
		10-2	10-3	10-3	10-1	10-2	10-3	10-3	10-2	10-2	10-3	10-3	10-3	10-4	10-2	10-3	10-2	10-2	10-2	10-3	10-3	10-3	10-3
1	004	4	4	0,5	7	0,9	4	<0,15	<0,3	1,2	<1,2	1,2	1,5	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,15	<0,12	<0,5	0,5
	004^{1}	4	3	0,5	5	0,7	4	<0,15	<0,3	1,2	<1,2	1,5	1,5	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,15	<0,12	<0,5	0,7
	004^{2}	5	4	0,7	5	0,7	4	<0,15	<0,3	1,2	<1,2	1,5	2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,7
average		4,3	3,7	0,6	5,7	0,8	4,0	<0,15	<0,3	1,2	<1,2	1,4	1,7	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,6
2	009	4	4	0,7	5	0,7	5	<0,15	<0,3	1,2	<1,2	2	2	0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	1,2
	009^{1}	5	4	0,7	5	0,7	5	<0,15	<0,3	1,5	<1,2	2	1,5	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,5
	009^{2}	4	4	0,7	4	0,9	5	<0,15	<0,3	1,5	<1,2	2	1,5	<0,3	<0,5	<0,2	<3	0,5	<0,3	0,2	<0,12	<0,5	0,7
	009^{3}	4	5	0,9	4	0,7	7	<0,15	<0,3	1,5	<1,2	2	3	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,7
average		4,25	4,25	0,75	4,5	0,75	5,5	<0,15	<0,3	1,425	<1,2	2	2	<0,3	<0,5	<0,2	<3	0,375	<0,3	0,2	<0,12	<0,5	0,775
3	010	7	4	1,2	7	0,7	5	<0,15	<0,3	1,5	<1,2	2	2	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	1,2
	011	4	5	1,2	7	1,2	4	<0,15	<0,3	1,5	<1,2	1,5	2	<0,3	<0,5	<0,2	<3	0,5	<0,3	0,2	<0,12	<0,5	0,5
	012	7	5	0,9	5	1,2	5	<0,15	<0,3	1,2	<1,2	2	2	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,5
	013	4	5	1,2	5	1,2	5	<0,15	<0,3	1,5	<1,2	2	1,5	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,5
	014	5	4	0,7	7	0,9	4	<0,15	<0,3	1,2	<1,2	2	2	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,15	<0,12	<0,5	0,4
average		5,4	4,6	1,04	6,2	1,04	4,6	<0,15	<0,3	1,38	<1,2	1,9	1,9	<0,3	<0,5	<0,2	<3	0,42	<0,3	0,19	<0,12	<0,5	0,62
4	018	4	4	0,7	7	0,7	3	<0,15	<0,3	1,2	<1,2	1,5	2	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,4
	019	5	5	1,2	7	1,2	4	<0,15	<0,3	1,5	1,5	1,5	2	0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,5
	020	3	5	1,2	5	0,9	4	<0,15	<0,3	1,2	1,2	1,5	1,5	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,4
	021	5	5	1,2	5	0,9	4	<0,15	<0,3	1,5	1,2	1,5	2	0,3	<0,5	<0,2	<3	0,5	<0,3	0,2	<0,12	<0,5	0,4
average		4,3	4,8	1,1	6,0	0,9	3,8	<0,15	<0,3	1,4	<1,2	1,5	1,9	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,4
5	030	5	7	1,2	5	0,9	5	<0,15	<0,3	1,2	1,2	1,5	2	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,4
	031	4	5	0,9	5	0,9	5	<0,15	<0,3	1,2	1,2	1,5	2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,4
	032	5	4	0,7	7	0,9	4	<0,15	<0,3	1,2	1,2	1,5	1,2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,15	<0,12	<0,5	0,4
average		4,7	5,3	0,9	5,7	0,9	4,7	<0,15	<0,3	1,2	1,2	1,5	1,7	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,4
6	034	5	7	1,2	5	1,5	5	<0,15	<0,3	1,5	<1,2	2	3	<0,3	<0,5	<0,2	<3	0,5	<0,3	0,2	<0,12	<0,5	0,5
	035	4	5	1,2	7	1,2	5	<0,15	<0,3	1,5	1,2	2	2	<0,3	<0,5	<0,2	<3	0,5	<0,3	0,3	<0,12	<0,5	0,4
	036	5	5	0,7	7	0,9	5	<0,15	<0,3	1,2	1,2	1,5	1,5	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,3	<0,12	<0,5	0,4
	037	4	5	0,9	5	1,2	5	<0,15	<0,3	1,2	1,2	1,5	1,5	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,5
average		4,5	5,5	1	6	1,2	5	<0,15	<0,3	1,35	1,2	1,75	2	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,25	<0,12	<0,5	0,45
7	038	4	4	0,7	5	1,2	4	<0,15	<0,3	1,5	1,2	1,2	2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,5
	039	4	5	0,7	5	1,2	5	<0,15	<0,3	1,5	1,2	1,2	3	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,5
	040	5	5	0,9	5	0,9	5	<0,15	<0,3	1,5	1,2	1,2	1,5	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,5
average		4,3	4,7	0,8	5,0	1,1	4,7	<0,15	<0,3	1,5	1,2	1,2	2,2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,5
8	041	4	5	0,9	5	0,7	5	<0,15	<0,3	1,5	1,2	1,2	1,5	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,5
	042	4	5	0,9	4	0,9	5	<0,15	<0,3	1,5	1,2	1,2	2	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,5
	043	3	3	0,3	3	0,7	3	<0,15	<0,3	0,9	1,2	1,5	1,2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,3
	044	4	4	0,9	4	0,9	4	<0,15	<0,3	1,2	1,2	2	1,2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,4
average		3,8	4,3	0,8	4,0	0,8	4,3	<0,15	<0,3	1,3	1,2	1,5	1,5	<0,3	<0,5	<0,2	<3	0,4	<0,3	0,2	<0,12	<0,5	0,4
9	045	4	4	0,7	4	0,7	4	<0,15	<0,3	1,2	<1,2	1,5	1,5	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,4
	046	4	4	0,7	4	0,7	4	<0,15	<0,3	1,5	<1,2	1,5	2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,15	<0,12	<0,5	0,4
	047	5	4	0,5	5	0,7	4	<0,15	<0,3	1,2	1,2	2	1,5	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,4
	048	4	4	0,7	7	0,9	4	<0,15	<0,3	1,2	<1,2	2	2	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,5
average		4,3	4,0	0,7	5,0	0,8	4,0	<0,15	<0,3	1,3	1,2	1,8	1,8	<0,3	<0,5	<0,2	<3	0,3	<0,3	0,2	<0,12	<0,5	0,4

Point №	№ sample	Yb	Y	La	Ce	P	Be	Sr	Ba	Li	Sc	Hf	Th	U	Pt	Au	SiO2	AlO3	MgO	Fe2O3	CaO	Na2O	K2O
		10-3	10-3	10-2	10-1	10-1	10-4	10-2	10-2	10-2	10-3	10-2	10-2	10-1	10-3	10-3	%	%	%	%	%	%	%
1	004	0,3	3	<1,2	<0,3	<2	2	3	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	4	3	>12	3	<0,5
	004^{1}	0,3	3	<1,2	<0,3	<2	<2	3	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	>12	4	2	>12	3	<0,5
	004^{2}	0,3	3	<1,2	<0,3	<2	2	3	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	>12	4	2	>12	2	<0,5
average		0,3	3,0	<1,2	<0,3	<2	2,0	3,0	4,0	3,0	2,0	<1,2	<0,3	<0,5	<0,5	<0,5	50,0	12,0	4,0	2,3	>12	2,7	<0,5
2	009	0,3	3	<1,2	<0,3	<2	<2	3	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	5	3	>12	3	<0,5
	009^{1}	0,3	3	<1,2	<0,3	<2	<2	4	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	5	3	>12	3	<0,5
	009^{2}	0,3	3	<1,2	<0,3	<2	<2	3	4	<3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	4	3	7	2	<0,5
	009^{3}	0,3	3	<1,2	<0,3	<2	2	4	4	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	5	3	12	3	<0,5
average		0,3	3,0	<1,2	<0,3	<2	2,0	3,5	4,3	3,3	2,0	<1,2	<0,3	<0,5	<0,5	<0,5	50,0	12,0	4,8	3,0	7,0	2,8	<0,5
3	010	0,3	3	<1,2	<0,3	<2	2	4	4	<3	2	<1,2	<0,3	<0,5	<0,5	<0,5	70	9	4	3	12	3	0,5
	011	0,3	3	<1,2	<0,3	<2	2	4	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	4	3	12	3	<0,5
	012	0,3	4	<1,2	<0,3	<2	2	4	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	2	3	12	2	<0,5
	013	0,3	2	<1,2	<0,3	<2	2	4	5	3	<2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	3	4	12	3	<0,5
	014	0,3	4	<1,2	<0,3	<2	2	5	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	5	3	>12	2	0,5
average		0,3	3,2	<1,2	<0,3	<2	2	4,2	4,4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	54	10,2	3,6	3,2	12	2,6	0,5
4	018	0,3	3	<1,2	<0,3	<2	2	4	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	4	2	>12	2	0,5
	019	0,3	3	<1,2	<0,3	<2	2	4	5	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	4	3	>12	2	0,5
	020	0,3	3	<1,2	<0,3	<2	2	4	5	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	5	3	>12	2	0,5
	021	0,3	3	<1,2	<0,3	<2	2	3	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	3	3	>12	2	<0,5
average		0,3	3	<1,2	<0,3	<2	2	3,75	4,5	3,5	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	10,5	4	2,75	>12	2	0,5
5	030	0,3	3	<1,2	<0,3	<2	<2	4	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	4	4	>12	2	<0,5
	031	0,3	3	<1,2	<0,3	<2	2	5	4	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	4	3	>12	2	0,5
	032	0,3	3	<1,2	<0,3	<2	<2	5	5	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	4	3	>12	2	0,5
average		0,3	3,0	<1,2	<0,3	<2	2,0	4,7	4,7	3,7	2,0	<1,2	<0,3	<0,5	<0,5	<0,5	50,0	10,0	4,0	3,3	>12	2,0	0,5
6	034	0,3	3	<1,2	<0,3	<2	2	4	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	3	4	9	2	0,5
	035	0,3	3	<1,2	<0,3	<2	3	4	4	3	<2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	4	3	12	2	<0,5
	036	0,3	3	<1,2	<0,3	<2	2	4	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	4	3	>12	2	0,5
	037	0,3	3	<1,2	<0,3	<2	2	4	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	4	3	>12	2	<0,5
average		0,3	3	<1,2	<0,3	<2	2,25	4	4,75	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9,75	3,75	3,25	9	2	0,5
7	038	0,3	2	<1,2	<0,3	<2	2	5	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	9	3	2	>12	3	0,5
	039	0,3	4	<1,2	<0,3	<2	2	5	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	4	3	>12	3	<0,5
	040	0,3	3	<1,2	<0,3	<2	2	5	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	5	3	>12	3	<0,5
average		0,3	3,0	<1,2	<0,3	<2	2,0	5,0	5,0	3,0	2,0	<1,2	<0,3	<0,5	<0,5	<0,5	50,0	11,0	4,0	2,7	>12	3,0	0,5
8	041	0,3	3	<1,2	<0,3	<2	3	4	4	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	5	4	>12	3	<0,5
	042	0,3	3	<1,2	<0,3	<2	2	4	4	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	12	5	3	>12	1,5	0,5
	043	0,3	2	<1,2	<0,3	<2	<2	7	3	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	7	2	2	>12	1,5	0,5
	044	0,3	3	<1,2	<0,3	<2	2	5	4	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	>12	4	3	>12	2	0,5
average		0,3	2,75	<1,2	<0,3	<2	2,333333	5	3,75	3,75	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	7	4	3	>12	2	0,5
9	045	0,3	3	<1,2	<0,3	<2	<2	5	5	4	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	>12	4	3	>12	2	0,5
	046	0,3	4	<1,2	<0,3	<2	2	5	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	>12	4	3	>12	2	0,5
	047	0,3	4	<1,2	<0,3	<2	<2	5	4	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	>12	4	3	>12	2	<0,5
	048	0,3	4	<1,2	<0,3	<2	2	5	5	3	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	>12	4	3	>12	2	<0,5
average		0,3	3,75	<1,2	<0,3	<2	2	5	4,5	3,25	2	<1,2	<0,3	<0,5	<0,5	<0,5	50	>12	4	3	>12	2	0,5

Table A.1.1: Locations of Soil Samples Taken for Analysis

Group	Soil cross sections numbers	Altitude above sea level, m	N	E
Group I	005	H - 3545	40° 33′ 51.1″	075° 05′ 53.8″
	022	H - 3569	40° 33′ 05.0″	075° 14′ 24.3″
	033	H - 3546	40° 32′ 53,4″	075° 18′ 15,6″
	035	H - 3534	40° 33′ 02.2″	075° 19′ 14.7″
	043	H - 3548	40° 33′ 56.9″	075° 21′ 22.1″
	048	H - 3588	40° 35′ 21.7″	075° 24′ 35.8″
Group II	026	H - 3571	40° 32′ 49.3″075° 16′ 14.7″	
	027	H - 3567	40° 32′ 48.9″075° 16′ 18.9″	
	028	H - 3569	40° 32′ 48.7″075° 16′ 22.6″	
	029	H - 3571	40° 32′ 48.5″075° 16′ 23.1″	
	034	H - 3536	40° 33′ 01.1″	075° 19′ 13.9″
	038	H - 3537	40° 33′ 05.5″	075° 19′ 40.0″
	041	H - 3554	40° 33′ 35.3″	075° 20′ 42.7″
	016	H - 3553	40° 33′ 08.7″	075° 13′ 02.4″
	017	H - 3556	40° 33′ 08.2″	075° 13′ 04.8″
Group III	004[1]	H - 3589	40° 33′ 57.1″	075° 05′ 22.3″
	009[2]	H - 3543	40° 33′ 57.1″	075° 05′ 22.3″
	012	H - 3543	40° 33′ 19.9″	075° 11′ 07.7″
	019	H - 3564	40° 33′ 01.1″	075° 14′ 23.5″
	030	H - 3545	40° 32′ 49.8″	075° 18′ 17.2″
	034	H - 3536	40° 33′ 01.1″	075° 19′ 13.9″
	038	H - 3537	40° 33′ 05.5″	075° 19′ 40.0″
	042	H - 3550	40° 33′ 56.2″	075° 21′ 22.7″
	046	H - 3591	40° 35′ 20.0″	075° 24′ 35.1″

High-Mountainous Takyr-Like Desert Crust Soils

1. The high-mountainous takyr-like desert crust soils are spread in the central and the eastern part of the project area. Section number 022 in the previous table is typical of this type.To better understand the morphological characteristics of those soils, below is adescription of the soil characteristics at section No.022:

> **<u>First Layer (0-19 cm)</u>** – is brownish in color, with a grey tincture, fresh, medium loam; divided into 2-3 layers with different densities and texture. In the upper part, there is a crust of a foliated structure with presence of salts; the middle and bottom partsare of lumpy structure, and it has a vertical cleavage at the expense of alkalinity, a compact constitution, numerous roots and holes of dorbeetles. Carbonates are present in the form of points and veins. In addition, there are sharp transitions by color and composition.
>
> **<u>Second Layer (19-39 cm)</u>** – is light-brown-straw-colored loamy soils of unstable lumpy, cracked, consolidated structure. There are also roots, grits, pebbles, holes of dorbeetles, efflorescence of salts and carbonates. In places, depending on a degree of manifestation of this or that property, it can be divided onto 2 sub-layers. The transition is obvious by composition.
>
> **<u>Third Layer (39-69 cm and lower)</u>** – is pale-yellow, with a brownish tincture, structureless, porous, consolidated stony medium loam, roots and points of salts and carbonates are rare.

2. The takyr-like soils are distinguished by the presence of a cracked crust on the surface. The profile is less carbonate, and in the bottom parts of the profile, there is a frost layer consisting of fine-grained soils with pebble-glacial debris. In accordance with their mechanical composition, the soils can be classified as middle and heavy loamy soils. Coarse silts (particles 0.05 – 0.01 mm) are the dominant fraction ranging from 34% to 47%.

Quantities of physical clay (the sum of particles <0.01 mm) fluctuates from 34.00 to 37 %, while quantities of humus in these soils make up 1.07% to 1.23%.

3. Tables A.1.2-A.1.4 summarize the results of the soil samples taken from sections of the project area that exhibit those types of soils (Section 022, 043, and 048).

Table A.1.2: The Mechanical Composition Of Takyr-Like Desert Crust Soils

Section No.	Depth of sampling, cm	Fractions content in %, particles size in mm.						Total particles < 0.01
		1.0-0.25	0.25-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	
022	0- 19	0.16	30.32	34.52	8.36	13.28	13.36	35.00
	19- 39	0.25	30.11	35.36	9.32	14.00	10.96	34.28
	39- 69	0.38	18.10	47.52	8.12	17.04	8.84	34.00
	69- 85	0.54	21.81	46.48	13.48	8.84	8.84	31.16
043	0- 20	2.90	24.66	35.08	10.08	14.44	12.84	37.36
048	0- 20	6.77	23.15	41.92	5.80	11.56	8.28	28.16

Table A.1.3: Chemical Properties Of Takyr-Like Desert Crust Soils

Section No.	Depth of sampling, cm	CO_2, %	pH	Humus, %	Base exchange capacity	Absorbed Na	Na, %	Total N, %	Bulk, %	
					mg-eq /100 g of soil				Phosphorus	Potassium
022	0- 19	6.16	8.10	1.23	8.0	2.1	26.25	0.095	0.14	1.50
	19- 39	7.92	8.10	0.84	7.6	1.5	19.73	0.055	0.13	1.50
	39- 69	7.92	8.05	0.63	6.4	1.4	21.87	0.032	0.13	1.59
	69- 85	8.05	8.10	0.47	6.0	1.4	23.33	0.010	0.13	1.56
043	0- 20	8.93	8.45	1.18	10.0	2.3	23.00	0.070	0.11	1.68
048	0- 20	8.80	8.30	1.07	7.2	1.9	26.38	0.070	0.11	1.29

Table A.1.4: Soil-Water Extract Composition Of Takyr-Like Desert Crust Soils(mg/l)

Section No.	Depth of sampling, cm	Dissolved solids, %	Alkali content		CL^-	$SO4^{--}$	Ca^{++}	Mg^{++}	By variety Na + K	Quality of salinity
			CO_3	HCO_3						
022	0- 19	0.493	-	0.018	0.279	0.023	0.040	0.026	0.103	Chloride
			-	0.30	7.87	0.48	2.0	2.14	4.51	
	19- 39	0.435	-	0.017	0.249	0.021	0.044	0.029	0.072	Chloride
			-	0.28	7.02	0.44	2.20	2.38	3.16	
	39- 69	0.418	-	0.017	0.245	0.012	0.046	0.029	0.063	Chloride
			-	0.28	6.91	0.24	2.30	2.36	2.75	
	69- 85	0.422	-	0.016	0.253	0.008	0.050	0.030	0.059	Chloride
			-	0.26	7.13	0.16	2.50	2.47	2.58	
043	0- 20	0.1	-	0.027	0.133	0.012	0.10	0.006	0.079	Chloride
			-	0.44	3.75	0.24	0.50	0.49	3.44	
048	0- 20	0.347	-	0.020	0.181	0.002	0.016	0.012	0.084	Chloride
			-	0.33	5.10	0.04	0.80	0.99	3.68	

High-Mountainous Chestnut Steppe Soils

4. These soils are distributed mainly in the south-western and eastern parts of the project area, and in the southern parts to a lesser extent. The morphological properties of these soils can be seen as per the data of Section No.005 as summarized below:

> **First Layer (0-22 cm) –** is mid-loamy, consolidated, strongly penetrated with roots, grain-lump-silty, with a lot of earthworms and dorbeetles. The transition is clear by color.
>
> **Second Layer (23-29 cm)** - is a grayish-brown, fresh, consolidated, heavy-loamy, pebble-lump-silty, penetrated with roots, fine-grained, with light lamination of structural units, there are also vertical cleavages and humic streaks. Transition is gradual.
>
> **Third Layer (29-56 cm)** – is brown-pale-yellowish, fresh, consolidated, with poorly expressed fragile laminated structure, fine-grained, and heavy-loamy.Below this layer, there is another layer, which is represented by pebbles, grits and granitic sub-soils. Pebbles are coated with mottles of carbonates.

5. Tables A.1.5-A.1,7 summarize the results of the soil samples taken from sections of the project area that exhibit those types of soils (Section 005).

Table A.1.5: Mechanical Composition Of Chestnut Steppe Soils

Section No.	Depth of sampling, cm	Fractions content in %, Particles size in mm.						Total particles < 0.01
		1.0-0.25	0.25-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	
Medium-loamy								
005	0- 22	0.25	27.71	41.56	11.12	11.88	7.48	30.48
	22- 37	0.13	27.27	43.92	5.44	15.88	7.36	28.68
	37- 50	0.13	28.51	39.76	8.24	15.12	8.24	31.60

Table A.1.6: Chemical Properties Of Chestnut Steppe Soils

Section No.	Depth of sampling, cm	CO_2, %	pH	Humus, %	Base exchange capacity	Na absorbed	Na,%	Total Nitrogen, %	Bulk, %	
					mg-eq/100 g of soil				Phosphorus	Potassium
005	0- 22	4.40	7.90	2.23	13.6	1.2	6.12	0.09	0.15	1.50
	22- 37	5.46	8.00	1.66	11.6	1.0	6.41	0.075	0.14	1.32
	37- 50	5.50	8.05	0.23	10.0	0.9	9.0	0.055	0.10	1.05

Table A.1.7: Soil-Water Extract Composition Of Chestnut Steppe Soils(mg/l)

Section No.	Depth of sampling, cm	Dissolved solids, %	Alkali content		L-	SO_4^{--}	Ca^{++}	Mg^{++}	By variety Na + K	Quality of salinity
			CO_3	HCO_3						
005	0- 22	0.289	-	0.016	0.162	0.008	0.036	0.010	0.054	Chloride
			-	0.26	4.57	0.16	1.30	0.82	2.37	
	22- 37	0.418	-	0.018	0.253	0.008	0.032	0.042	0.058	Chloride
			-	0.30	7.13	0.16	1.60	3.45	2.54	
	37- 50	0.422	-	0.018	0.248	0.018	0.044	0.053	0.025	Chloride
			-	0.30	6.99	0.36	2.20	4.36	1.09	

Meadow-Swamp Soils

6. Meadow-swampy soils are formed as separate small areas in bottomlands of rivers and in the near-lake part of the project area. Permanent strong humidification of the upper and over-moistening of the bottom horizons, coupled with an unstable groundwater table have led to that these soils are formed in a complex.Meadow-swamp soils are developed at a low groundwater table (0.3-1.0). These soils are characterized by presence of oxide-ochreous spots and signs of gleyification, which are found at depths 30-40 cm.

7. By their mechanical composition the soils are classified as coarse silty medium-textured loams. The sum of particles less than 0,01 mm makes up for 22-34% of their composition. Down along the profile, the mechanical composition becomes simpler. The quantity of humus is insignificant, its content in the upper layers is 1.22% to 2.60%.

8. Tables A.1.8-A.1.10 summarize the results of the soil samples taken from sections of the project area that exhibit those types of soils (Sections 033 and 035).

Saline Lands in the Area of Takyr-Like Soils

9. These saline soils belong to the group of automorphous saline lands. They are situated mainly along the east coast of the lake Chatyr-Kul.They are formed on saliferous (salt yielding) lake deposits of medium textured loams of a mechanical composition.

10. By their morphological texture they are very similar to takyr-like soils, which form complexes in the area of interest. Among these complexes, on the soil surface there are large enough spots of salts in the form of mottles, crusts and incrustations. These are saline lands, which are characterized by very high content of readily soluble salts.

11. Thus, soils in the project area contain little humus, and, by their mechanical composition are medium-loamy soils. In these soils, there are prevailing coarse silty fractions of sizes 0.05 – 0.01 mm, by the laboratory data. This normally causes fast crust formation on the surface, and high capillarity. Owing to this, these soils are easily yieldable to wind and water erosion.

Table A.1.8: Mechanical Composition Of Meadow-Swampy Soils

Section No.	Depth of sampling, cm	Fractions content in %, Particles size in mm.						Total particles < 0.01
		1.0-0.25	0.25-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	
033	0- 21	4.42	21.58	39.28	10.08	12.28	12.36	34.72
	21- 40	5.38	25.58	36.00	10.60	11.20	11.24	33.04
035	0-20	7.35	24.89	40.76	9.08	11.04	6.88	27.0

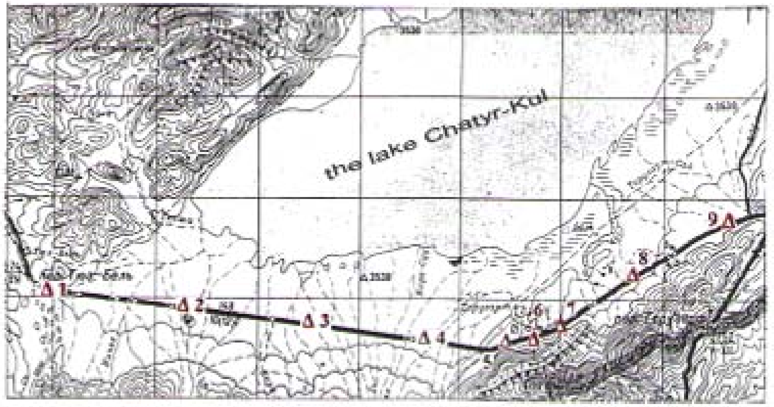
Table A.1.9: Chemical Properties Of Meadow-Swampy Soils

Section No.	Depth of sampling, cm	CO_2, %	pH	Humus, %	Base exchange capacity	Na absorbed	Na,%	Total Nitrogen, %	Bulk, %	
					mg-eq/100 g of soil				Phosphorus	Potassium
033	0- 21	10.5	8.30	2.60	16.0	1.12	7.0	0.102	0.14	1.50
	21- 40	5.41	8.55	1.35	8.0	0.4	5.0	0.065	0.12	1.44
035	0-20	5.28	8.40	1.22	12.0	1.3		0.102	0.13	1.62

Table A.1.10: Soil-Water Extract Composition Of Meadow-Swampy Soils(mg/l)

Section No.	Depth of sampling, cm	Dissolved solids, %	Alkali content		L-	SO_4^{--}	Ca^{++}	Mg^{++}	By variety Na + K	Degree and quality of salinity
			CO_3	HCO_3						
033	0- 21	0.080	-	0.021	0.024	0.002	0.010	0.006	0.002	
			-	0.34	0.68	0.04	0.50	0.49	0.07	
	21- 40	0.036	-	0.023	0.011	0.002	0.006	0.004	0.002	
			-	0.38	0.31	0.04	0.30	0.33	0.10	
035	0-20	0.145	-	0.026	0.069	0.002	0.010	0.006	0.033	
			-	0.43	1.95	0.04	0.50	0.49	1.43	

Figure 1. Area Prone to Erosion



1	2	3	4	5	6	7	8	9
004^2	009^3	014	021	032	037	040	044	048
004^1	009^2	013	020	031	036	039	043	047
004	009	012	019	030	035	038	042	046
	009^1	010	018		034		041	045

Figure 2. Locations of Sampling for Toxic Heavy Metals[1]

FLORA

Table A.1 Prevailing Flora and Vegetation in Area 1

<table>
<tr><td>Area No: 1</td><td>GPS Coordinates:40º 33' 12.8", 75º 12' 28.3"</td></tr>
<tr><td>Elevation: 3551 m</td><td>Ground Coverage: 30%</td></tr>
<tr><td>General:
Hordeum brevisubulatum (Trin.) Link and Festuca kirghisorum (Katsch. ex Tzvel.) E. Alexeev.
Prevailing loessial soil
Other species:
1. Androsace dasyphylla Bunge;
2. Festuca valesiaca Gaudin;
3. Oxytropis humifusa Kar. et Kir. – Oxytopus, creeping;
4. Kobresia capilliformis Ivanova – Hair-like Kobrezia;
5. Kobresia humilis (C.A.Mey. ex Trautv.) Serg. – Low Kobrezia;
6. Potentilla moorcroftii Wall. ex Lehm. – Cinquefoil;
7. Potentilla asiae-mediae Ovcz. et Koczk. - Cinquefoil of Middle Asia – Subendemic;
8. Schmalhausenia nidulans (Regel) Petrak – Shmalgauzeniya gnezdistaya – Subendemic.</td><td></td></tr>
<tr><td colspan="2">Main Influencing Factors: Overgrazing</td></tr>
</table>

Table A.2: Prevailing Flora and Vegetation in Area 2

Area No: 2	**GPS Coordinates:** 40º 33'11.7", 75º 12'40.7"
Elevation: 3557 m	**Ground Coverage:** 40%
General: *Festuca valesiaca* Gaudin + *Hordeum brevisubulatum* (Trin.) Prevailing coarse gravelly soil. **Other species** (in the decreasing order of abundance): 1. *Oxytropis humifusa* Kar. et Kir. - Oxytopus, creeping; 2. *Androsace dasyphylla* Bunge 3. *Oxytropis tianschanica* Bunge - Tien Shan Oxytropis; 4. *Puccinellia hackeliana* V.Krecz. - Puccinellia Hackelya – Subendemic; 5. *Calamagrostis tianschanica* Rupr. - Tien Shan bluejoint – Subendemic; 6. *Kobresia humilis* (C.A.Mey. ex Trautv.) Serg. – Kobrezia, low; **Off-site species** 1. *Kobresia capilliformis* Ivanova - Hair-like Kobrezia; 2. *Potentilla moorcroftii* Wall. ex Lehm. - Cinquefoil; 3. *Potentilla asiae-mediae* Ovcz. et Koczk. – Cinquefoil of Central Asia – Subendemic; 4. *Schmalhausenia nidulans* (Regel) Petrak - Shmalgauzeniya gnezdistaya – Subendemic;	
Main Influencing Factors: N/A	

Table A.3: Prevailing Flora and Vegetation in Area 3

<table>
<tr><td>Area No: 3</td><td>GPS Coordinates:40º 33'09.4", 75º 13'04.5"</td></tr>
<tr><td>Elevation: 3561 m</td><td>Ground Coverage: 70%</td></tr>
<tr><td>General:
Kobresia capilliformis Ivanova + Kobresia humilis (C.A.Mey. ex Trautv.) Serg.
Prevailing clay soil.
Other species (in decreasing order of abundance):
1. Festuca valesiaca Gaudin – Velesian Fescue;
2. Gentiana karelinii Griseb. – Karelin's gentian;
3. Gastrolychnis apetala (L.) Tolm. et Kozhanczikov – Petalless campion;</td><td></td></tr>
<tr><td colspan="2">Main Influencing Factors: Overgrazing</td></tr>
</table>

Table A.4: Prevailing Flora and Vegetation in Area 4

Area No: 4	**GPS Coordinates:** 40º 33'45.6", 75º 06'48.8"
Elevation: 3555 m	**Ground Coverage:** 30%
General: Puccinellia hackeliana V.Krecz. + Calamagrostis tianschanica Rupr. Prevailing clay soil (saline). **Other species** (in decreasing order of abundance): 1. *Taraxacum leucanthum* (Ledeb.) Ledeb. - White-flowered dandelion; 2. *Suaeda olufsenii* Pauls. – Olufsen's seepweed – Subendemic; 3. *Taraxacum syrtorum* Dshanaeva – Syrt dandelion – Endemic; 4. *Saussurea faminziniana* Krasn. – Famintsin's Saussurea – Subendemic; **Off-site species:** 1. *Calamagrostis tianschanica* Rupr. – Tien Shan bluejoint – Subendemic; 2. *Oxytropis chionobia* Bunge – Snowy oxytropis; 3. *Taphrospermum altaicum* C.A.Mey. – Altai taphrophyte; 4. *Sophiopsis* sp. 5. *Polygonum pamiricum* Korsh. – Pamir jointweed – Subendemic;	
Main Influencing Factors: Overgrazing	

Table A.5: Prevailing Flora and Vegetation in Area 5

Area No: 5	**GPS Coordinates:**40º 33'48.1", 75º 06'20.3"
Elevation: 3576 m	**Ground Coverage:** 80%
General: *Carex sp.* + *Carex melanantha* C.A.Mey. Prevailing clay soil. **Other species** (in decreasing order of abundance): 1. *Kobresia humilis* (C.A.Mey. ex Trautv.) Serg. - Kobresia low; 2. *Kobresia capilliformis* Ivanova - Hair-like Kobresia 3. *Primula algida* Adams - violet primrose; 4. *Leontopodium ochroleucum* Beauverd - Pale yellow edelweiss; 5. *Halerpestes sarmentosa* (Adams) Kom. - Proliferous halerpestes;	
Main Influencing Factors: Overgrazing	

Table A.6: Prevailing Flora and Vegetation in Area 6

<table>
<tr><td>Area No: 6</td><td>GPS Coordinates:40º 33' 11.7", 75º 12' 40.7"</td></tr>
<tr><td>Elevation: 3557 m</td><td>Ground Coverage: 40%</td></tr>
<tr><td>General:

Oxytropis tianschanica Bunge + Hordeum brevisubulatum (Trin.)This species of vegetation is spread mainly on numerous alluvial cones.

Prevailing coarse gravelly soil, a river alluvial cone.

Other species (in decreasing order of abundance):

1. Festuca valesiaca Gaudin – Valesian fescue;

2. Potentilla sp.

3. Androsace dasyphylla Bunge - rock jasmin;

4. Oxytropis humifusa Kar. et Kir. - Oxytopus, creeping;

5. Acantholimon tianschanicum Czerniak. – Tien Shan prickly thrift;

6. Pyrethrum pyrethroides (Kar. et Kir.) B.Fedtsch.ex Krasch. – Whiteweed;

7. Oxytropis tianschanica Bunge - Tien Shan Oxytropis – Subendemic;

8. Schmalhausenia nidulans (Regel) Petrak - Shmalgauzenija gnezdistaya – Subendemic;

9. Festuca sp.

10. Erysimum humillimum (C.A.Mey.) N.Busch - Tansy mustard;

11. Smelovskia calycina (Steph.) C.A.Mey. - Cup-shaped Smelovskija;

12. Ziziphora pamiroalaica Juz. – Pamir-Alai ziziphora.

Off-site species

1. Ephedra regeliana Florin – Regel ephedra.</td><td></td></tr>
<tr><td colspan="2">Main Influencing Factors:Overgrazing, gravel for road construction</td></tr>
</table>

Table A.7: Prevailing Flora and Vegetation in Area 7

<table>
<tr><td>Area No: 7</td><td>GPS Coordinates:40º 34' 11.2", 75º 21' 53.6"</td></tr>
<tr><td>Elevation: 3589 m</td><td>Ground Coverage: 30%</td></tr>
<tr><td>General:
Leucopoa olgae (Regel) V.Krecz. et Bobr. + Hordeum brevisubulatum (Trin.)
Prevailing clay, takyr-like soil.
Other species (in decreasing order of abundance):
1. Poa sp.
2. Festuca valesiaca Gaudin;
3. Potentilla sp.
4. Androsace dasyphylla Bunge - Rock jasmin;
5. Oxytropis humifusa Kar. et Kir. – pyrethroid, creeping;
6. Pyrethrum pyrethroides (Kar. et Kir.) B.Fedtsch.ex Krasch. - Pyrethroid whiteweed;
7. Oxytropis tianschanica Bunge – Tien Shan pyrethroid – Subendemic;
8. Festuca sp.
9. Schulzia prostrata M.Pimen. et Kljuykov - White-flowered shultsia – Subendemic;
10. Thesium sp. – Toadflax.
Off-site species
1. Ephedra regeliana Florin – Regel's ephedra.</td><td></td></tr>
<tr><td colspan="2">Main Influencing Factors: Overgrazing</td></tr>
</table>

Main Findings from Second Field Mission in the Summer of 2012

1. A follow-on field assessment was conducted in August 2012 to supplement the findings of the first survey as described above. Tables A.2.8 through 25 present the main findings of the areas that were surveyed as part of this second stage of the study

Table A.8: Prevailing Flora and Vegetation in Area 8

Area No: 8

GPS Coordinates:40º 34' 10.2" 75º 21' 43.6"

Elevation: 3589 m

Ground Coverage: 30%

General:

Plant name		Life form	Abundance
Latin	English		
Saussurea faminziniana Krasn.	Gentle thistle	Grass	Cop_1
Calamagrostis tianschanica Rupr.	Short-awned barley	Grass	Cop_1
Suaedaolufsenii Pauls.	Seepweed	Grass	Sp.
Poa sp.	Bluegrass	Grass	Sp.
Acantholimon tianschanicum Czerniak.	Tien Shan prickly thrift	Shrub	Sp.
Festuca valesiaca Gaudin	Fescue grass	Grass	Sp.
Schulziaprostrata M.Pimen. et Kljuykov	Schulziaprostrata Subendemic	Grass	Sol

The abundance of plants in the lists is provided for according to Drude scale adopted in geo-botanical studies:
Cop_3 – (70-90% of the grass stand volume)
Cop_2 – (50–70 %)
Cop_1 – (30–50 %)
Sp – (5–30 %)
Sol – (1-5 %)
Un – in single quantities

Off-site species: *Ephedra regeliana* Florin

Main Influencing Factors: Overgrazing

Table A.9: Prevailing Flora and Vegetation in Area 9

Area No:9

GPS Coordinates: 40º 33’ 55.2” 75º 21’ 43.6”

Elevation: 3589 m

Ground Coverage: 30%

General:clayey saline soil

Plant name		Life form	Abundance
Latin	English		
Suaeda olufsenii Pauls.	Seepweed	Grass	Cop1
Calamagrostis tianschanica Rupr.	Tien Shan bluejoint	Grass	Sp.
Schulziaprostrata M.Pimen. et Kljuykov	Schulziaprostrata Subendemic	Grass	Sol

The abundance of plants in the lists is provided for according to Drude scale adopted in geo-botanical studies:
Cop_3 – (70-90% of the grass stand volume)
Cop_2 – (50–70 %)
Cop_1 – (30–50 %)
Sp – (5–30 %)
Sol – (1-5 %)
Un – in single quantities

Off-site species: *Ephedra regeliana* Florin

Main Influencing Factors: Overgrazing

Table A.10: Prevailing Flora and Vegetation in Area 10

Area No: 10

GPS Coordinates: 40º 34’ 12.2” 75º 21’ 40.6”

Elevation: 3594 m

Ground Coverage:40%

General: clayey saline soil

Plant name		Life form	Abundance
Latin	English		
Artemisiarhodantha Pauls.	Artemisia rhodantha	Grass	Cop1
Calamagrostis tianschanica Rupr.	Tien Shan bluejoint	Grass	Sp.
Schulziaprostrata M.Pimen. et Kljuykov	Schulziaprostrata Subendemic	Grass	Sol

The abundance of plants in the lists is provided for according to Drude scale adopted in geo-botanical studies:
Cop_3 – (70-90% of the grass stand volume)
Cop_2 – (50–70 %)
Cop_1 – (30–50 %)
Sp – (5–30 %)
Sol – (1-5 %)
Un – in single quantities

Off-site species: *Ephedra regeliana* Florin

Main Influencing Factors: Overgrazing

Table A.11: Prevailing Flora and Vegetation in Area 11

Area No: 11	GPS Coordinates: 40º 34' 40.1"75º 23' 10.2"
Elevation: 3575 m	**Ground Coverage:** 30%

General: clayey saline soil

Plant name		Life form	Abundance
Latin	English		
Polygonumpamir icumKorsh. - Subendemic	Pamir knotweed	Grass	Cop1
Suaeda olufsenii Pauls.	Seepweed	Grass	Cop1
Calamagrostis tianschanica Rupr.	Tien Shan bluejoint	Grass	Sp.
Schulziaprostrata M.Pimen. et Kljuykov	Schulziaprostrata Subendemic	Grass	Sol

The abundance of plants in the lists is provided for according to Drude scale adopted in geo-botanical studies:
Cop_3 – (70-90% of the grass stand volume)
Cop_2 – (50–70 %)
Cop_1 – (30–50 %)
Sp – (5–30 %)
Sol – (1-5 %)
Un – in single quantities

Off-site species: *Ephedra regeliana* Florin

Main Influencing Factors: Overgrazing

Table A.11: Prevailing Flora and Vegetation in Area 12

Area No: 12	GPS Coordinates: 40º 34' 38.1" 75º 22' 11.1"
Elevation: 3566 m	**Ground Coverage:** 40%

General: clayey saline soil

Plant name		Life form	Abundance
Latin	English		
Acantholimon tianschanicum Czerniak.	Tien Shan prickly thrift	Grass	Cop1
Suaeda olufsenii Pauls.	Seepweed	Grass	Cop1
Saussurea faminziniana Krasn.	Gentle thistle	Grass	Sp.
Calamagrostis tianschanica Rupr.	Tien Shan bluejoint	Grass	Sp.

The abundance of plants in the lists is provided for according to Drude scale adopted in geo-botanical studies:
Cop_3 – (70-90% of the grass stand volume)
Cop_2 – (50–70 %)
Cop_1 – (30–50 %)
Sp – (5–30 %)
Sol – (1-5 %)
Un – in single quantities

Off-site species: *Ephedra regeliana* Florin

Main Influencing Factors: Overgrazing

2.	The overall list of species found in the study area during both visits is as shown below.Study of the region flora during the two visits indicated that the flora of the region is poor enough and includes no more than 200 species (of which actually recorded 155 species were recorded).

3.	Species listed in the "Red Book of Kyrgyzstan" have not been found, although the area has been intensively studied during 2 trips.

Table A.12: List of species found in the study area

No.	Family/Species (Latin Name)	(English Name)
1	AlliaceaeJ. Agarrdh.	Alliaceous
2	*Allium atrosanguineum* Kar. et Kir.	Black and red onion
3	Asteraceae Dumort.	Minnie Daisy
4	*Alfredia nivea* Kar. et Kir.	Alfredia nivea
5	*A. dracunculus* L.	Silky wormwood
6	*A. macrocephala* Jacq. ex Bess.	Large-headed wormwood
7	*A. rhodantha* Rupr.	Artemisia rhodantha
8	*Aster alpinus* L. s. l.	Alpine aster
9	*Cirsium esculentum* (Stev.) C. A. Mey.	Ground thistle
10	*Crepis multicaulis* Ledeb.	Multi-caulescent hawk's-beard
11	*C. flexuosa* (Ledeb.) Clarke	Flexuose hawk's-beard
12	*C. karelinii* M. Pop. et Schischk.	Askellia karelinii
13	*Erigeron aurantiacus* Regel	Orange daisy
14	*Inula rhizocephala Schrenk*	Inula rhizocephala Schrenk
15	*Leontopodium ochroleucum* Beauverd	Jonquil yellow edelweiss
16	*Ligularia alpigena* Pojark.	Ligularia alpigena
17	*Pyrethrum pyrethroides* (Kar. et Kir.) Krasch.	Pyrethrum pyrethroides
18	*Rhinactinidia limoniifolia* (Less.) Botsch.	Rhinactinidia limoniifolia
19	*Saussurea leucophylla* Schrenk	Silver-leaved gentle thistle
20	*S. sordida* Kar. et Kir.	Saussurea sordida
21	*Saussurea faminziniana* Krasn.	Saussurea faminziniana
22	*Saussurea larionowii* C. Winkl.	Saussurea larionowii
23	*Saussurea kuschakewiczii* C. Winkl.	Saussurea kuschakewiczii
24	*Schmalhausenianidulans* (Regel) Petrak -–	Schmalhausenianidulans
25	*Taraxacum leucanthum* (Ledeb.) Ledeb.	White-flowered dandelion
26	*Taraxacum maracandicum* Kovalevsk.	Samarkand dandelion
27	*Taraxacumsyrtorum*Dshanaeva – Endemic	Taraxacumsyrtorum
28	Athyridaceae Alst.	Athyridaceae
29	*Cystopteris fragilis* (L.) Borb.	Brittle fern
30	Brassicaceae Burnett	Cabbage
31	*Braya rosea* Bunge	Braya rosea
32	*Chorispora bungeana* Fisch. et C. A. Mey.	Chorispora bungeana
33	*Draba altaica* (C. A. Mey.) Bunge	Altai whitlow grass
34	*D. subamplexicaulis* C. A. Mey.	Amplexicaul whitlow grass
35	*Erysimum humillimum* (C. A. Mey.) N. Busch.	Erysimum humillimum
36	*Neotorularia humilis* (C. A. Mey.) Hedge et J. Leonard	Neotorularia humilis
37	*N. korolkowii* (Regel et Schmalh.) Hedge et J. Leonard	Neotorularia korolkowii
38	*Sisymbriopsis mollipila* (Maxim.) Botsch.	Sisymbriopsis mollipila
39	*Smelowskia calycina* (Steph.) C. A. Mey.	Smelowskia calycina
40	*Sophiopsis annua* (Rupr.) O. E. Schulz	Sophiopsis annua
41	*Taphrospermum altaicum* C. A. Mey.	Taphrospermum altaicum
42	*Thlaspi arvense* L.	Dish mustard
43	Caryophyllaceae Juss.	Caryophyllaceous
44	*Cerastium bungeanum* Vved.	Cerastium bungeanum
45	*Cerastium cerastoides* (L.) Britt.	Cerastium cerastoides
46	*Gastrolychnis apetala* (L.). Tolm. et Kozhanczikov	Gastrolychnis apetala
47	*Silene graminifolia* Otth	Silene graminifolia
48	*Stellaria brachypetala* Bunge	Short-petaled starwort
49	Chenopodiaceae Vent.	Goosefoot
50	*Chenopodium foliosum* Aschers.	Chenopodium foliosum

51	*Krascheninnikovia ceratoides* (L.) Gueldenst.	Krascheninnikovia ceratoides
52	*Suaeda olufsenii* Pauls.	Seepweed
53	Crassulaceae DC.	Crassulaceae
54	*Hylotelephium ewersii* (Ledeb.) H. Ohba	Hylotelephium ewersii
55	Cyperaceae Juss.	Sedgy
56	*Carex aterrima* Hoppe	Carex aterrima
57	*C. melanantha* C. A. Mey.	Carex melanantha
58	*Carex pseudofoetida* Kuk.	Carex pseudofoetida
59	*Kobresia capilliformis* Ivanova	Kobresia capilliformis
60	*Kobresia humilis* (Trautv.) Serg.	Kobresia humilis
61	*K. stenocarpa* (Kar. et Kir.) Steud.	Kobresia stenocarpa
62	Ephedraceae Dumort.	Ephedraceae
63	*Ephedra regeliana* Florin	Ephedra
64	Fabaceae Lindl.	Fabaceous
65	*Astragalus kuschakewiczi* B. Fedtsch.	Astragalus kuschakewiczi
66	*A. nivalis* Kar. et Kir.	Astragalus nivalis
67	*Caragana jubata* (Pall.) Poir.	Caragana jubata
68	*Hedysarum kirghisorum* B. Fedtsch.	Kyrgyz tick trefoil
69	*Oxytropis globiflora* Bunge	Oxytropis globiflora
70	*O. chionobia* Bunge	Oxytropis chionobia
71	*O. humifusa* Kar. et Kir.	Oxytropis humifusa
72	*O. lapponica* (Wahlenb.) J. Gay	Oxytropis lapponica
73	Gentianaceae Juss.	Gentian-worts
74	*Comastoma falcatum* (Turcz.) Toyokuni	Comastoma falcatum
75	*Gentiana karelinii* Griseb.	Gentiana karelinii
76	*Gentianella turkestanorum* (Gand.) Holub	Gentianella turkestanorum
77	*Gentianopsis barbata* (Froel.) Ma	Gentianopsis barbata
78	*Lomatogonium carinthiacum* (Wulf.) Reichenb.	Lomatogonium carinthiacum
79	*Swertia marginata* Schrenk	Swertia marginata
80	Juncaceae Juss.	Juncaceous
81	*Juncus triglumis* L.	Juncus triglumis
82	Juncaginaceae Rich.	Juncaginaceae
83	*Triglochin maritimum* L.	Arrow grass
84	Lamiaceae Lindl.	Lamiaceae
85	*Dracocepalum heterophyllum* Benth.	Heterophyllous dragonhead
86	*D. stamineum* Kar. et Kir.	Staminal dragonhead
87	Liliaceae Juss.	Liliaceous
88	*Lloydia serotina* (L.) Reichenb.	Alp lily
89	Limoniaceae Ser.	Limoniaceae
90	*Acantholimon tianschanicum* Czerniak.	Tien Shan prickly thrift
91	Papaveraceae Juss.	Papaveraceous
92	*Papaver croceum* Ledeb.	Papaver croceum
93	Parnassiaceae S. F. Gray	Parnassiaceae
94	*Parnassia laxmannii* Pall. ex Schult.	Parnassia laxmannii
95	Poaceae Barnhart	Poaceae Barnhart
96	*Achnatherum splendens* (Trin.) Nevski	Jiji grass
97	*Calamagrostis anthoxanthoides* (Munro) Regel	Calamagrostis anthoxanthoides
98	*Deschampsia caespitosa* (L.) Beauv.	Tussock-grass
99	*D. koelerioides* Regel	Deschampsia koelerioides
100	*Elymus tschimganicus* (Drob.) Tzvel.	Elymus tschimganicus
101	*E. schrenkianus* (Fisch. et C. A. Mey.) Tzvel.	Elymus schrenkianus
102	*Festuca alatavica* (St.-Yves) Roshev.	Festuca alatavica
103	*Festuca kirghisorum* (Katsch. ex Tzvel.) E.Alexeev	Festuca kirghisorum
104	*F. valesiaca* Gaudin	Festuca valesiaca
105	*Helictotrichon desertorum* (Less.) Nevski	Helictotrichon desertorum
106	*Hordeum brevisubulatum* (Trin.) Link	Hordeum brevisubulatum
107	*Leucopoaolgae* (Regel) V.Krecz.	Leucopoaolgae
108	*Leymus dasystachys* (Trin.) Pilg.	Leymus dasystachys
109	*Poa alpina* L.	Alpine snow grass
110	*P. litvinoviana* Ovcz.	Poa litvinoviana

111	*Ptilagrostis mongolica* (Trin.) Griseb.	Ptilagrostis mongolica
112	*Puccinelliahackeliana* V.Krecz. - Subendemic	Puccinelliahackeliana
113	*Trisetum spicatum* (L.) K. Richt.	Spicigerous trisetum
114	Polygonaceae Juss.	Buckwheat
115	*Oxyria didyna* (L.) Hill	Mountain sorrel
116	*Polygonumpamiricum*Korsh. – Subendemic	Pamir knotweed
117	Potamogetonaceae Dumort.	Potamogetonaceae
118	*Potamogeton pectinatus* L.	Fennel-leaved pondweed
119	Primulaceae Vent.	Primulaceae
120	*Androsace dasyphylla* Bunge	Rock jasmin
121	*A. septentrionalis* L. s. l.	Androsace septentrionalis
122	*Cortusa brotheri* Lipsky	Cortusa brotheri
123	*Glaux maritima* L.	Glaux maritima
124	*Primula algida* Adams	Primula algida
125	*P. pamirica* Fed.	Primula pamirica
126	*P. turkestanica* (Haage et Schmidt) E. A. White	Primula turkestanica
127	Ranunculaceae Juss.	Ranunculaceous
128	*Batrachium trichophyllum*	Batrachium trichophyllum
129	*Halerpestes sarmentosa* (Adams) Kom.	Halerpestes sarmentosa
130	*Pulsatilla campanella* Fisch. ex Regel et Til.	Pulsatilla campanella
131	*Ranunculus alberti* Regel et Schmalh.	Ranunculus alberti
132	*R. karelinii* Czer. (*R. gelidus* Kar.)	Ranunculus karelinii
133	*R. natans* C. A. Mey.	Ranunculus natans
134	*Thalictrum alpinum* L.	Thalictrum alpinum
135	*T. minus* L.	Thalictrum minus
136	*Trollius lilacinus* Bunge	Trollius lilacinus
137	Rosaceae Juss.	Pink
138	*Potentilla asiae-mediae* Ovcz. et Koczk.	Potentilla asiae-mediae
139	*P. moorcroftii* Wall. ex Lehm.	Potentilla moorcroftii
140	*Santalaceae*	
141	*Thesium* sp.	Toadflax
142	*Scrophulariaceae* Juss.	Snapdragon
143	*Euphrasia pectinata* Ten.	Euphrasia pectinata
144	*Lagotis decumbens* Rupr.	Lagotis decumbens
145	*Pedicularis .dolichorhiza* Schrenk	Pedicularis dolichorhiza
146	*P. ludvigii* Regel	Pedicularis ludvigii
147	*P. oederi* Vahl.	Pedicularis oederi
148	*P. rhinanthoides* Schrenk	Pedicularis rhinanthoides
149	*Umbelliferae* Juss.	Umbellate
150	*Angelica brevicaulis* (Rupr.) B. Fedtsch.	Angelica brevicaulis
151	*Lomatocarpa albomarginata* (Schrenk) M. Pimen e	Lomatocarpa albomarginata
152	*Schulziaprostrata* M.Pimen. et Kljuykov	SchulziaprostrataSubendemic
153	*Violaceae* Batsch	Violet
154	*Viola altaica* Ker-Gawl.	Altai violet
155	*V. tianschanica* Maxim.	Tien Shan violet

Avifauna

1. Below is the detailed list of birds of the Chatyr-Kul site of the Karatal-Zhapyryk state reserve prepared based on various sources[1].

1) Non-perching birds:

Little Grebe (*Tachybaptusruficollis* (Pallas, 1764) - Little Grebe), Slavonian Grebe (*Podicepsauritus* (Linnaeus, 1758) - Slavonian Grebe), Great Crested Grebe (*P. cristatus* (Linnaeus, 1758) - Great Crested Grebe), Red-necked Grebe (*P. grisegena* (Boddaert, 1783) - Red-necked Grebe), Black-necked Grebe (*P. nigricollis* C. L. Brehm, 1831 - Black-necked Grebe), cormorant (*Phalacrocoraxcarbo* (Linnaeus, 1758) - Cormorant), little bittern (*Ixobrychusminutus* (Linnaeus, 1766) - Little Bittern (migratory), Night Heron (*Nycticoraxnycticorax* (Linnaeus, 1758) - Night Heron (migratory), Great White Heron (*Egretta alba* (Linnaeus, 1758) - Great White Heron), common heron (*Ardeacinerea* (*Linnaeus*, 1758) - Common Heron), spoonbill (*Platalealeucorodia Linnaeus*, 1758 - Spoonbill), black stork (*Ciconianigra* (Linnaeus, 1758) - Black Stork), white-fronted goose (*Anseralbifrons* (Scopoli, 1769) - White-fronted Goose), grey goose (*A. anser* (Linnaeus, 1758) - Grey Lag-Goose), mountain, or Indian goose (*A. indicus* (Latham, 1790) - Bar-headed Goose), whooper swan (*Cygnus cygnus* (Linnaeus, 1758) - Whooper Swan), ruddy shield-duck (*Tadornaferruginea* (Pallas, 1764) - Ruddy Shield-Duck), shield-duck (*T. tadorna* (Linnaeus, 1758) - Shield-Duck), pintail duck (*Anasacuta* Linnaeus, 1758 - Northern Pintail), northern shoveler (*A. clypeata* Linnaeus, 1758 - Northern Shoveler), common teal (*A. crecca* Linnaeus, 1758 - Common Teal), baikal tea (*A. formosa*Georgi, 1775 - Baikal Tea (migratory), Eurasian Wigeon (*A. penelope* Linnaeus, 1758 - Eurasian Wigeon), mallard (*A. platyrhynchos* Linnaeus, 1758 - Mallard), garganey (*A. querquedula* Linnaeus, 1758 - Garganey), grey duck (*A. strepera* Linnaeus, 1758 - Gadwall), red-crested pochard (*Nettarufina* (Pallas, 1773) - Red-crested Pochard), common pochard (*Aythyaferina* (Linnaeus, 1758) - Common Pochard), tufted duck (*A. fuligula* (Linnaeus, 1758) - Tufted Duck), Ferruginous Duck (*A. nyroca* (Guldtnstadt, 1770) - Ferruginous Duck), ordinary golden eye (*Bucephalaclangula* (Linnaeus, 1758) - Common Golden-eye), goosander (*Mergus merganser* Linnaeus, 1758 - Goosander), Red-breasted Merganser (*M. serrator* Linnaeus, 1758 - Red-breasted Merganser), black kite (*Milvusmigrans* (Boddaert, 1783) - Black Kite), Marsh Harrier (*Circus aeruginosus* (Linnaeus, 1758) - Marsh Harrier), pale harrier (*C. macrourus* (S. G. Gmelin, 1771) - Pallid Harrie), goshawk (*Accipiter gentilis* (Linnaeus, 1758) - Goshawk), sparrow-hawk (*A. nisus* (Linnaeus, 1758) - Sparrow-Hawk), common buzzard (*Buteobuteo* (Linnaeus, 1758) - Common Buzzard), spotted eagle (*Aquila clanga* Pallas, 1811 - Spotted Eagle), golden eagle (*A. chrysaetos* (Linnaeus, 1758) - Golden Eagle), steppe eagle (*Aquila nipalensis* Hodgson, 1833 - Steppe Eagle), Pallas's Fish Eagle (*Haliaeetusleucoryphus* (Pallas, 1771) - Pallas's Fish Eagle), Bearded Vulture (*Gypaetusbarbatus*(Linnaeus, 1758) - Bearded Vulture, Lammergeiger), white-headed vulture (*Gyps fulvous* (Hablizl, 1783) - Griffon-Vulture), Himalayan Griffon (*G. himalayensis* Hume, 1869 - Himalayan Griffon), ordinary kestrel (*Cerchneustinnunculus* (Linnaeus, 1758) - Kestrel), Saker Falcon (*Falco cherrug* J. E. Gray, 1834 - Saker Falcon), Merlin (F. columbarius (Linnaeus, 1758) - Merlin), Shaheen Falcon (*F. pelegrinoides*Temmink, 1829 - Shaheen Falcon), hobby (*Hypotriorchissubbuteo* (Linnaeus, 1758) - Hobby), mountain patridge (*Alectoriskakelik* (J. E. Gray, 1830) - Rock Partridge), bearded partridge (*Perdixdauurica* (Pallas, 1811) - Daurian Partridge), quail (*Coturnixcoturnix* (Linnaeus, 1758) - Quail), Demoiselle Crane (*Anthropoidesvirgo* (Linnaeus, 1758) - Demoiselle Crane), bald-coot (*Fulicaatra* Linnaeus, 1758 - Coot), corn crake (*Crexcrex* (Linnaeus, 1758) - Corncrake) (migratory) (Rallidae), Grey Plover (*Pluvialissquatarola* (Linnaeus, 1758) - Grey Plover), Asian lesser golden plover (*P. fulva* (Gmelin, 1789 - Pacific Golden Plover), red-capped dotterel (*Charadriusalexandrinus* Linnaeus, 1758 - Kentish Plover), little ringed plover (*C.*

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[1] Kydyraliev, 1990; KZhSR-2003; Ostashchenko, Davletbakov, 2004; Toropova, 2004; Oskonbaev, Choroev, 2005, and others] - 123 species in total).

*dubius*Scopoli, 1786 - Little Ringed Plover), thick-billed plover (*C. leschenaultii* Lesson, 1826 - Greater Sand Plover), Ringed Plover (*C. hiaticula* Linnaeus, 1758 - Ringed Plover), Mongolian plover (*C. mongolus* Pallas, 1776 - Mongolian Plover, Lesser Sand Plover), lapwing (*Vanellusvanellus* (Linnaeus, 1758) - Lapwing), Turnstone (*Arenariainterpres* (Linnaeus, 1758) - Turnstone), black-winged stilt (*Himantopushimantopus* (Linnaeus, 1758) - Black-winged Stilt), avocet (*Recurvirostraavosetta* Linnaeus, 1758 - Avocet), Spotted Redshank (*Tringaerythropus* (Pallas, 1764) - Spotted Redshank), Wood-Sandpiper (*T. glareola* Linnaeus, 1758 - Wood-Sandpiper), Greenscank (*T. nebularia* (Gunnerus, 1767) - Greenscank), Green Sandpiper (*T. ochropus* Linnaeus, 1758 - Green Sandpiper, Redshank (*T. totanus* (Linnaeus, 1758) - Redshank), Common Sandpiper (*Actitishypoleucos* (Linnaeus, 1758) - Common Sandpiper), Terek-Sandpiper (*Xenuscinereus* (Guldenstadt, 1775) - Terek-Sandpiper), Red-necked Phalapore (*Phalaporuslobatus* (Linnaeus, 1758) - Red-necked Phalapore), ruff (*Philomachuspugnax* (Linnaeus, 1758) - Reeve (female), Ruff (male)), sandpiper (*Calidris alba* (Pallas, 1764) - Sanderling), dunlin (*C. alpina* (Linnaeus, 1758) - Dunlin), Curlew-Sandpiper (*C. ferruginea* (Pontoppidan, 1763) - Curlew-Sandpiper), little stint (*C. minuta* (Leisler, 1812) - Little Stint), Temminck's stint (*C. temminckii*(Leisler, 1812) - Temminck's Stint), Broad-billed Sandpiper (*Limicolafalcinellus* (Pontoppidan, 1763) - Broad-billed Sandpiper), Wilson's snipe (*Gallinagogallinago* (Linnaeus, 1758) - Common Snipe), mountain great snipe, or snipe-eremite (*G. solitaria* Hodgson, 1831 - Solitary Snipe), Curlew (*Numeniusarguata* (Linnaeus, 1758) - Curlew), Whimbrel (*N. phaeopus* (Linnaeus, 1758) - Whimbrel), big black-tailed godwit (Limosalimosa (Linnaeus, 1758) - Black-tailed Godwit), yellow-legged gull (*Laruscachinnans* Pallas, 1811 - Yellow-legged Gull), grey seagull (*L. canus Linnaeus*, 1758 - Common Gull), Great Black-headed Gull (*L. ichtyaetus*Pallas, 1773 - Great Black-headed Gull), small seagull (*L. minutus* Pallas, 1776 - Little Gull), Black-headed Gull (*L. ridibundus Linnaeus*, 1766 - Black-headed Gull), black tern (*Chlidoniasniger* (Linnaeus, 1758) - Black Tern), Gull-billed Tern (*Gelochelidonnilotica* (Gmelin, 1789) - Gull-billed Tern), Little Tern (*Sterna albifrons* Pallas, 1764 - Little Tern, Little Morwennol), river tern (*S. hirundo* Linnaeus, 1758 - Common Tern, Sea Swallow), Black-bellied Sandgrouse (*Pteroclesorientalis* (Linnaeus, 1758) - Black-bellied Sandgrouse) (Pteroclidae), rock-dove (*Columba livia*Gmelin, 1789 ssp. *neglecta* Hume, 1873 - Rock Pigeon), rocky pigeon (*Columba rupestris*Pallas, 1811 - Hill Pigeon), ordinary turtle-dove (*Streptopeliaturtur* (Linnaeus, 1758) - European Turtle Dove) (Columbidae), cuckoo (*Cuculuscanorus* Linnaeus, 1758 - Common Cuckoo), Scops Owl (*Otusscops* (Linnaeus, 1758) ssp. *pulchellus* (Pallas, 1771) - Scops Owl), little owl (*Athenenoctua* (Scopoli, 1769) ssp. *bactriana* Hutton - Little Owl), Tawny Owl (*Strixaluco* Linnaeus, 1758 ssp. *haermsi*Zarudny, 1911 - Tawny Owl), black swift (*Apusapus* (Linnaeus, 1758) ssp. *pekinensis*Swinhoe, 1870 - Chinese Black Swift), white-bellied swift (*A. melba* (Linnaeus, 1758) ssp. *tuneti*Tschusi, 1894 - Alpine Swift), ordinary halcyon (*Alcedoatthis* Linnaeus, 1758 - Common halcyon, European kingfisher) (migratory), hoopoe (*Upupaepops*Linnaeus, 1758 - Hoopoe, Whoop).

2) Perching birds (i.e. the order of Passeriformes):

2. Horned lark Eremophilaalpestris (Linnaeus, 1758), skylark Alaudaarvensis Linnaeus, 1758 (Alaudidae), bank swallow Ripariariparia (Linnaeus, 1758) (Hirundinidae), Citrine Wagtail M. citreola Pallas, 1771 (Motacillidae), common starling Sturnus vulgaris Linnaeus, 1758 (Sturnidae), killigrewPyrrhocoraxpyrrhocorax (Linnaeus, 1758), Alpine chough Graculusgraculus (Linnaeus, 1766), raven Corvuscorax Linnaeus, 1758, crow C. corone Linnaeus, 1758, hooded crow C. cornix Linnaeus, 1758 (migratory), rook C. frugilegus Linnaeus, 1758 (migratory) (Corvidae), ordinary dipper Cincluscinclus (Linnaeus, 1758) (Cinclidae), Isabelline chat Oenantheisabellina (Temminck, 1829), wheatear Oenantheoenanthe (Linnaeus, 1758) (migratory) (Turdidae), snow finch Montifringillanivals (Linnaeus, 1766) (Passeridae).

3. In the course of the survey, a total of 95 bird species were observed. Those consist of 12 orders (Podicipitiformes, Ciconiiformes, Anseriformes, Falconiformes, Gruiformes, Charadriiformes, Columbiformes, Cuculiforms, Strigiforms, Apodiformes, Coraciiforms, Passeriforms) and 25 families (Podicipitidae, Ardeidae, Anatidae, AccipitridaeFalconidae, Gruidae, Charadriidae, Laridae, Columbidae, Cuculidae, Strigidae, Apodidae, Upupidae, Alaudidae, Hirundinidae, Motacillidae, Laniidae, Cinclidae, Prunellidae, Turdidae, Emberizidae, Fringillidae, Ploceidae, Sturnidae, Corvidae).

4. On the route from mountain crossing Tuzbel till customs station the inventory zone was made up of 200 m on either side of the road. Inthiszone, thefollowingbirdspecieswereregistered

common heron, roodyshelduck, mallard, common teal, grey duck, pintail duck, garganey teal, black kite, marsh harrier, sparrow hawk, long-legged buzzard, hobby, ordinary common kestrel, Mongolian plover, plover, green sandpiper, wood sandpiper, fiddler, Wilson's snipe, black-headed gull, collared turtledove, ordinary cuckoo, little owl, black swift, hoopoe, bank swallow, house martin, rocky swallow, horned lark, skylark, tree pipit, rock pipit, blue headed wagtail, Citrine wagtail, grey wagtail, pied wagtail, masked wagtail, Laniusspiniloroquius, lesser grey shrike, starling, ordinary myna, common magpie, killigrew, Alpine chough, rook, crow, dipper, wren, Alpine accentor, pale accentor, whitethroat, chiffchaff, greenish warbler, yellow-browed warbler, stonechat, ordinary wheatear, isabelline wheatear, Rufous-tailed Rock Thrush, ordinary redstart, Indian redstart, Giildenstadt's redstart, blue-throated robin, blackbird, mistle thrush, wallcreeper, house sparrow, tree sparrow, snow finch, linnet, Hodgson's rosy finch, Brandt's rosy finch and gray-necked bunting.

5. The total number of birds is estimated at 2800 birds. Of those, the pre-dominant species were the black swift, bank swallow, house martin and horned lark. On the given site there prevailed birds inhabiting the steppe, meadow, wood and rocky biotopes. It is necessary to notice that birds of the water-marsh complex were observed on small rivers and intermittent water basins. Massflightofblackkiteswasobserved.

6. The data from the mouth of the river Kok-Aigyr covers the southeastern coast, and the basin within the visible range. Inthatarea, thefollowingbirdspecieswereobserved:

- **Water-marsh complex**: slavonian grebe, great-crested grebe, great white heron, common heron, black stork, grey goose, bar-headed goose, hooping swan, roodyshelduck, mallard, common teal, European wigeon, pintail duck, garganey teal, common shoveler, red-nosed pochard, ruddy-headed bluebill, common bluebill, common golden eye, goosander, grey crane, bald-coot, Mongolian plover, small plover, plover, turnstone, black-winged stilt, green sandpiper, wood sandpiper, green shank, red shank, fiddler, ruff, little stint, Temminck's stint, curlew sandpiper, dunlin, Wilson's snipe, woodcock, slender-billed curlew, curlew, black-tailed godwit, Pallas's Gull, black-headed gull, Caspian Gull, grey seagull, black tern and common tern.
- **Predatory birds**: black kite, neophron, Montagu's harrier, marsh harrier, sparrow hawk, long-legged buzzard, common buzzard, golden eagle, lammergeier, black vulture, Himalayan griffon, saker falcon, peregrin, common kestrel.

7. The population of birds of wood, meadow, steppe and rocky biotopes are represented by the following species: quail, big turtle-dove, ordinary cuckoo, black swift, bank swallow, house martin, skylark, horned lark, blue headed wagtail and masked wagtail.

8. The aggregate number of birds is estimated at 10,000 birds. Mass species are represented by mallards, common teals, European wigeons, pintail ducks, garganey teals, ruddy-headed bluebills and floccose bluebills.

9. The southern site of the lake was also surveyed from the eastern to western coast. A transect was laid every 3 kilometers. Birds in the vicinity were observed within the range of vision. Also, birds were registered along the shore band within 500 m. inthatarea, thefollowingbirdspecieswereobserved:

Representatives of the water-marsh complex: slavonian grebe, great-crested grebe, big large egret, common heron, bar-headed goose, roodyshelduck, mallard, common teal, European wigeon, pintail duck, garganey teal, common shoveler, red-nosed pochard, ruddy-headed bluebill, floccose bluebill, ordinary goldeneye, goosander, grey crane, bald-coot, Mongolian plover, small plover, plover, turnstone, black-winged stilt, green sandpiper, wood sandpiper, green shank, red shank, fiddler, ruff, little stint, Temminck's stint, curlew sandpiper, dunlin, Wilson's snipe, woodcock, slender-billed curlew, curlew, big black-tailed godwit, Pallas's Gull, black-headed gull, Caspian Gull, grey seagull, black tern and common tern.

Representatives of predatory birds: black kite, Montagu's harrier, marsh harrier, sparrow hawk, long-legged buzzard, common buzzard, golden eagle, Himalayan griffon, red-headed falcon and common kestrel.

10. Population of birds of wood, meadow, steppe and rocky biotopes were represented by: quail, big turtle-dove, ordinary cuckoo, black swift, bank swallow, house martin, steppe lark, tawny pipit, tree pipit, rock pipit, blue headed wagtail, grey wagtail, masked wagtail, Laniusspiniloroquius, starling, killigrew, Alpine chough, rook, crow, raven, ordinary cricket, chiffchaff, black-headed wheatear, wheatear, isabelline wheatear, blue-throated robin and mistle thrush.

11. The aggregate number of birds is estimates at 10,000 birds. Mass species are; common teals, pintail ducks, garganey teals. On the given site species included in the Red Book of Kyrgyzstan were observed.

12. On the western coast of the lake the following bird species were observed**:**

birds of the water-marsh complex: great-crested grebe, grey goose, bar-headed goose, roodyshelduck, mallard, common teal, pintail duck, garganey teal, red-nosed pochard, ruddy-headed bluebill, floccose bluebill, goosander, bald-coot, Mongolian plover, plover, black-winged stilt, green sandpiper, wood sandpiper, red shank, fiddler, Wilson's snipe, curlew, black-headed gull, Caspian Gull and common tern.

Predatory birds: black kite and Egyptian vulture.

Steppe and meadow complex: quail, steppe lark, tree pipit, rock pipit, masked wagtail, crow, raven, and isabelline wheatear.

13. The aggregate number of birds in this area is estimated at 3,500 with Garganey teals being the pre-dominant species.

14. The bird species included in the Red Book of Kyrgyzstan, that can be met at the highway section "Bishkek-Naryn-Torugart" and the Chatyr-Kul section of the Karatal-Zhapyryk state reserve are summarized in the Table below.

Table A.1: Bird Species Identified in the Red Book of Kyrgzstan

Date	Name		
	Latin	**Russian**	**English**
1984	*Plataea leucorodia,* Linnaeus, 1758	Колпица	Spoonbill
1985	*Ciconia nigra* (Linnaeus, 1758)	Черный аист	Black Stork
1985	*Anser indicus* Latham, 1790	Горный гусь	Bar-headed Goose
1985	*Cygnus cygnus* (Linnaeus, 1758)	Лебедь-кликун	Whooper Swan
2005	*Aythya nyroca* (Guldtnstadt, 1770)	Белоглазая чернеть	Ferrugineous Duck, Ferrugineous Scaup
2005	*Mergus serrator* Linnaeus, 1758	Крохаль средний, или длинноносый	Red-breasted Merganser

1985	*Aquila chrysaetos* (Linnaeus, 1758)	Беркут	Golden Eagle
1985	*Aquila nipalensis* Hodgson, 1833	Степной орел	Steppe Eagle
1984	*Haliaeetus leucoryphus* (Pallas, 1771)	Орлан-долгохвост	Pallas's Fish Eagle
1985	*Gypaetus barbatus* (Linnaeus, 1758)	Бородач	Bearded Vulture, Lammergeiger
2005	*Gyps fulvus* (Hablizl, 1783)	Белоголовый сип	Griffon-Vulture
1985	*Gyps himalayensis* Hume, 1869	Снежный (гималайский) гриф	Himalayan Griffon
1985	*Falco cherrug* J. E. Gray, 1834	Балобан	Saker Falcon
1985	*Falco pelegrinoides* Temmink, 1829	Рыжеголовый сокол, или Шахин	Shaheen Falcon
1985	*Anthropoides virgo* (Linnaeus, 1758)	Журавль-красавка	Demoiselle Crane
1984	*Larus ichthyaetus* Pallas, 1773	Черноголовый хохотун	Great Black-headed Gull
2005	*Pterocles orientalis* (Linnaeus, 1758)	Чернобрюхий рябок	Black-bellied Sandgrouse

15. One of the most simple and effective methods of environmental control is the method of birds monitoring, because they are the first to respond to any ecological changes such as climate reversals, changes in the composition of vegetation, reduction of food potential, etc. By using indicator species, it is possible to assess parameters of ecological factors and to forecast their change in the future once the road construction and operation begins.

16. Proposed indicators include whooper swan, demoiselle crane, mallard, pintail duck, garganey teal, common teal, long-legged buzzard, sparrow hawk, golden eagle, lammergeier, Himalayan griffon, horned larks, and isabelline wheatear. This is as per the methodology outlined by the previous research in the area undertaken by Davletbakov A.T. in 2003

Main Findings from Second Field Mission in the Summer of 2012

17. A second filed mission was undertaken in August 2012, during which factual evidence on 83 species of birds consisting of 12 orders were collected. The study area was divided into a number of sections ans sub-sections as summarized below along with the main findings and observations at the various sections:

Table A.2: August 2012 Observations

TuzBel section		West shore towards the east along the southern coast		From the customs post towards the west along the road		Eastbound along the northern shore		Over the border zone (southern part of the road)	
Northing	**Easting**	**Northing**	**Easting**	**Northing**	**Easting**	**Northing**	**Easting**	**Northing**	**Easting**
4056701	7508651	4058881	7517400	4059359	7541232	4059688	7514870	4055676	7515754
4056443	7509888	4058415	7517783	4058709	7540395	4060382	75 16352	4054975	7515398
4056448	75 10252	4057417	7521384	4058271	7539368	4061543	7517573	4053978	7514623
4056437	7510770	4057787	7525034	4057830	7538333	4062324	7518676	4053582	7514041
4056333	7511176	4061579	7536095	4057354	7537290	4063189	7519911	4053656	7513245
4056274	7556274	4063280	7537567	4056882	7536333	4064577	7520958	4054913	7512970
4056204	7512509	4066018	7540629	4056387	7535337	4064182	7521609	4055980	7512929
4056176	7512878	4069073	7540176	4055757	7534066	4064906	7522695		
4056077	7513804			4055520	7533031	4065950	7524266		
4056016	7514436								
4055947	7515224								
4055940	7515539								
4057875	7529871								
4055905	7516161								
4055767	7517222								

4055656	7518051								
4055564	7518903								
4055502	7519638								

On the Route Tuz-Bel alongthe Road

18. Generally, birds of water and mire complex were observed such as Mongolian Plover and Gray Gull.Representatives of birds of prey in this area include long-legged buzzard and the common kestrel.

19. Species of steppe and meadow complexes aremainly represented by horned lark, rock pipit, yellow wagtail, and isabelline wheatear.

20. The total number of observed birds in this section amounted to 509 birds as shown below. ThedominantspeciesistheHornedLark.

Table A.3: Bird Species Identified in this section

Species Composition	Number Of Specimens
Buteorufinus (Cretzschmar, 1827) – Long-Legged Buzzard	1
Falcotinnunculuslinnaeus, 1758, - Common Kestrel	3
CharadriusMongolus Pallas, 1776 - Mongolian Plover	3
TringaOchropus Linnaeus, 1758 – Gray Gull	3
UpupaEpops Linnaeus, 1758 – Hoopoe	1
Eremophilaalpestris (Linnaeus, 1758) – Horned Lark	424
Anthusspinoletta (Linnaeus, 1758) – Rock Pipit	1
MotacillaFlava (Linnaeus, 1758) – Yellow Wagtail	1
Oenantheisabellina (Temminck, 1829) - Isabelline Wheatear	72
Total	**509**

Along the Lake from the West Shore to the East

21. Birds of water and mire complex inlcudeBare-Headed Goose, Sheld Duck, Pintail, Garganey, Little Ringer Plover, Mongolian Plover, Gray Gull, Terek Sandpiper and Temminck's Stint.

22. The total number of observed birds was 1209 specimens. The dominant species is theSheld Duck.

Table A.4: Bird Species Identified in this section

Species Composition	Number Of Specimens
AnserIndicus (Latham, 1790) – Bar-Headed Goose	6
TadornaFerruginea (Pallas, 1764) – Sheld Duck	880
AnasAcuta Linnaeus, 1758 – Pintail	100
Anasquerquedulalinnaeus, 1758 - Garganey	80
CharadriusDubiusScopoli, 1786 - Little Ringer Plover	5
CharadriusMongolus Pallas, 1776 - Mongolian Plover	98
TringaOchropus Linnaeus, 1758 – Gray Gull	5
XenusCinereus (Guldenstadt, 1775) – Terek Sandpiper	5
Calidristemminckii (Leisler, 1812) - Temminck's Stint	30
Total	**1209**

Along the East Shore of the Lake

23. Birds of water and mire complex included - Black-Necked Grebe, Great-Crested Grebe, Grey Heron, Bar-Headed Goose, Sheld Duck, Mallard, Gadwall, Pintail, Garganey, Shoveler, Red-Headed Scaup Duck, Tufted Duck, Black-Belled Plover, Mongolian Plover,

Stilt, Gray Gull, Wood Sandpiper, Greenshank, Redshank, Spotted Redshank, Fiddler, Terek Sandpiper, Ruff, Temminck's Stint, Curlew Sandpiper, Snipe, Curlew, Black-Tailed Godwit, Great Black-Headed Gull, Common Black-Headed Gull, Caspian Gull, Common Gull and Coomon Tern.

24. Representatives of birds of prey wereMarsh Harrier and Red-Headed Falcon.

25. Species of steppe and meadow complex are represented by one species - Eastern Grasshopper Warbler.Birds that live on screes and rocks are represented by Pale Swallow and Common House Martin.

26. The total number of observed birds was 25436 specimens as shown below. The dominant species is the Sheld Duck.

Table A.5: Bird Species Identified in this section

Species Composition	**Number Of Specimens**
Podicepsnigricollisc. L. Brehm, 1831 - Black-Necked Grebe	300
PodicepsCristatus (Linnaeus,1758) – Great-Crested Grebe	101
Ardeacinerea (Linnaeus, 1758) – Grey Heron	2
AnserAnser(Linnaeus, 1758) Grey Goose	55
AnserIndicus (Latham, 1790) - Bar-Headed Goose	305
TadornaFerruginea (Pallas, 1764) – Sheld Duck	18350
AnasPlatyrhynchos Linnaeus, 1758 – Mallard	7
AnasStrepera Linnaeus, 1758 – Gadwall	250
AnasAcuta Linnaeus, 1758 – Pintail	3210
Anasquerquedulalinnaeus, 1758 - Garganey	920
AnasClypeata Linnaeus, 1758 – Shoveler	1000
Aythyaferina (Linnaeus, 1758) - Red-Headed Scaup Duck	100
Aythyafuligula (Linnaeus, 1758) - Tufted Duck	500
Circusaeruginosus (Linnaeus, 1758) – Marsh Harrier	1
FalcoPelegrinoidesTemmink, 1829 - Red-Headed Falcon	2
PluvialisSquatarola (Linnaeus, 1758) – Black-Belled Plover	3
CharadriusMongolus Pallas, 1776 - Mongolian Plover	100
HimantopusHimantopus (Linnaeus, 1758) - Stilt	12
TringaOchropus Linnaeus, 1758 – Gray Gull	12
TringaGlareola Linnaeus, 1758 – Wood Sandpiper	7
TringaNebularia (Gunnerus, 1767) – Greenshank	1
TringaTotanus (Linnaeus, 1758) - Redshank	1
TringaErythropus(Pallas, 1764) - Spotted Redshank	1
ActitisHypoleucos (Linnaeus, 1758) – Fiddler	1
XenusCinereus (Guldenstadt, 1775) – Terek Sandpiper	6
PhilomachusPugnax (Linnaeus, 1758) – Ruff	7
Calidristemminckii (Leisler, 1812) - Temminck's Stint	53
CalidrisFerruginea (Pontoppidan, 1763) – Curlew Sandpiper	2
GallinagoGallinago (Linnaeus, 1758) – Snipe	3
Numeniusarguata (Linnaeus, 1758) – Curlew	2
Limosalimosa (Linnaeus, 1758) – Black-Tailed Godwit	3
Larusichtyaetuspallas, 1773 - Great Black-Headed Gull	1
Larusridibunduslinnaeus, 1766 - Common Black-Headed Gull	29
LarusCachinnans Pallas, 1811 – Caspian Gull	22
Laruscanuslinnaeus, 1758 – Common Gull	2
Sternahirundolinnaeus, 1758 – Coomon Tern	3
Ripariadiluta (Sharpeetwyatt, 1893) – Pale Swallow	50
DelichonUrbica (Linnaeus, 1758) – Common House Martin	10
Locusttelanaevia (Boddaert, 1783) - Eastern Grasshopper Warbler	2
Total	**25436**

From the post Torugart to the West Alongthe Highway

27. Representatives of birds of prey include Sparrow Hawk, Long-Legged Buzzard, Golden Eagle and Common Kestrel.

28. Birds of forest complex include Eastern Turtle Dove, Common Cuckoo, Isabelline Shrike, Golden Oriole, Rose-Colored Starling, Magpie, Common Redstart, Black Redstart, Blue-Throated Robin and Gray-Headed Goldfinch.

29. Synanthropic birds (settling in human buildings) include Hoopoe, Common Myna and House Sparrow.

30. Birds that live on screes and rocks include Rock Pigeon, Owlet, Black Swift, Pale Swallow, Rock Swallow, Rock, Killigrew, Alpine Chough, Raven, Himalayan Accentor, Guldenstadt's Redstart, Hodgson's Rosy Finch and Rock Bunting.

31. Species of steppe and meadow complex represented by the Masked Wagtail and Isabelline Wheatear.

32. The total number of observed birds was 307 as shown below. The dominant species is the Common Swift.

Table A.6: Species composition

Species Composition	**Number Of Specimens**
Accipiternisus (Linnaeus, 1758) – Sparrow Hawk	4
Buteorufinus (Cretzschmar, 1827) – Long-Legged Buzzard	5
Aquilachrysaetos (Linnaeus, 1758) – Golden Eagle	2
Falcotinnunculuslinnaeus, 1758, - Common Kestrel	12
ColumbaLivia Gmelin,1789 – Rock Pigeon	34
StreptopeliaOrientalis (Latham, 1790) – Eastern Turtle Dove	2
Cuculuscanoruslinnaeus, 1758 - Common Cuckoo	3
Ahtenenoctua (Scopoli, 1769) – Owlet	1
Apusapus (Linnaeus, 1758) - Common Swift	50
UpupaEpops Linnaeus, 1758 – Hoopoe	4
Ripariadiluta (Sharpeetwyatt, 1893) – Pale Swallow	27
PtyonoprogneRupestris (Scopoli, 1769) – Rock Swallow	5
DelichonUrbica (Linnaeus, 1758) – Common House Martin	22
Motacillapersonatagould, 1861 - Masked Wagtail	9
LaniusIsabellinusHemprich Et Ehrenberg, 1833 - Isabelline Shrike	9
Oriolusoriolus (Linnaeus, 1758) - Golden Oriole	1
Sturnusroseus (Linnaeus, 1758) – Rose-Colored Starling	5
Acridotherestristis (Linnaeus, 1766) – Common Myna	12
PicaPica (Linnaeus, 1758) - Magpie	4
PyrrhocoraxPyrrhocorax (Linnaeus, 1758) – Killigrew	17
Pyrrhocoraxgraculus (Linnaeus, 1766) - Alpine Chough	5
CorvusCorax Linnaeus, 1758 – Raven	19
Prunellahimalayana (Blyth, 1842) - Himalayan Accentor	4
Oenantheisabellina (Temminck, 1829) - Isabelline Wheatear	3
Phoenicurusphoenicurus (Linnaeus, 1758) - Common Redstart	5
Phoenicurusochruros (S. G. Gmelin, 1774) - Black Redstart	4
Phoenicuruserythrogaster (Guldenstadt, 1775) - Guldenstadt's Redstart	13
LusciniaSvecica (Linnaeus, 1758) – Blue-Throated Robin	1
PasserDomesticus (Linnaeus, 1758) – House Sparrow	5
Cardueliscanicepsvigors, 1931 - Gray-Headed Goldfinch	3
Leucostictenemoricola (Hodgson, 1836) - Hodgson's Rosy Finch	14
Emberizacialinnaeus, 1766 - Rock Bunting	2
Total	**307**

Along the Northern Shore of the Lake

33. Birds of water and mire complex included - Bar-Headed Goose, Sheld Duck, Pintail, Garganey, Greenshank, Fiddler, Terek Sandpiper and Common Black-Headed Gull.

34. Representatives of birds of prey were Long-Legged Buzzard, Golden Eagle, Lammergeyer, Black Vulture, Himalayan Vulture and Common Kestrel.

35. Species of steppe and meadow complex were represented by Horned Lark, Skylark, Tree Pipit, Rock Pipit, Stonechat, Isabelline Wheatear and Red-Winged Finch.

36. Birds that live on screes and rocks includedKilligrew, Rose-Colored Starling, Alpine Chough and Himalayan Crow Finch.

37. Birds of the forest complex included mainly the Blue-Throated Robin.

38. The total number of observed birds was 779 specimens as shown below. DominantspeciesistheHornedLark.

Table A.7: Species composition

Species Composition	Number Of Specimens
AnserIndicus (Latham, 1790) – Bar-Headed Goose	20
TadornaFerruginea (Pallas, 1764) – Sheld Duck	57
AnasAcuta Linnaeus, 1758 – Pintail	50
Anasquerquedulalinnaeus, 1758 - Garganey	2
ButeoRufinus (Cretzschmar, 1827) – Long-Legged Buzzard	1
AquilaChrysaetos (Linnaeus, 1758) – Golden Eagle	4
GypaetusBarbatus, (Linnaeus, 1758) – Lammergeier	1
Aegypiusmonachus (Linnaeus, 1766) - Black Vulture	2
Gypshimalayensishume, 1869 – Himalayan Vulture	1
Falcotinnunculuslinnaeus, 1758, - Common Kestrel	5
TringaNebularia (Gunnerus, 1767) – Greenshank	2
ActitisHypoleucos (Linnaeus, 1758) – Fiddler	2
XenusCinereus (Guldenstadt, 1775) – Terek Sandpiper	4
Larusridibunduslinnaeus, 1766 - Common Black-Headed Gull	12
UpupaEpops Linnaeus, 1758 – Hoopoe	2
Eremophilaalpestris (Linnaeus, 1758) – Horned Lark	490
AlaudaArvensis Linnaeus, 1758 - Skylark	5
AnthusTrivialis (Linnaeus, 1758) – Tree Pipit	5
Anthusspinoletta (Linnaeus, 1758) – Rock Pipit	1
Sturnusroseus (Linnaeus, 1758) – Rose-Colored Starling	7
PyrrhocoraxPyrrhocorax (Linnaeus, 1758) – Killigrew	39
Pyrrhocoraxgraculus (Linnaeus, 1766) - Alpine Chough	15
Saxicolatorquata (Linnaeus, 1766) - Stonechat	1
Oenantheisabellina (Temminck, 1829) - Isabelline Wheatear	26
LusciniaSvecica (Linnaeus, 1758) – Blue-Throated Robin	1
Rhodopechyssanguinea (Gould, 1838) Red-Winged Finch	2
Leucostictenemoricola (Hodgson, 1836) - Himalayan Crow Finch	22
Total	**779**

Over the Border Zone

39. Representatives of birds of prey included Long-Legged Buzzard, Lammergeier and Common Kestrel.Species of steppe and meadow complex are represented by Horned Lark, Skylark and Isabelline Wheatear.

40. Birds that live on screes and rocks were mainly ravens, while birds of the forest complex were mainly the MistleThrush.The total number of observed birds was 139 specimens as shown below. ThedominantspeciesistheHornedLark.

Table A.8: Species composition

Species Composition	Number Of Specimens
Buteorufinus (Cretzschmar, 1827) – Long-Legged Buzzard	1
GypaetusBarbatus, (Linnaeus, 1758) – Lammergeier	1
Falcotinnunculuslinnaeus, 1758, - Common Kestrel	2
Eremophilaalpestris (Linnaeus, 1758) – Horned Lark	113
AlaudaArvensis Linnaeus, 1758 - Skylark	1
CorvusCorax Linnaeus, 1758 – Raven	3
Oenantheisabellina (Temminck, 1829) - Isabelline Wheatear	14
TurdusViscivorus Linnaeus, 1758 - Mistle Thrush	2
Total	**139**

41. During the summer expedition, only 82 species were observed. The highest number recorded was on the east shore (25436 specimens). TheabsolutedominantspeciesistheSheldDuck.

42. It is necessary to carry out the spring-summer study on the population and nesting patterns of birds.It is required to build several artificial islands to increase the nesting capacity and improve the nesting sites of Bar-Headed Geese.

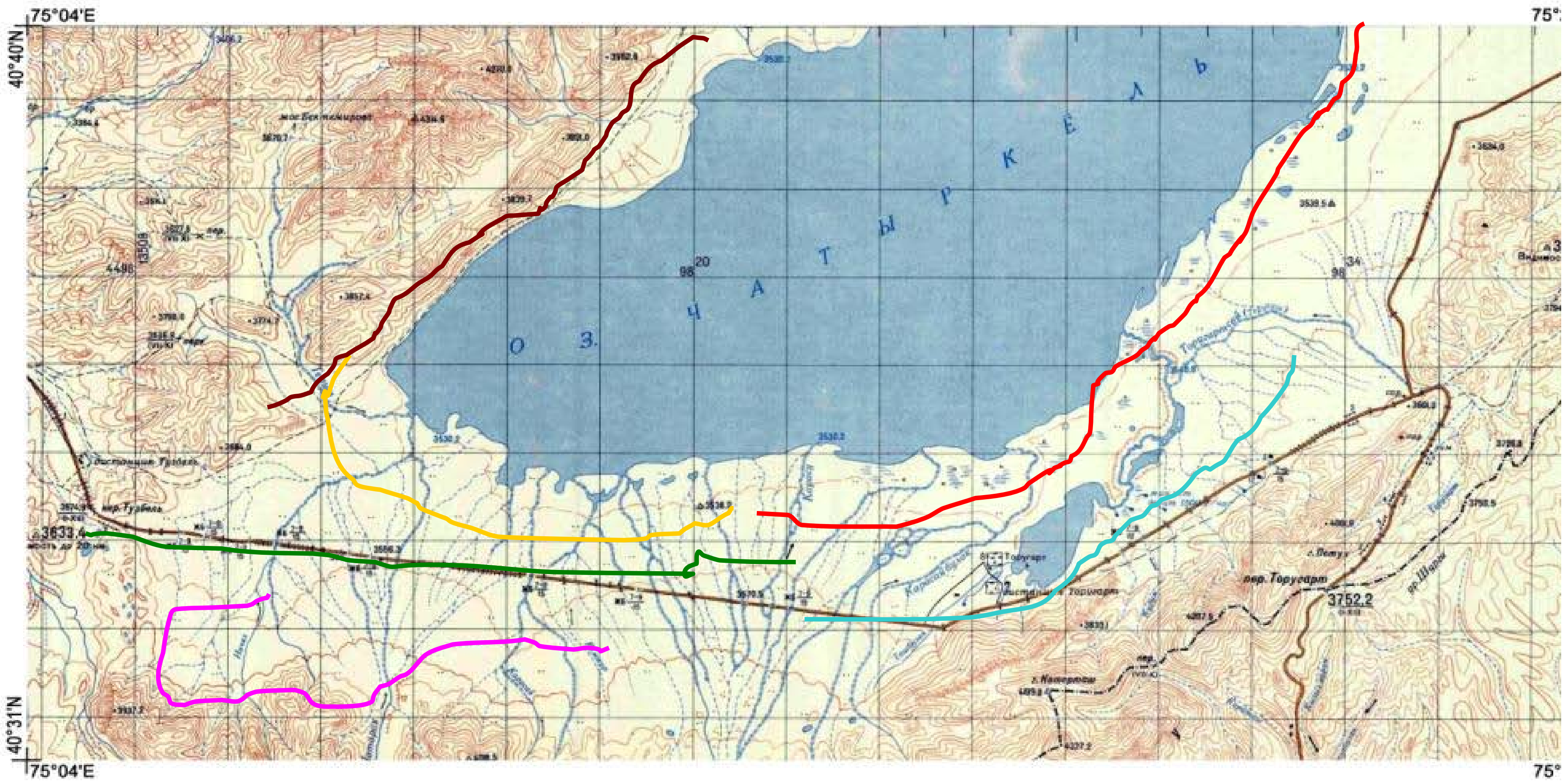
Swan on the west coast of ChatyrKullake

Ruddy Shelduck on the west coast.

Pochard on the west coast.

Teal whistler on the east coast

Scheme of the route of ornithological observations



Route № 1	Route № 5
Route № 2	
Route № 3	Route № 6
Route № 4	

Eagles Nestling on the northern shore of the lake

Flockofcranes

Egg mass of mallard duck

Juvenile Great-crested grebe and coot

Ruddy shelduck – the main habitant of Chatyr-Kullake

Coot

AdultGreat-crested

Mongoliandotterel

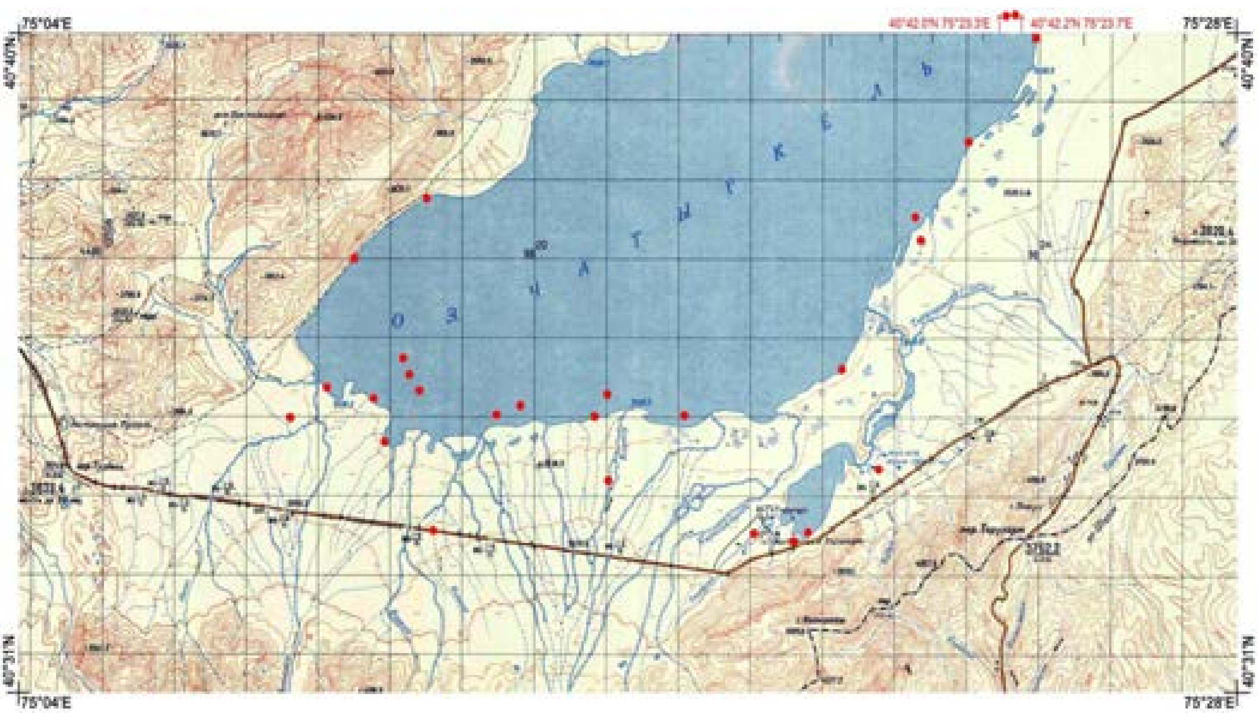
Flock of coots, Chatyr-Kullake

Hydrobiology

Locations of Sampling for the Hydro Biological Survey

Aquatic organisms sampling localities	N	E	Depth, m	Temperature (ºC) Depth-Surface
The Big Lake				
T.1	40º57'78"	75º22'33"	0.5	11.0ºC
T.2	40º57'86"	75º25'61"	2.2	12.0ºC
T.3	40º57'67"	75º28'74"	2.0	12.0ºC
T.4	40º57'67"	75º15'32"	0.5	9.5ºC
T.5	40º59'42"	75º19'36"	0.5	13.5ºC
T.6	40º58'68"	75º19'36"	2.3	12.5ºC
T.7	40º58'68"	75º19'56"	0.3	14.0ºC
T.8	40º58'13"	75º22'80"	1.7	6.0-12.0ºC
T.9	40º56'32"	75º26'14"	1.2	9.0-11.0ºC
T.10	40º70'30"	75º39'53"	0.7	14ºC
T.11	40º70'23"	75º39'37"	0.7	13ºC
T.13	40º70'05"	75º38'86"	1.1	13ºC
T.14	40º67'46"	75º40'41"	0.7	16ºC
T.15	40º67'23"	75º39'46"	0.2	17ºC
T.16	40º64'25"	75º37'98"	1.7	13ºC
T.17	40º62'23"	75º36'26"	2.0	12-14ºC
T.18	40º62'33"	75º35'80"	2.0	14.0ºC
Intermittent Water Bodies				
At a source of "Narzan"	40º56'94"	75º35'14"	9.7	15.0ºC
The Small Lake				
The Southern shore	40º55'22"	75º32'53"	1.5-1.8	16ºC

These data is used for the Map (below)



Lake Soils Characteristics and Aquatic Organisms

1. At all the locations of sampling, the predominant soils were grey carbonate clays with inclusions of ferromanganese nodules. Those had residuals of water vegetation (pondweed, water milfoil, filamentous alga) gammaruses and chironomids larvae. In the bottom samples there were orals of ostracods, shells of mollusks (presumably of the genus Cyclocalyx), vegetation fragments, live gammaruses and larvae of beetles that were often found. Only at the locations of the Kok-Aigyrriver inflow was the soil found to fine-grained sand with small pebbles admixed to grey carbonate clays.

2. In the Small Chatyr-Kul, grey carbonate clay with sand and rough detritis predominates. In addition, the southwest coast of the Big Chatyr-Kul is the most saline, especially in the shallow water basins.

3. The database analysis of the lake Chatyr-Kul data has shown that in the beginning and the middle of the last century, phytoplanktons, zooplanktons, fishery possibilities have been previously surveyed. Later on, surveys on zoobenthos, cabbageworms, and seed shrimps have been carried out. Up to now, 4 species of the higher aquatic plants, 43 species of the lowest seaweeds, 34 species of zooplankters, 5 species of larvae chironomids, 3 species cabbageworms, 2 species of mollusks and 24 species of seed shrimps have been found and documented in lake Chatyr-Kul.

4. The higher aquatic plants are represented by pondweeds *Potamogetonpectinalis*, buttercups *Ranunculus natans*, milfoils *Myriophilum* sp., and water milfoils *Ceratophylum sp*. In terms of chironomids, the most frequent in assays were three species: *Cironomusthummi*, *Tanytarsuslongipes*, and *Paratanytarsus sp*.

5. Eight species of backboneless animals have been found by Daday in zooplanktons,and rotifers (*Rotatoria*) have been found to be the dominant species. The crustaceans group is represented in the lake by planktonic cladoceras and copepodas. Nectobentos is represented by amphipodas*Gammarus sp*., and benthos – by seed shrimps, and larvae chironomids. A significant role in zooplanktons is played by rotifers *Polyarthratrigla* and *Keratellaquadrata*, cladoceras*Daphnia longispina*, *Daphnia pulex* and copepodas*Hemidiaptomusignatovi*, and *Arctodiaptomusbacillifer*.

6. Among zoobenthos, the predominant species were gammaruses (also called fresh-water shrimps). Of the mollusks, two species have been found: *OdhneripisidiumChatyrkulense* and *Cyclocalyx sp*.

Current Composition of Aquatic Organisms in the Surveyed Water Basins

7. The qualitative assessment of data conducted in the water basin in September 2011 has shown that since the winter had already come, many species had run into antibiosis (have formed latent eggs, cysts etc.). For a more comprehensive survey of the lake, a second phase of data collection should be carried out in the summer season where species diversity development can be observed. Up to now, organisms from planktonic and benthos assays have been sampled, their quantity in each assay counted up, and their specifics defined.

8. The higher aquatic plants are represented by the following species forming dense submarine thickets in shallow-water sites of the lake (at 2.5-8 meter depths):

- Potamogetonpectinatus L. (Pondweed),
- Myriophilumsp. (Milfoil),
- Ceratophylumsp. (Hornwort), and
- Ranunculusnatans L. (Buttercup).

9. The algal flora was found to be rich in species of several types including Chrysophyta, Chlorophyta, Cyanophyta, Bacillariophyta and mosses of the family Amblystegiacea.Of the phylum Chrisophyta, only one species was observed (Hydrurusfoetidus Kirchner).

10. The phylum Chlorophyta, on the other hand, is represented by 13 species including Pediastrumboryanum, Scenedesmuscurvatocornis, Ulothrixmoniliformis, Cladophoraglomerata, Spirogiracommunis, and Mougeotia sp.

11. Seven species were documented that are considered as rare in the mountain water basins of Central Asia. Those are Gloeocystisampla,Apiocystisbrauniana, Pediastrumovatum, Ulothrixaequalis, Cosmariumobtusatum, and Spirogyra inflate.

12. Of the phylum Cyanophyta, there were seven species found: Merismopediapunctata, Microcystispulverea, Gloeocapsaturgida, Sphaeronostockihlmani, Calothrixbrauni, Calothrixparietina, and Phormidiumambiguum.

13. The rich species' diversity is represented by the phylum Bacillariophita (23 species), of which Achnantheslinearis, Diploneismardinestriata, Naviculacari, Naviculalacustris, Navicularhynchocephala, Pinnularia borealis, Pinnulariaesox, Pinnulariarhombica are considered rare species. The group of eurysynusic species includes Diatomaelongatum, Naviculacincta, Cymbellaangustata, Cymbellaventricosa, Dentikulatenuis which are known to inhabit cold fresh water basins.

14. Of water mosses category, *Drepanocladius sp.*, *Hydrochypnum sp.*, and *Callergontugescens*were found.

15. Zooplankton populations are summarized in Table 22. As can be seen in the Table there are 2 types of invertebrates, 2 classes, 12 families, 22 genuses and 35 species.

Zooplankton Species Composition

Organisms	**Years of survey**			
	1906	**1960**	**1976**	**2011**
1				
Phylum Nemathelminthes-nematods				
Class Rotatoria -rotifers				
*Family*Synchaetidae				
GenusSynchaeta				
Synchaetapectinata	+	+	+	
*Family*Testudinellidae				
GenusTestudinella				
Testudinella patina	+	+	+	
*Family*Brachionidae				
GenusBrachionus				
Brachionusurceolaris		+		+
Br.quadridentatabrevispina		+		
GenusKeratella				
Keratellaquadrata	+	+	+	+
Keratellabrevispina		+	+	
Keratellatestudo		+	+	
Keratellavalga		+	+	
GenusNotholca				
Notholcastriata	+			+
Notholcalabis	+			
Notholcaacuminata		+	+	
*Family*Euchlanidae				
GenusEuchlanis				
Euchlanissp.			+	
*Family*Asplanchnidae				
GenusCephalodella				
Cephalodella sp.			+	
*Family*Lecanidae				
GenusLecane				
Lecane sp.			+	+
*Family*Colurellidae				
GenusLepadella				
Lepadella sp.				+

*Family*Trichotriidae				
GenusTrichocerca				
Trichocerca (Diurella) pocillum				+
GenusCeratium				
Ceratiumhirundinella		+	+	
Phylum Arthropoda – arthropods				
Class Crustacea				
*Family*Daphniidae				
Genus Daphnia				

Zooplankton Species Composition

Organisms	Years of survey			
	1906		**1906**	
D. (Ctenodaphnia) triguetra				+
D. (Daphnia) longispina (bunch of species)	+	+		+
Daphnia longispina caudate				
Daphnia longispina hyaline		+		
D. (Daphnia) pulexs.lat (bunch of species)			+	+
*Family*Chydoridae				
GenusAlona				
Alonaguttata		+	+	
Alonarectangularectangula			+	
Alonaweltneri			+	
GenusChydorus				
Chydorussphaericus		+	+	+
*Family*Macrothricidae				
GenusMacrothrix				
M.hirsuticornis			+	+
*Family*Diaptomidae				
GenusHemidiaptomus				
H. (Hemidiaptomus) ignatovi	+	+	+	+
GenusArctodiaptomus				
A. (Rhabdodiaptomus) bacillifer	+	+	+	+
GenusDiaptomus (Ch.)				
Diaptomus (Ch.) glacialis			+	
*Family*Cyclopidae				
GenusParacyclops				
Paracyclopsfimbriatus			+	
Genus Cyclops				
Cyclops strenuous (bunch of species)		+	+	+
GenusAcanthocyclops				
Acanthocyclopsviridis		+	+	+
Acanthocyclopsvernalis			+	+
GenusEucyclops Claus, 1893				
Eucyclopsserrulatus				+
Total species 35	**8**	**18**	**24**	**17**

16. In spite of the fact the data demonstrates an obvious increase in the numbers, many of species specified in earlier published sources were not observed under this study. This is especially true for classes such as rotifers. Between 1960 and 1976, their diversity totaled 14 species, whereas this study only revealed 6. This can probably be explained by the fact that sampling was performed in September (i.e., the time when many summer species have dropped out of the planktonic community). The majority of species areeurysynusic, and inhabit many mountain water basins of Pamir and Tien-Shan. No endemics or species peculiar only to lake Chatyr-Kul have been found.

17. The substantial volume of collected data has allowed studying carefully the bottom-dwelling invertebrates whose species composition is presented below. A total of 37 species of bottom-dwelling invertebrates were found. Those belong to phylums, four classes, eight families and 26 genuses. Species of class Insecta are de-biontic (i.e. inhabiting two habitats- Larvae of many hexapods inhabit aquatic environment, and the adult stages - imagos - in air). Worms, crustaceans and mollusks are included into communities of monobionts that are inhabitants of the aquatic environment only.

Species Composition Of Zoobenthos Of Lake Chatyr-Kul

Organisms	Years	
	2005	2011
Nematoda gen. sp.		+
Romanomermisrubzovi	+	+
Genus Gammarus		+
Syndiamesamonstrata		+
Diamesa sp.		+
Diamesapseudostilata		+
Vivicricotopusalbidus		+
Cricotopus sp.		+
Mesocricotopusthinemanni		+
Acricotopusluceus		+
Paracricotopus sp.		+
Parakiefferiellagracillima		+
Nanocladiusgr.parvus		+
Paraphaenocladius sp.		+
Chironomusthummi Kiefer	+	
Chironomusheterodentatus		+
Chironomusalbidus		+
Chironomusbehningii		+
Stictochironomuspictulus (Meigen)	+	
Genus Psectrocladius Thienemann,1918		
Psectrocladiusinaequalis (Kieffer,1926)		+
TanytarsuslongipesAchrorov	+	
Paratanytarsussiderophila		+
Paratanytarsusaustriacus		+
Paratanytarsus sp.	+	+
Psilotanypusimicola Kiefer	+	+
Lautrbornia sp.		+
Tipula(Sawenkia) cheethami		+
Atherix sp.		+
Dicranotabimaculata		+
Antochavitripennis		+
Ibisiamarginata		+
Helius sp.		+
Hexatoma sp.		+
Family Anthomyiidae gen? sp?		+
H.(Coelambus) enneagrammus		+
Cyclocalyxobtusalis		+
Total 37	**6**	**34**

18. Almost all species are eurysynusic, cold-water inhabited in various water basins. Only one species, mollusk Odneripisidiumchatyrkulense so far is known only as the inhabitant of lake Chatyr-Kul. To date, there are 46 known 46 species of water invertebratesinlakeChatyr-Kul.

19. In terms of the list of seed shrimps - Ostracoda - belonging to class Crustacea of phylum Arthropoda; the most recent data on Seed shrimps is form the year 2007. Research has identified 20 species belonging to four families and 16 genuses. Thelistcitedintheliteratureincludes:

FamilyIlyocyprididae

Genus Ilyocypris: I.cf.bradyiSars, I.cf.mongolicaSars (1903), I.cf.gibba (Ramdorf, 1808)

Family Candonidae

Genus Candona: C.candida (Muller, 1776)

Genus Fabaeformiscandona: F.caudata (Kaufmann, 1900)

Genus Neglectocandona: N.iliensis (Mandelstam, 1962)

Family Cyprididae

Genus Cypris: C.subglobosaSowerby, 1940

Genus Heterocypris: H.cf.incongruens (Ramdorf, 1808), H.cf.rotundata (Bronstein, 1928)

GenusEucyprinotus: E.rostratus (Sywula, 1865)

GenusCavernocypris: C.subterranean (Wolf, 1920)

GenusTonnacypris: T.convexDiebel et Pietrzenik, 1975, T.tonnensis (Dieb.et Piet.1975)

GenusTrajancypris: Trajancyprislaevis (Muller, 1900)

GenusStenocypria: Stenocypriasp.

GenusCypridopsis: Cypridopsissp

GenusPotamocypris: P.arcuata (Sars, 1903)

Family Limnocyteridae

Genus Frontocytherina: F.mosquensis (mosquensis (Negadaev, 1967)

Genus Limnocytere: L.inopinata (Baird, 1835)

GenusProlimnocythere: Prolimnocytheresp.

20. All the listed seed shrimp species by Shornikov E.I. (2007) were found alive. The majority of them are eurysynusic and eurythermal. Species such as C.subterranea, is cold-watered and can only be found in the Big Lake. Many thermophilic species inhabit warm waters, roadside pools and form diapausing stages at their drying in summertime.

21. Four species of Seed shrimps can be found In the central part of the Big Chatyr-Kul, an d another and four species can be found by the shores. In addition, there are 15 species - in the estuary parts of river Kok-Aigyr, and 15 species in the Small Chatyr-Kul.

22. In roadside pools with pondweed and filamentous alga, there are 9 species that can be found which are tolerant to contamination by combustion residuals of petroleum products (motor transport emissions). Of these nine species, F.mosquensis and L.inopinata are the most abundant.

23. The quantitative ratio of separate groups of organisms is presented in Table A.4.4, which shows that larvae chironomids form the greatest communities in the biota of the lake Chatyr-Kul. Samples from other localities (points) of the lake appeared empty, without zoobenthos organisms.

Quantitative Ratio Of Groups Of Organisms In Different Sites Of The Lake

Localities (points)	Groups of organisms				
	Freshwater shrimps	Larvae chironomids	Oligochaetes	Seed shrimps	Diaptomuses
1	55	129			38
2		79			1
3					
4	42	1			230
5	88	22			2
6					
7	77	100	3	10	5
8					
9	36	25	1		6
16	1	417	1		1
17					
The Small Lake	13		4	68	7
Intermittent water basins		42		23	10

Main Findings from Second Field Mission in the Summer of 2012

24. In August 2012, additional collections of aquatic vegetation (higher aquatic plants and algae), zooplanktons, and zoobenthos were carried out at the same locations described in the previous sections. A total of 20 samples were collected and analyzed for phytoplanktons and zooplanktons, and 22 samples for zoobenthos.

25. The results of treatment of materials on the higher plants and phytoplanktonwere not found to be significantly different from the 2011 results.

26. Three new species were found in the zooplanktons; Daphnia (Ctenodaphnia) Magna Straus, 1980, Daphnia (Daphnia) turbinataG.O.Sars, 1903, and Rotifer Asplanchna sp.

27. It should be noted that mass formations of latent eggs in the family of Daphniidae and egg laying in ephippiums were observed in the last days of August, which is associated with the onset of cold weather.

28. Six species of chironomid larvae were added to the list of zoobenthosorganisms.An amphipod species was named as Gammarusaliussp.nov, and given the status of "new species" by team member D.A. Sidorov, an expert of the Biology and Soil Institute of Far East Department of Russian Academy of Sciences. Gammarusalius is a characteristic component of zoobenthos of the lake. Among chironomid larvae found in 2012, the most numerous were the genera Chironomus and Corynoneura, indicating a significant content in organic matter of the soil.

29. Larvae and adults of the groups such as beetles, caddisflies, stoneflies, and Diptera (except chironomids) are very small and do not play a significant role in the formation of the structure and biomass of zoobenthos.Quantitatively, the mass groups in zoobenthos are gammarids and chironomid larvae were as presented below.

Table A.4.5: Quantitative Characterization of Groups OfZoobenthos

Groups Of Organisms	Northern Shore	Eastern Shore	Southern Shore	Small Lake
Worms	1		1	1
Gammarids		18	128	105
Ostracods			9	
Chironomid larvae	153	101	46	29
Total	**154**	**119**	**184**	**135**

Hydrobiologicalsurvey

The nature of wetland south coast

Mammals

1. This part of the survey was conducted in parallel with the data collection effort on Birds as described in the previous section. Within the expedition framework, between September 1-5, an inventory of mammals was carried out at 4 sections, for which data is presented below.

2. **Section 1:** From the mountain crossing of Tuz-Bel to the gamekeeper's cordon. The length of this section is 10 km, with the width of the assessment zone taken at 500 meters (250 meters on each side of the road). The total area of the assessment zone was 5 sq. km. On the south side, a total of 17 marmots were registered, while on the north side a total of 53. The average density of population per square kilometer is 21.2 on the north side, and on the south side nearly 6.8 species.

3. **Section 2:** From the Small Lake to the customs station. The length of this assessment section was 12 km, with a total width of 500 meters (250 meters on each side of the road). The total area of the assessment zone was 6 sq. km. On the north side, 38 marmots were registered, while 16 were registered on the south side. The corresponding densities per square kilometer were 12.6, and 5.3 species, respectively.

4. In order to assess the number of marmots outside the 250 meter boundary for the assessment zone, 2 more routes were laid on sections 3 and 4.

5. **Section 3:** this section extended from the mountain crossing Tuz-Bel, along the country road until the lake (where there is outcrop of rocks on the shore). The length of the route was 6.7 km with an average width of 350 meters (2.4 sq. km). A total of 63 marmots were, resulting in an average density of 25.2 marmots per sq. km.

Entomologic Inspection of Grey Marmots' Butans

6. **Section 4:** this section extends from the building of the former meteorological station to the lakeshore. The length of the route is 6 km over a width of 500 meters (total area - 3 sq. kilometers). A total 17 marmots was registered with an average density is 5.7 marmots per sq. km.

7. Thus, along a corridor that is 34.7 km in length, a total of 204 marmots were registered with fluctuations of an average density along the road between 5.3 to 21.2 marmots per sq. km. Within the reserve area, the average density of marmots ranged from 5.7 to 25.2 species per sq. km. Marmots' colonies in the assessment zone are distributed more or less in regular intervals and their regional distribution depends basically on proximity of groundwater.

8. Thus, in the zone adjoining the highway and on the reserve, 3 orders of mammals represented by 6 species have been established visually and by traces of life-sustaining activity. Thoseare:

Order Carnivora - Predatory

Genus VulpesFisch, 1775 - foxes

Vulpes V.) vulpes (Linnaeus, 1758) - ordinary fox

Order Rodentia - Gnawers

Marmotabaibacina (Kastschenko, 1889) - grey marmot badger

Allactaga (Orientallactaga) sibirica (Forster, 1778) - jerboa-jumper

Microtus (Stenocranius) gregalis (Pallas, 1779) - narrow-skulled vole

Ellobius (E.) tancrei (Blasius, 1884) – eastern mole lemming

Order Lagomorpha - Double-toothed rodents

Lepus (L.) capensis (Linnaeus, 1758) - jackrabbit

9. According to local residents, the mountains to the south of the road are inhabited by mountain goats - Capra ibex (Linnaeus, 1758)) and argali - Ovisammon (Linnaeus, 1758)). Other mammals inlcude wolves - Canis lupus (Linnaeus, 1758), and snow leopard - Unciauncia (Schreber, 1776). In recent times a brown bear - Ursus (U.) arctos (Linnaeus, 1758) inhabited in these mountains as well.

Table A.1: Number Of Gray Marmot On The Transect No. 1, With A Length Of 10 Km.

Km	The Left Side Of The Road		The Right Side Of The Road	
	Adults	Juveniles	Adults	Juveniles
1	2		5	3
2	6		1	
3	6			
4	1			
5	7			
6	6	2	3	
7	7			
8	7		6	
9	1			
10				
Subtotal	43	2	15	3
Total	**63**			

Table A.2: The Number Of Gray Marmot On The Transect No. 2, With A Length Of 7.7 Km

	adults	juveniles
	37	10
Total	47	

Table A.3: The Number Of Gray Marmot On The Transect No.3, With A Length Of 18 Km

Km	The Left Side Of The Road		The Right Side Of The Road	
	Adults	Juveniles	Adults	Juveniles
11	4		6	2
12	9	4	7	5
13	3	3	27	2
14	13	10	17	3
15	12	2	10	
16	23		21	2
17	15	5	8	5
18	7		3	2
19	2		1	
20	1			
21			9	3
22				
23	9	5	8	5
24	5		8	6
25	6		4	4
26	1			1
27	1	1	9	8
28	2	1	4	8

29	1	1	5	2
Subtotal	115	32	147	58
Total	353			

Table A.4: The Number Of Gray Marmot On The Transect No.4, With A Length Of 7.0 Km.

	Adults	Juveniles
	35	30
Total	65	

Roadside vegetation strongly etched with cattle and in the suppressed conditions

Young marmots at burrows.

Siberian jerboa

The coastal plain between the lake and the road. The habitat of Gray marmot, eastern mole voles, narrow-skulled voles and foxes.

Insects

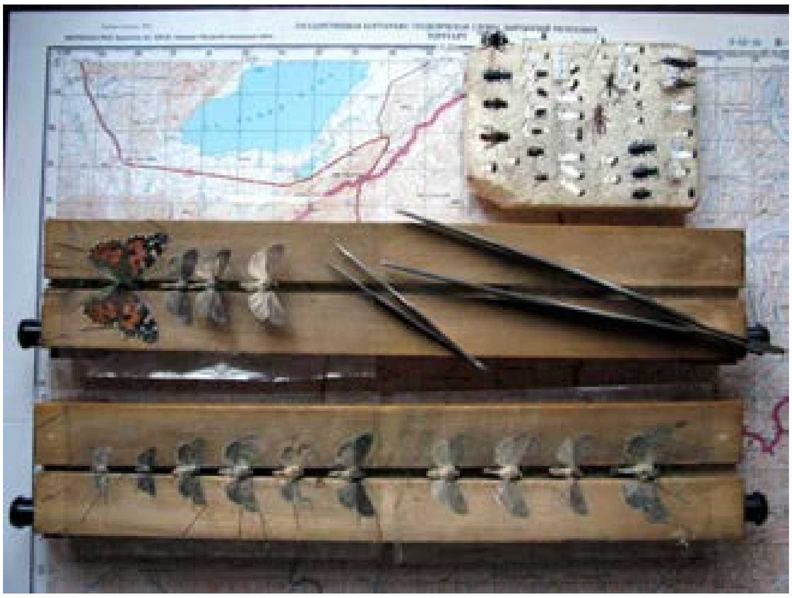
1. From "The list of taxons of arthropods needing special attention to their state, there are three species under the threat of extinction (unofficial data) of the family Pieridae). From the same list,it is possible to expect (by the analysis of biotopic preferences and availability of accessible habitats) the discovery of eight more populations of very rare and poorly studied species.

2. Those are: Neobufonariacostata (Emelyanov, 1963) (family Cicadellidae), CephalothripslongicapitusBorzykh, 1972 (family Thripidae), Oreodytesalpinus (Paykull, 1790) (family Dityscidae), ApterolomasillemiJeannel, 1935 (family Agyrtidae), Dasorgyiaselenophora (Staudinger, 1887) (family Lymantriidae), Acerbiaseitzi (A.Bang-Haas, 1910) (family Arctiidae), ApantelesstackelbergiTelenga, 1955 (family Braconidae), CercerismilkoiKazenas, 2000 (family Sphecidae).

Vanessa cardui (Linnaeus, 1758) ♀ (Eng.: Painted Lady, or Thistle Lady) from Nymphalidae type – the most visible specie of lepidopterous in Chatyr-Kul area, BNT road section

*Plotnikovialanigera*Umnov, 1930 subimago ♂ (Eng.: Plotnikovia Wingless Locust) from Acrididae type – the most vulnerable unique specie of entomofauna, Chatyr-Kul area, BNT road section

Cicindela (s. str.) granulataGebler, 1842 nom. ssp. ♂ (Eng.:Gebler's Black Tiger-beetle) fromCicindelidae – themostvisiblebeetle in Chatyrarea, BNT roadsection



Some entomological matherials, collected in Chatyr-Kul area, BNT road section

BORROW PIT MANAGEMENT PLAN

Bishkek-Torugart (BNT) Road Project 3, Km 479-539

1. INTRODUCTION

1. There are a total of 12 borrow pits for the Project road. The contractor has received approvals from the local authorities and the local ecology department and the State Agency for Environmental Protection and Forestry to utilize these pits. The contractor has also received approvals for spoils areas. The use of the 8 borrow pits from km 479-km 500 will be determined by MOTC and the Consultant. The use of the borrow pits from km 501-km 532 will be jointly determined with input from ADB, SAEPF, and the KJSR.

2. Discussed below are the 12 borrow pits with particular emphasis on those (4) that are in the sensitive zone in the Lake Chartyr Kul watershed area. The plan begins by describing the general locations of the 12 borrow pits and the general requirements to utilize them. The plan then focuses on the special measures required for opening, utilizing and then closing the 4 borrow pits between km 501 and 539. The goal of the plan is to ensure that these 4 pits do not negatively impact the Chartyr Kul watershed.

2. DESCRIPTION OF BORROW AREAS

3. Table 1 shows main characteristics of the 12 borrow pits. Eight borrow pits are outside of the Chartyr Kul watershed. All are relatively close to the road with the exception of #8, which is about 6 km from the road. (Note: the chainage shown for the borrow pits and spoil areas are based on the existing kilometer readings).

Table 1: Borrow Pit Characteristics

Number	Location (km) (L=left side of road to Torugart; R=right)	Volume to be Removed (m^3)	Dimensions (m x m)	Area (ha)	Distance from Road (m)
1	480+750 R	150,000	100 x 600	6	200
2	484+400 R	240,000	600 X 200	12	150
3	489+750 R	120,000	300 x 200	6	200
4	491+100 R	480,000	800 x 300	24	200
5	493+000 R	120,000	300 x 200	6	100
6	495+500 R	120,000	300 x 200	6	100
7	497+500 R	160,000	400 x 200	8	100
8	499+000 R	3,000,000	750 x 2,000	150	6,000
9	507+600 L	225,000	450 x 250	11.25	200
10	514+600 L	250,000	500 x 250	12.5	150
11	518+000 L	325,000	650 x 250	16.25	100
12	528+200 L	325,000	650 x 250	16.25	160

4. There are also 12 spoils areas that have been approved:

Km 479+400 R

Km 480+800 R

Km 483+800 R

Km 484+400 R

Km 487+700 R

Km 489+800 R

Km 491+100 R

Km 497+800 R

Km 502+800 L

Km 513+000 R

Km 534+550 R

Km 536+200 L

5. The spoils sites will have areas set aside for the topsoil that is removed from the borrow pits. Contaminated soil that can be cleaned will be stored in the spoils site at km 484+400. No contaminated soil will be stored at spoils sites from km 501-539. All contaminated soil will be located at the spoils site at km 484+400. Contaminated soil that cannot be cleaned will be taken to the At Bashy dump site that has been authorized to receive waste from the project. When contaminated soil is removed, the contractor and the engineer will have their environmental specialists present along with the local authorities to ensure that all processes and procedures are compliant. This will include accompanying the contaminated soil to the authorized dump site.

6. The basic requirements that the contractor will have to follow for the borrow pits are outlined in Table 2. Specific measures regarding the borrow pits from km 501-539 include requesting approval from the engineer before starting any work and the appointment of a special ecological team to monitor work in the borrow pits. Any new borrow pit opening requires prior site inspection in the presence of environmental specialist, as stated in the EMP, and a KJSR representative, as may be required.

7. Figure 1 is a map of all of the borrow pits and Table 4 shows borrow pit management measures for pits in km 479-500.

Table 2: Environmental Management Requirements for the Contractor for all Borrow Pits

#	Requirement
1	Before opening the pit, remove top soil from the top of the borrow area and the temporary road leading to it. Both the borrow area and the temporary road will be clearly delineated and contained using fencing that will be kept in good conditions and periodically maintained.
2	Stock pile top soil at the end border of the borrows area in heaps not more than 3 m in height. Such stockpiled topsoil shall be protected by tarp of other cover to prevent soil blown off by wind. In addition, the various grades of borrow material shall be sequences such that the coarser grades face the wind while the finer grades are protected by the coarser grades to prevent the transport of PM.
3	Make slope cuts at a ratio that ensures slope stability (e.g., 1:2).
4	Depth of cutting should be above water table and in any case should not be more than 2 m in depth in sensitive areas (water table depth in sensitive areas will be determined before opening the pit).
5	At all times, the contractor's special ecology team will be monitoring the operation, if any spillage is determined, it will directly be removed to a special spoil area and restored or transported to a disposal area outside the km 479-539 area. Any spillage areas will be immediately contained, delineated, and restored.
6	The contractor will appoint a special ecology team to control all work at all times in the km 500-539 sensitive zone; those teams will continuously inspect the various locations during working hours.
7	Truck fuelling will be done at the main camp and not in the km 501-539 area. Environmental requirements for vehicles fuelling and oil change shall be followed as stated in the EMP.
8	Oil changes will only be done at the main camp.
9	No trucks or equipment will be allowed beyond the end border of the borrow area.
10	Water tank truck will be used to spray water to control dust regularly depending on the weather and the wind intensity.
11	Before starting work in any borrow area in the km 500-539 sensitive zone, request will be submitted to Engineer for work approval.
12	After work in the borrow area is finsihed, a re-cultivation plan will be submitted to local authorities and the ecology department for approval. This will detail the types of sod to be used, their intensities, and layouts.
13	After completion of the re-cultivation according to the approved plan, commission of local authorities and the ecological department will check the work.
14	After approval of the work by the Engineer, top soil will be spread again on top of the re-cultivated borrow area according to the approved Plan and will be watered.

3. KM 501-539 BORROW PITS

8. The borrow pits from km 501-539 will require special attention beyond what is mentioned above. Table 3 indicates costs for these measures including the ecology team. In addition, a

supply of chemicals for potential spills will be kept at an environmental monitoring site that will be located in this area. Extra drainage will be added to protect against run-off into the lake(s).

9. All four of the borrow pits are located on the Chartyr Kul Lake side of the road. The one at km 528+200 is 1,380 m from a small lake that flows into Chartyr Kul. Special attention will have to be given to these borrow pits and how they are utilized in order to prevent any pollution of the lakes. The contractor will have to submit drainage and containment plans for approval before the pits can be opened.

Table 3: Cost for Opening and Restoring 5 Borrow Pits, km 501-539

Item	$
Cleaning and Grubbing	47,500
Documents for Approval	8,500
Ecology Team (1 engineer + 6 laborers) + pickup for 12 months	55,200
Chemical materials for spills	10,000
Extra Drainage 10 km (about 2 km per borrow pit)	341,250
Re-cultivation Plan and Approval	6,000
Re-cultivation	71,250
Sillt fencing	135,500
Total	675,200

10. The *Plotnikovia lanigera* (similar to a locust), a candidate to the KR Red Data Book, is a unique species; a representative of relic monotypic genus *Plotnikovia*, and endemic. It is found only in the Kyrgyz Republic and nowhere else in the world. Based on the survey results the only population is found in the area of the proposed borrow pit and spoils site at km 508+600, which includes the Chatarak River bed. Therefore, it is advised to fully prohibit any borrow works, spoils sites, operation of any equipment, and cattle grazing in this area. Therefore, this proposed pit has not been included in this plan.

11. Grey marmot populates the areas marked for the proposed borrow pits. According to zoological surveys several colonies of grey marmot were found in the areas of the proposed borrow pits. There is a great probability that such colonies can be destroyed. During civil works these animals, due to their biological behavioral pattern, will seek refuge deep in their holes, and this would surely kill them. In order to avoid destruction of the endangered colonies, zoologists suggest carrying out proper activities for their resettlement to safer areas with the purpose to preserve populations of grey marmot. Re-location of the marmot populations will be

undertaken by the contractor under the direction of SAEPF/KJSR/Consultant/zoologists. It is proposed to relocate the marmots in a suitable area between km 479 and 500.

12. Installation of noise barriers to protect biodiversity is not required. Birds and animals have already adapted to the specific noise from the road and machinery for many years of its operation, as stated in the EIA. It is identified that such noise itself does not appear as a critical impact. On the contrary, installation of noise barriers in this area to protect bird nesting locations, for example, will reduce visibility and may serve as an improved ambush site for traditional predators. However, noise impacts will be monitored and if it is found that species are being adversely affected, then appropriate mitigation measures including sound blankets, etc will be implemented.

13. One of the key issues will be the proper restoration and re-cultivation of the borrow pits. Soils are fragile in this environment and re-grading will have to be done in such a manner as to prevent erosion.

14. All 4 of the borrow pits will be allowed to be opened simultaneously. This is because of the short construction season (4-5 months) and the fact that borrow pits have different characteristics and thus the material is used for different pavement layers (e,g, fill, sub-grade, sub-base, etc). Thus, to complete the section, several pits have to be opened simultaneously. However, the pits will be immediately re-cultivated following the completion of works in the section.

15. In addition to the environmental management requirements for the contractor shown in Table 2 for all borrow pits, the following measures for the borrow pits in the km 501-539 zone will be undertaken:

Borrow pit opening:

- Requires visual site inspection by the Contractor together with SAEPF/KJSR/Consultant/scientists (as necessary) to ensure that no rare or endangered species are populating the proposed borrow and spoils areas;
- Requires visual site inspection by the Contractor together with SAEPF/KJSR/Consultant to identify areas where the fertile topsoil shall be preserved;
- The same is required to the access roads to the borrow pits to make sure that vehicles/trucks commute on the barren land;
- The removed fertile topsoil shall be removed from these areas and stored properly in plies. The height of the pile shall not be any higher than 3 meters to prevent soil compaction and degradation;
- It is preferred to protect/cover such removed topsoil from weathering out/dust emissions;
- Such removed topsoil bulk shall be used during the re-cultivation upon the works completion;

- The Contractor will place signs along the road stating that km 501-530 is a no stopping zone for trucks and other vehicles that will be enforced with assistance from the Police post at km 531;
- Requires visual site inspection by Contractor together with SAEPF/KJSR/Consultant to identify areas populated by grey marmot and together with biodiversity specialists undertake to resettle affected colonies to safer areas;
- Requires visual site inspection by Contractor together with SAEPF/KJSR/Consultant to identify areas populated by 5-toed gerboas (a Red Data Book species) and together with biodiversity specialists undertake to resettle affected colonies to safer areas;
- Requires visual site inspection by Contractor together with SAEPF/KJSR/Consultant to identify areas of nesting birds (horned lark) to make necessary adjustments to the borrow pit operations; and
- Undertake necessary engineering activities to fully exclude any contamination of river beds and creeks.

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Borrow pits operation:

- The Contractor undertakes to operate duly maintained machinery (dozers, trucks, excavators) to avoid any possible oil/petroleum spills;
- No oil change/fuelling or maintenance shall be allowed within the borrow pit areas. All such works shall be done only in the designed areas of the camp site;
- In case of any oil/petroleum products spillage the Contractor shall immediately apply measures for the spills neutralization/removal from the site;
- The Contractor undertakes to implement necessary dust control measures. Only water con be used for sprinkling; no oil shall be allowed for use in any proportions;
- The Contractor undertakes reasonable measures to visually monitor any possible ground water outcrops and not to excavate earth any deeper than 2 meters;
- The Contractor shall undertake to avoid operating machinery/equipment anywhere beyond the northern boundaries of the borrow pits located between the road and the lake(s); and
- Submit monthly reports on the borrow pits that are verified by SAEPF/KJSR/Consultant.

Borrow pits closure:

- Immediately upon the earthworks completion the Contractor shall re-cultivate the borrow pit as required by the borrow pit re-cultivation Plan;
- In the presence of SAEPF/KJSR/Consultant identify locations and areas for the fertile topsoil to spread;
- Proceed with the standard contractual procedures for official borrow pit closure and commissioning;

- No borrow pit can be commissioned unless properly re-cultivated and dressed back with the fertile topsoil; and
- SAEPF/KJSR/Consultant must approve the re-cultivation and commissioning.

16. The borrow pit management measures for pits in the km 501-539 zone are shown in Tables 5-8 and sketches of the pits are shown in Figures 2-5. The tables also indicate the location of each borrow pit in terms of distance from the lake.

17. The borrow pit at km 528+200 includes a dry stream that has some water flow during the rainy season, and the stream flows into the small lake. As noted, it is 1,380m from the small lake. Extra drainage and erosion control measures will be included for this pit. Figure 6 shows the drainage plan for this pit. Embankments were evaluated as a means to control erosion but the gravel silt berm (see below) is the recommended alternative. Soil erosion is considered unlikely to occur at this site but it will be closely monitored and further preventive measures will be undertaken if it begins to happen. The Contractor will be closely monitored to ensure that equipment operate only in the pit and on the 160m access road.

18. Figure 7 shows a generic drainage plan that will be used for borrow pits in the km 501-539 zone. The plan also includes sumps or settling ponds to ensure that there will be no run-off into the lake(s).

19. Figures 8 and 9 show two alternative silt fences. Figure 8 is based on using wire. The advantage of using this material is that it is a more secure structure that may require less maintenance. Figure 9 is based on using gravel berms. The advantages for using gravel include: 1) it is more effective in controlling silt particles that could easily blow through the wire fence; 2) it will cause less damage to birds and small mammals that could be trapped in the wire; and 3) if large pastoral animals damage it, it can be quickly restored. Based on these reasons, the gravel fencing is recommended. The wire fencing would cost $196,000 compared to $135,500 for the gravel.

Figure 1: Map of Borrow Pits, km 479-539

(Restricted area: 2 km land from the lake shore, including prohibited zone width of 1km, and additional buffer zone width of 1km)

Table 4: Borrow Pit Management Measures for km 479-500

ITEM	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY
Air	Exhaust fumes from equipment.	Equipment is properly maintained and operated to reduce emissions. Idle times minimized.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Water	Contamination from spills and run-off from pits.	Contaminated soil removed; construction of temporary containment berms and/or sediment ponds to control run-off if necessary.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Dust	Decreased air quality affecting flora and fauna.	Water is sprayed to control dust.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Noise and vibration	Impacts on flora and fauna.	Equipment is properly maintained and operated to reduce impacts.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Soils	Erosion. Contamination from spills. Disturbance by equipment.	Cut of slopes at maximum ratio of 1:2. Contaminated soil removed. Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Excavation	Loss of topsoil.	Topsoil is removed and stored at a proper site.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.

Drainage	Possible flooding and erosion.	Drains and culverts kept cleared. Drainage (including berms) for borrow areas constructed and maintained as necessary.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Waste	Pollution of environment.	All waste materials collected and taken to approved dump site.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Spills and pollutants	Contamination of soil and water.	Maintain equipment properly; clean and/or remove contaminated soil; maintain supply of absorbent/detoxifying materials.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Flora	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Fauna	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.
Restoration	Loss of habitat.	Topsoil is returned to re-graded area and re-vegetated.	Contractor and monitoring by Engineer and MOTC. Contractor will monitor every 2 days; Engineer twice per week.

:

Table 5: Borrow Pit Management for km 507+600

Location: lake side of the road; 3,120m from Lake Chartyr Kul.

ITEM	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY
Air	Exhaust fumes from equipment.	Equipment is properly maintained and operated to reduce emissions. Idle times minimized.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Water	Contamination from spills and run-off from pits.	Contaminated soil removed; construction of temporary containment berms and/or sediment ponds to control run-off if necessary.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Dust	Decreased air quality affecting flora and fauna.	Water is sprayed to control dust and borrow materials stacked with the coarser grades facing eth prevailing direction of wind directly.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Noise and vibration	Impacts on flora and fauna.	Equipment is properly maintained and operated to reduce impacts.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Soils	Erosion. Contamination from spills. Disturbance by equipment.	Cut of slopes at maximum ratio of 1:2. Contaminated soil removed. Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Erosion Control	Erosion and sediment transport	A gravel silt bermwill be used to delineate the borrow pit area and the access road leading to it. This will be regularly cleaned, and tightened to ensure it entraps any eroded soil. It is preferred that straw bales be also used behind the silt fence on the outer perimeter of the area	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.

Excavation	Loss of topsoil.	Topsoil is removed and stored at a proper site.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Drainage	Possible flooding and erosion.	Drains and culverts kept cleared and rip rapped Drainage (including berms) for borrow areas constructed and maintained as necessary.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Waste	Pollution of environment.	All waste materials collected and taken to approved dump site.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Spills and pollutants	Contamination of soil and water.	Maintain equipment properly; clean and/or remove contaminated soil; maintain supply of absorbent/detoxifying materials.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Flora	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Fauna	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Restoration	Loss of habitat.	Topsoil is returned to re-graded area and re-vegetated.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.

Figure 2: Layout of Borrow Pit at km 507+600

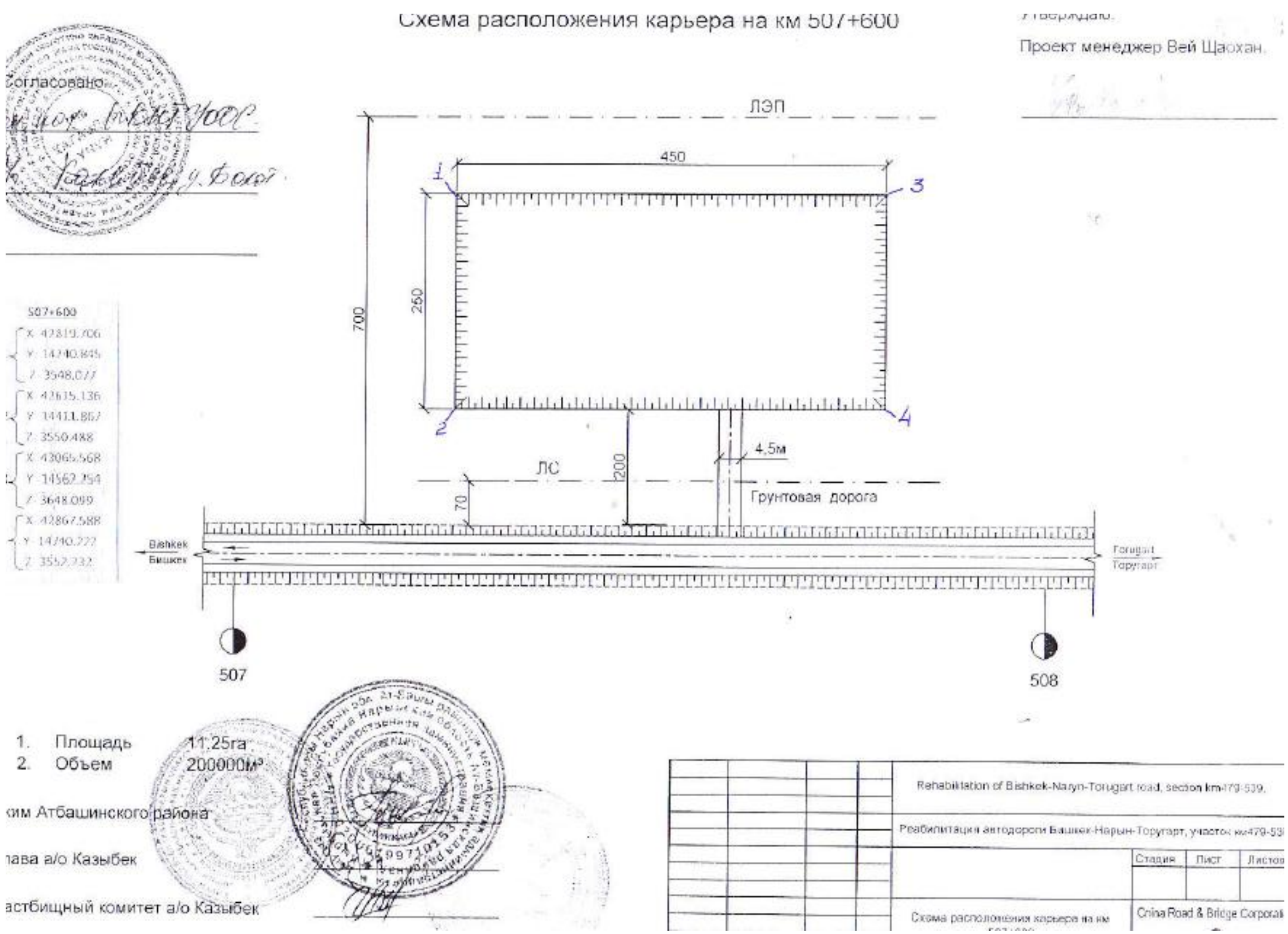


Table 6: Borrow Pit Management for km 514+600

Location: lake side of the road; 2,340 m from Lake Chartyr Kul.

ITEM	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY
Air	Exhaust fumes from equipment.	Equipment is properly maintained and operated to reduce emissions. Idle times minimized.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Water	Contamination from spills and run-off from pits.	Contaminated soil removed; construction of temporary containment berms and/or sediment ponds to control run-off if necessary.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Dust	Decreased air quality affecting flora and fauna.	Water is sprayed to control dust and borrow materials stacked with the coarser grades facing eth prevailing direction of wind directly.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Noise and vibration	Impacts on flora and fauna.	Equipment is properly maintained and operated to reduce impacts.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Soils	Erosion. Contamination from spills. Disturbance by equipment.	Cut of slopes at maximum ratio of 1:2. Contaminated soil removed. Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Erosion Control	Erosion and sediment transport	A gravel silt berm will be used to delineate the borrow pit area and the access road leading to it. This will be regularly cleaned, and tightened to ensure it entraps any eroded soil. It is preferred that straw bales be also used behind the silt fence on the outer perimeter of the area	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.

Excavation	Loss of topsoil.	Topsoil is removed and stored at a proper site.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Drainage	Possible flooding and erosion.	Drains and culverts kept cleared and rip rapped Drainage (including berms) for borrow areas constructed and maintained as necessary.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Waste	Pollution of environment.	All waste materials collected and taken to approved dump site.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Spills and pollutants	Contamination of soil and water.	Maintain equipment properly; clean and/or remove contaminated soil; maintain supply of absorbent/detoxifying materials.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Flora	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Fauna	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Restoration	Loss of habitat.	Topsoil is returned to re-graded area and re-vegetated.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.

Figure 3: Layout of Borrow Pit at km 514+600

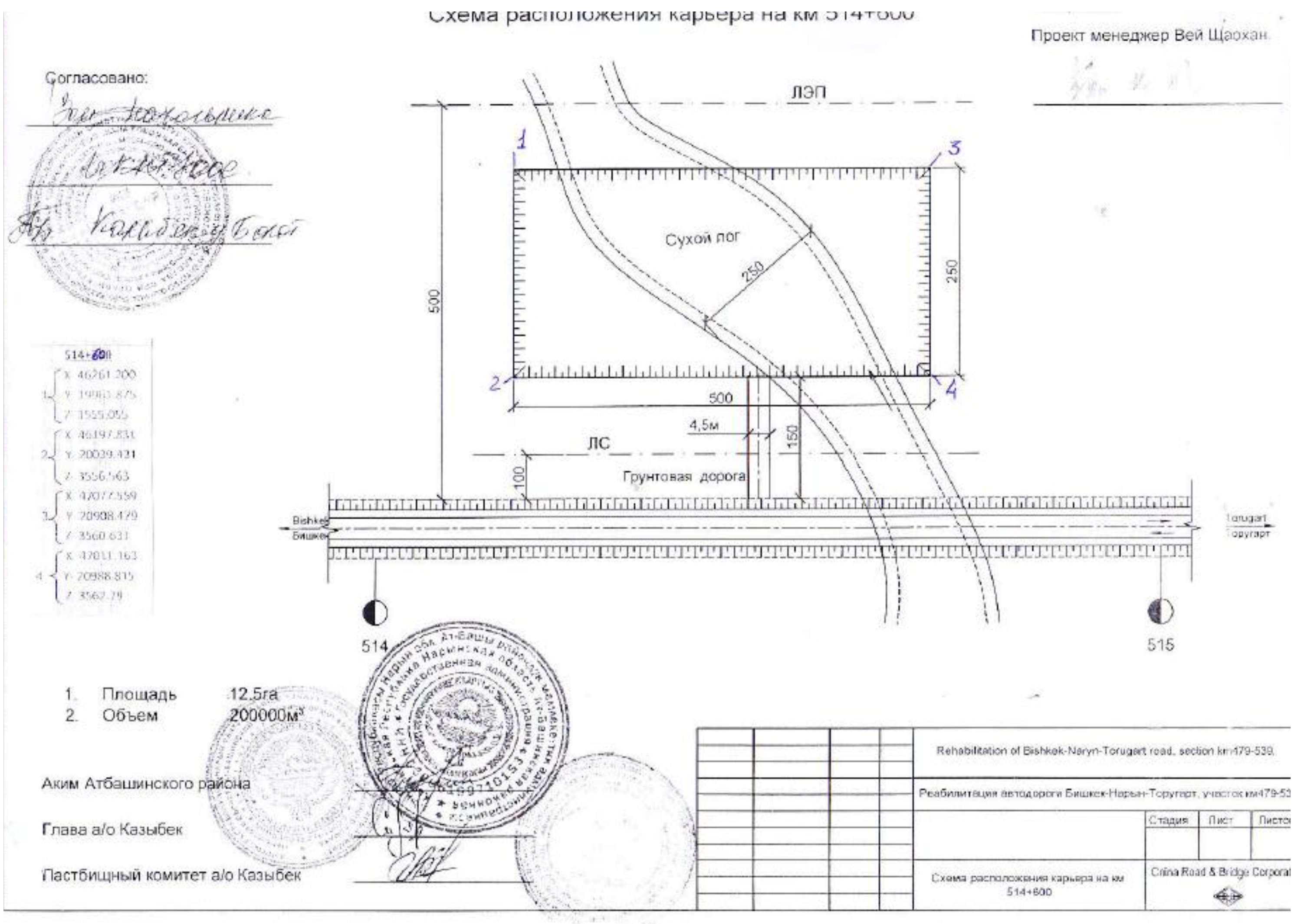


Table 7: Borrow Pit Management for km 518+000

Location: lake side of the road; 3,020m from Lake Chartyr Kul.

ITEM	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY
Air	Exhaust fumes from equipment.	Equipment is properly maintained and operated to reduce emissions. Idle times minimized.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Water	Contamination from spills and run-off from pits.	Contaminated soil removed; construction of temporary containment berms and/or sediment ponds to control run-off if necessary.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Dust	Decreased air quality affecting flora and fauna.	Water is sprayed to control dust and borrow materials stacked with the coarser grades facing eth prevailing direction of wind directly.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Noise and vibration	Impacts on flora and fauna.	Equipment is properly maintained and operated to reduce impacts.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Soils	Erosion. Contamination from spills. Disturbance by equipment.	Cut of slopes at maximum ratio of 1:2. Contaminated soil removed. Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Erosion Control	Erosion and sediment transport	A gravel silt berm will be used to delineate the borrow pit area and the access road leading to it. This will be regularly cleaned, and tightened to ensure it entraps any eroded soil. It is preferred that straw bales be also used behind the silt fence on the outer perimeter of the area	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.

Excavation	Loss of topsoil.	Topsoil is removed and stored at a proper site.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Drainage	Possible flooding and erosion.	Drains and culverts kept cleared and rip rapped Drainage (including berms) for borrow areas constructed and maintained as necessary.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Waste	Pollution of environment.	All waste materials collected and taken to approved dump site.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Spills and pollutants	Contamination of soil and water.	Maintain equipment properly; clean and/or remove contaminated soil; maintain supply of absorbent/detoxifying materials.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Flora	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Fauna	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Restoration	Loss of habitat.	Topsoil is returned to re-graded area and re-vegetated.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.

Figure 4: Layout of Borrow Pit at km 518+000

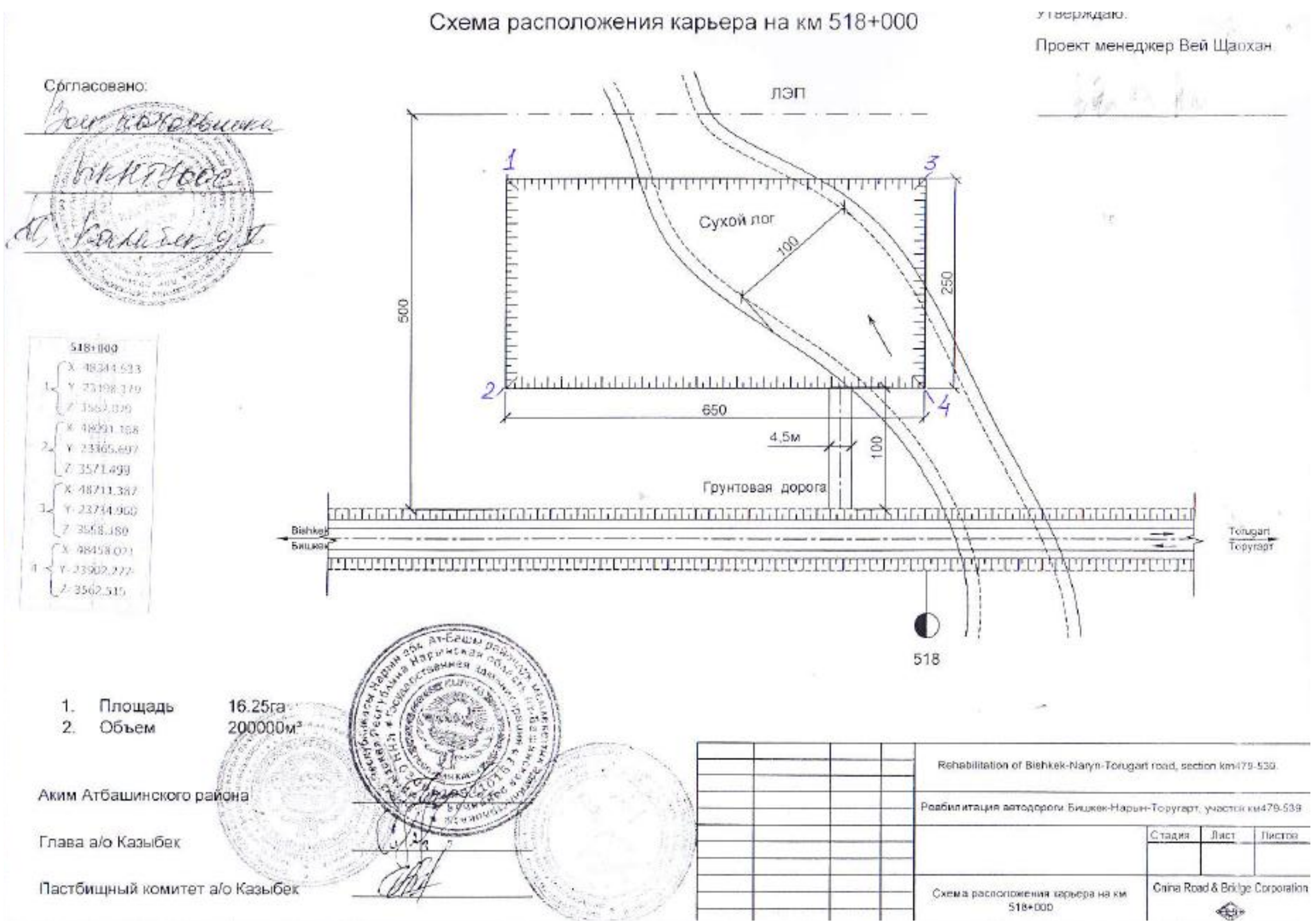


Table 8: Borrow Pit Management for km 528+200

Location: lake side of the road; 3,410m from Lake Chartyr Kul and 1,380m from small lake that flows into Lake Chartyr Kul.

ITEM	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY
Air	Exhaust fumes from equipment.	Equipment is properly maintained and operated to reduce emissions. Idle times minimized.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Water	Contamination from spills and run-off from pits.	Contaminated soil removed; construction of temporary containment berms and/or sediment ponds to control run-off if necessary.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Dust	Decreased air quality affecting flora and fauna.	Water is sprayed to control dust and borrow materials stacked with the coarser grades facing eth prevailing direction of wind directly.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Noise and vibration	Impacts on flora and fauna.	Equipment is properly maintained and operated to reduce impacts.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Soils	Erosion. Contamination from spills. Disturbance by equipment.	Cut of slopes at maximum ratio of 1:2. Contaminated soil removed. Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Erosion Control	Erosion and sediment transport	A gravel silt berm will be used to delineate the borrow pit area and the access road leading to it. This will be regularly cleaned, and tightened to ensure it entraps any eroded soil. It is preferred that straw bales be also used behind the silt fence on the outer perimeter of the area. Downstream areas will be closely monitored to	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.

		ensure that erosion is not occurring.	
Excavation	Loss of topsoil.	Topsoil is removed and stored at a proper site.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Drainage	Possible flooding and erosion.	Drains and culverts kept cleared and rip rapped Drainage (including berms) for borrow areas constructed and maintained as necessary.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Waste	Pollution of environment.	All waste materials collected and taken to approved dump site.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Spills and pollutants	Contamination of soil and water.	Maintain equipment properly; clean and/or remove contaminated soil; maintain supply of absorbent/detoxifying materials.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Flora	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Fauna	Decrease of population and disturbance of habitat.	Equipment is operated only in designated areas and on access roads.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.
Restoration	Loss of habitat.	Topsoil is returned to re-graded area and re-vegetated.	Contractor and monitoring by Engineer and MOTC. Contractor and Engineer will monitor daily.

Figure 5: Layout of Borrow Pit at km 528+200

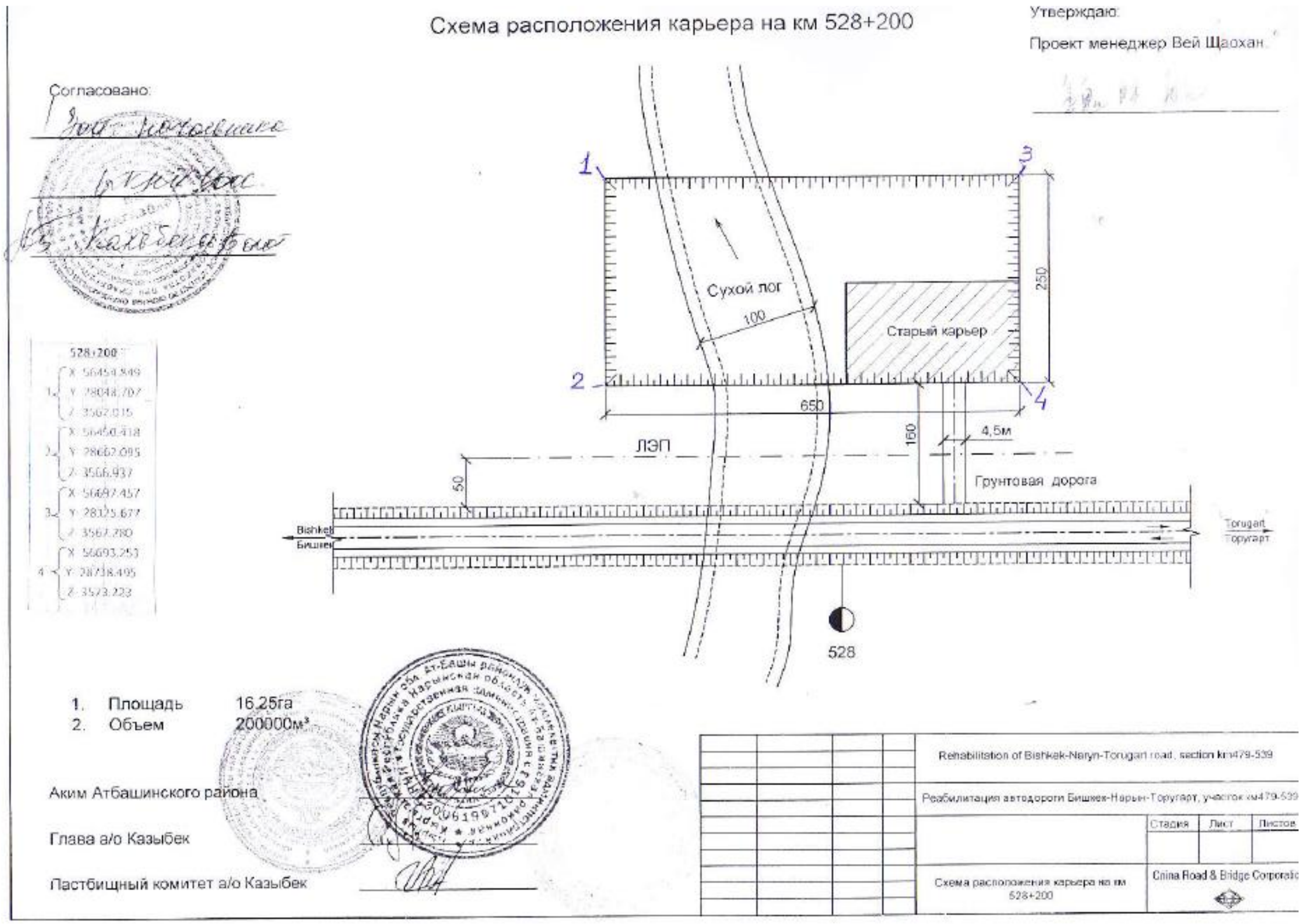


Figure 6: Drainage Plan for Borrow Pits, km 528+200

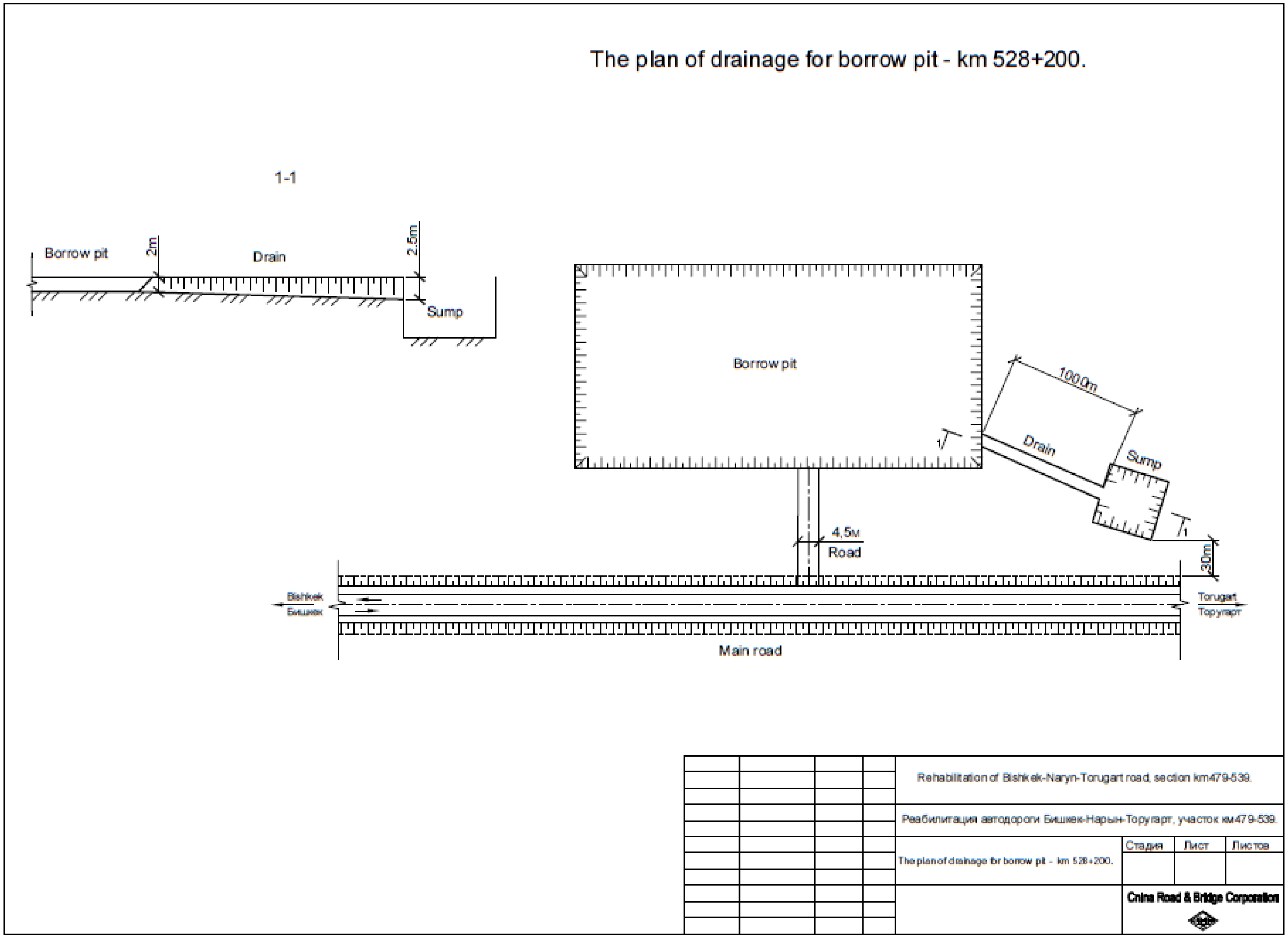


Figure 7: Drainage Plan for Borrow Pits, km 501-539

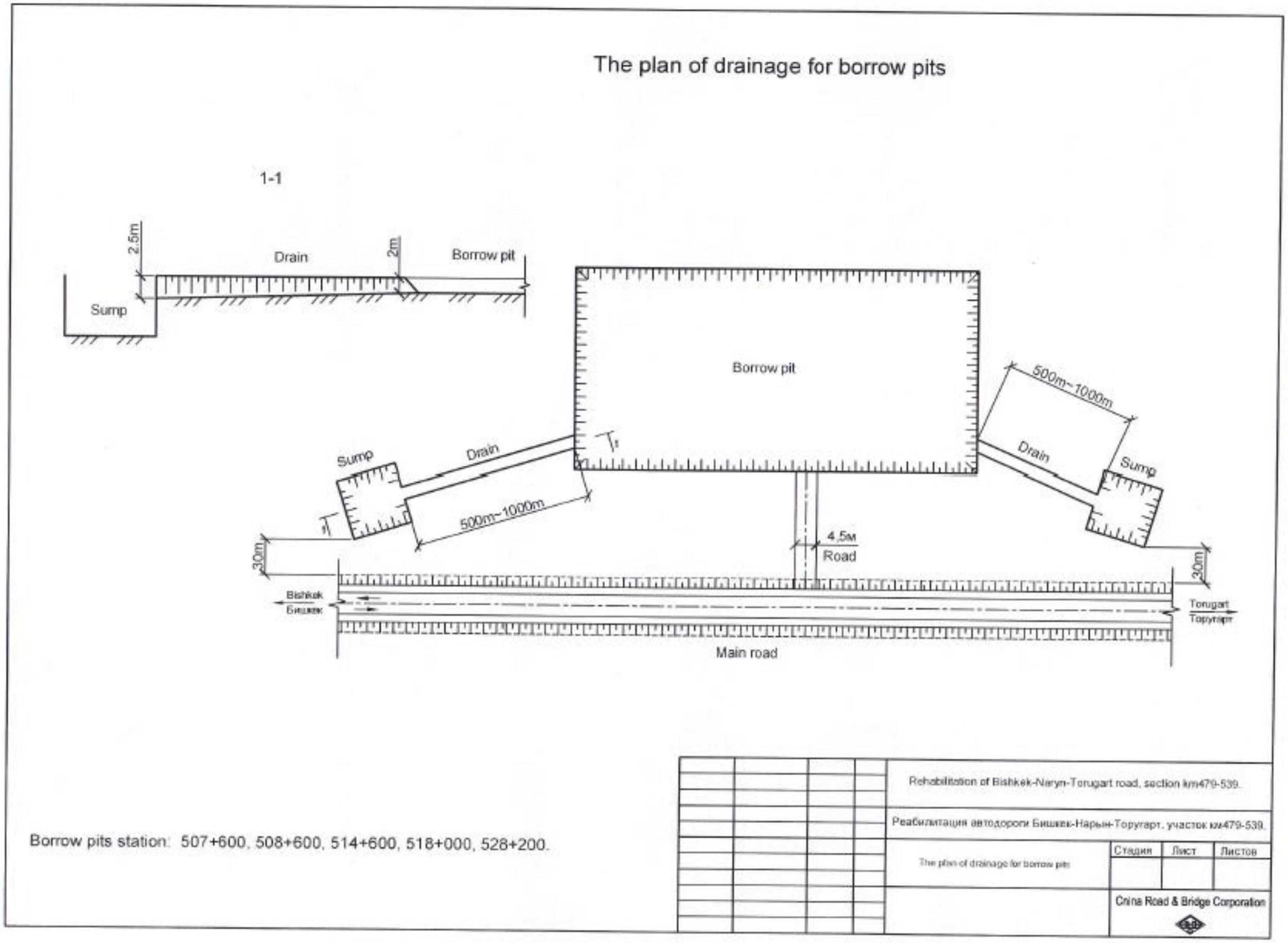


Figure 8: Silt Fence Plan Using Wire for Borrow Pits, km 501-539

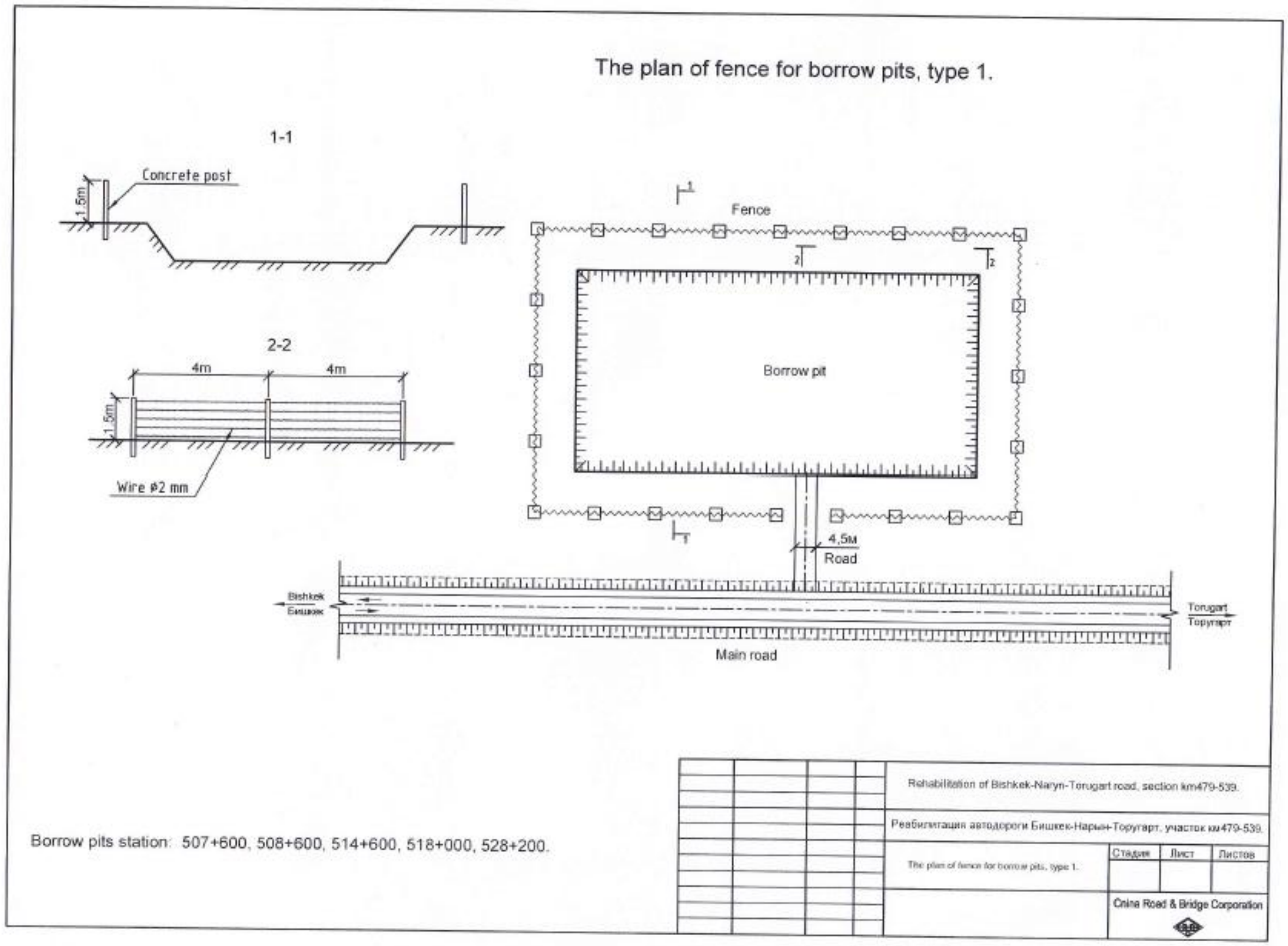
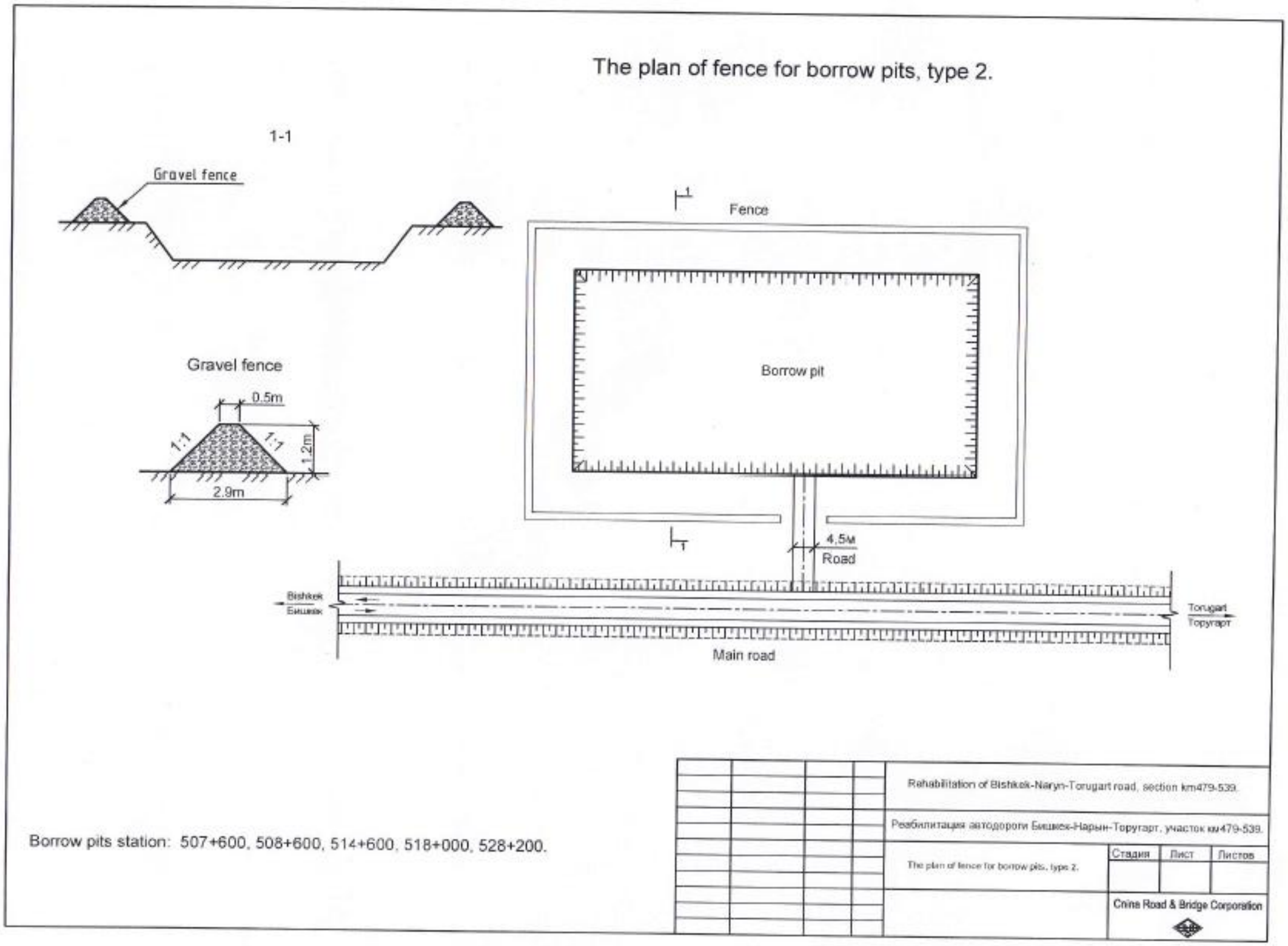


Figure 9: Silt Fence Plan Using Gravel for Borrow Pits, km 501-539



Appendix 10

«About Grievance Consideration Group »

In order to ensure a coherent interaction of IPIG MOTC KR with local organizations and civil society, and timely consideration of the grievances and statements of citizens, who has direct or indirect influence from Bishkek-Torugart rehabilitation project (third project) km 479 – km 539 sections, **Followings are ordered:**

1. To form a group who will consider with grievances and statements of citizens, becomes during implementation process of Bishkek-Torugart Rehabilitation Project (third project) km 479 – km 539 sections, with consideration of complaints and statements:

1.1. At the local level:

- Oserov I., Deputy Resident Engineer ar construction area;
- Abylov K., Chief of the Road Maintenance Unit 957;
- Not less then 3 representatives of the persons affected by the project, (as may be agreed);
- Village administration representatives;
- Ombutsmen representatives at Naryn oblast (as may be agreed);

1.2. At the central level:

- Mamaev K., Director IPIG MOTC KR;
- Satybaldiev P., Regional Coordinator IPIG MOTC KR;
- Keldibaeva S., Protective Measures Specialist IPIG MOTC KR;
- Abdygulov A., Environmental Protection Specialist IPIG MOTC KR.

2. Establish that:

2.1 All grievances and statements of citizens becomes during implementation process of Bishkek-Torugart Rehabilitation Project (third project) km 479 – km 539 sections, will be considered in the following order:

- at the local level, within 15 working days with decision-making;
- at the central level, within 15 working days with decision-making.

3. Ensure Grievances Consideration Group with timely consideration and appropriate solutions following the results of the considered grievances and statements at construction area km 479 - 539 km, according to Item 2 of this Order.

4. To Appoint Oserov I., Deputy Resident Engineer at construction area, as Local Authorized Person, who will provide interaction and contact between residents of the project surrounding areas, MOTC KR, Contractors «China Road and Bridge Corporation », Consulting Company «TERA International Group Inc.», head of local authorities, village administrations and NGO.

5. To appoint Beksultanov M. – Inspector, representative of «TERA International Group Inc.», as Deputy of Local Authorized Person.

6. To appoint Mamaev K. Director IPIG MOTC KR, as person who responsible to ensure Control over the implementation of this Order.

Minister **К. Sultanov**

MINISTRY OF HEALTH OF THE KYRGYZ REPUBLIC
DEPARTMENT OF STATE SANITARY AND EPIDEMIOLOGICAL SURVEILLANCE
ACCREDITED DEPARTMENT OF CHEMICAL AND ANALYTICAL RESEARCH
Address: 720033, 535 Frunze Str., Bishkek
Telephone: (996312) 32-32-08

CERTIFICATE
Laboratory studies of water

No.49 as of May 07, 2012
Applicant: Department of the sanitary and epidemiological expertise and services, direction No.1814
Name of water source: water from the lake Kosh-Kol
Date and time of sampling: 24.04.2012, 11h. 10 min 40º33'36,6"
Date of receipt of the sample: 25.04.2012 075º20'04,1"
Date of testing: from April 25, 2012 to May 07, 2012

Parameters to be determined	Testing results	ND for testing methods
Hydrogen index, pH	7,00	GOST R 51232098
Turbidity, mg/dm^3	4,5±1,0	Collection of standardized methods for water analysis
Ammonia (NH_4), mg/dm^3	<0,05	
Nitrites (NO_2), mg/dm^3	0,03±0,01	
Nitrates (NO_3), mg/dm^3	1,4±0,2	
Hardness, º	8,4±1,3	
Solid residuals, mg/dm^3	848,0±84,8	
Chlorides (Cl), mg/dm^3	254,0±38,1	
Sulphates, mg/dm^3	67,5±6,8	
Manganese, mg/dm^3	<0,01	
Ferrum (Fe, total), mg/dm^3	0,33±0,08	
Oil products, mg/dm^3	0,027	
Plumbum (Pb, total), mg/dm^3	<0,001	MU No. 08-47/091
Cadmuim (Cd, total), mg/dm^3	<0,001	
Cuprum (Cu, total), mg/dm^3	<0,006	
Zink (Zn, total), mg/dm^3	<0,006	
Arsenic (As, total), mg/dm^3	<0,01	GOST 4152-89

TESTINGS ARE PERFORMED BY:

Laboratory doctors	Laboratory assistants:
Asanalieva R.Sh. /signed/ Akimbaeva G.N. /signed/ Omurkulova G.S. /signed/	Mamytova N.A. /signed/

Head of the Department of Chemical
and Analytical Research: /signed/ Savina S.P.
/Seal affixed/

NOTE: RESULTS OF THE ANALYSIS RELATE ONLY TO THE SAMPLES SUBMITTED TO THE DEPARTMENT OF CHEMICAL AND ANALYTICAL RESEARCH BY THE CUSTOMER. SAMPLING CONDUCTED BY THE CUSTOMER. THE DEPARTMENT OF CHEMICAL AND ANALYTICAL RESEARCH SHALL NOT TAKE RESPONSIBILITY FOR SAMPLING. THE DOCUMENT CANNOT BE REPRODUCED IN FULL OR IN PARTS (EITHER COPIED OR REPRINTED) WITHOUT THE CONSENT OF THE DEPARTMENT OF CHEMICAL AND ANALYTICAL RESEARCH.
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The findings of the test:
Position: Signature:

MINISTRY OF HEALTH OF THE KYRGYZ REPUBLIC
DEPARTMENT OF STATE SANITARY AND EPIDEMIOLOGICAL SURVEILLANCE
ACCREDITED DEPARTMENT OF CHEMICAL AND ANALYTICAL RESEARCH
Address: 720033, 535 Frunze Str., Bishkek
Telephone: (996312) 32-32-08

CERTIFICATE
Laboratory studies of water

No.51 as of May 07, 2012
Applicant: Department of the sanitary and epidemiological expertise and services, direction No.1814
Name of water source: water from the lake Chatyr-Kol
Date and time of sampling: 24.04.2012, 12h. 10 min 40º32'46,6"
Date of receipt of the sample: 25.04.2012 075º16'51,5"
Date of testing: from April 25, 2012 to May 07, 2012

Parameters to be determined	Testing results	ND for testing methods
Hydrogen index, pH	7,00	GOST R 51232-98
Turbidity, mg/dm^3	10,8±2,2	Collection of standardized methods for water analysis, Bishkek, 2000
Ammonia (NH_4), mg/dm^3	<0,05	
Nitrites (NO_2), mg/dm^3	0,03±0,01	
Nitrates (NO_3), mg/dm^3	<0,1	
Hardness, º	4,2±0,6	
Solid residuals, mg/dm^3	490,5±49,1	
Chlorides (Cl), mg/dm^3	201,3±30,2	
Sulphates, mg/dm^3	41,3±4,1	
Manganese, mg/dm^3	<0,01	
Ferrum (Fe, total), mg/dm^3	0,15±0,04	
Plumbum (Pb, total), mg/dm^3	<0,001	MU No. 08-47/091
Cadmuim (Cd, total), mg/dm^3	<0,001	
Cuprum (Cu, total), mg/dm^3	<0,006	
Zink (Zn, total), mg/dm^3	<0,006	
Arsenic (As, total), mg/dm^3	<0,01	GOST 4152-89

TESTINGS ARE PERFORMED BY:

Laboratory doctors	Laboratory assistants:
Asanalieva R.Sh. /signed/ Akimbaeva G.N. /signed/ Omurkulova G.S. /signed/	Mamytova N.A. /signed/

Head of the Department of Chemical
and Analytical Research: /signed/ Savina S.P.
/Seal affixed/

NOTE: RESULTS OF THE ANALYSIS RELATE ONLY TO THE SAMPLES SUBMITTED TO THE DEPARTMENT OF CHEMICAL AND ANALYTICAL RESEARCH BY THE CUSTOMER. SAMPLING CONDUCTED BY THE CUSTOMER. THE DEPARTMENT OF CHEMICAL AND ANALYTICAL RESEARCH SHALL NOT TAKE RESPONSIBILITY FOR SAMPLING. THE DOCUMENT CANNOT BE REPRODUCED IN FULL OR IN PARTS (EITHER COPIED OR REPRINTED) WITHOUT THE CONSENT OF THE DEPARTMENT OF CHEMICAL AND ANALYTICAL RESEARCH.
----end of the document----

The findings of the test:
Position: Signature:

MINISTRY OF HEALTH OF THE KYRGYZ REPUBLIC
DEPARTMENT OF STATE SANITARY AND EPIDEMIOLOGICAL SURVEILLANCE
ACCREDITED DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING
Address: 535 Frunze Str., Bishkek, 720033
Phone: (0312) 32-31-98

PROTOCOL
of laboratory testing of water
No. 127 dated 10 October 2012

Applicant: *Department of Sanitary and Epidemiological Expertise and Services, referral No. 4153*
Place of sampling: *Water from Kosh-Kul Lake 40° 33' 00,1" 075° 19' 14,2"*
Date of sampling: *07.09.2012, 9:39 (time)*
Date of receipt of the sample: *10.10.2012*
Date of testing: *from 10 September 2012 to 10 October 2012*

DETERMINED INDICATORS, UNITS OF MEASUREMENT	TEST RESULTS	REGULATORY DOCUMENT FOR TEST METHODS
Turbidity, mg/dm^3	*10,8 ± 2,2*	*Collection of standardized methods for water analysis, Bishkek, 2000*
Ammonia (NH_4), mg/dm^3	*< 0,05*	
Nitrites ($N0_2$), mg/dm^3	*< 0,003*	
Nitrates ($N0_3$), mg/dm^3	*0,7 ± 0,1*	
Hardness, mole/m^3	*7,6 ± 1,6*	
Dry residue, mg/dm^3	*269,0 ± 26,9*	
Chlorides (Cl), mg/dm^3	*71,2 ± 10,7*	
Sulphates, mg/dm^3	*64,5 ± 6,5*	
Manganese, mg/dm^3	*< 0,01*	
Iron (Fe, total), mg/dm^3	*0,06 ± 0,02*	
Petroleum products, mg/dm^3	*0,004*	
Lead (Pb, total), mg/dm^3	*< 0,001*	MU No.08-47/091
Cadmium (Cd, total), mg/dm^3	*< 0,001*	
Copper (Cu, total), mg/dm^3	*< 0,006*	
Zinc (Zn, total), mg/dm^3	*< 0,006*	
Arsenic (As, total), mg/dm^3	*< 0,01*	GOST 4152-89

TESTS WERE CONDUCTED

Laboratory doctors:	Laboratory technicians:
Asanalieva R.Sh. /signed/	Mamytova N.A. /signed/
Akimbaeva G.N. /signed/	
Boobekova M.M. /signed/	

Head of Department of Chemical and Analytical Testing /signed/ /seal affixed/ Savina S.P.

NOTE: TEST RESULTS RELATE ONLY TO THE SAMPLES SUBMITTED BY THE CUSTOMER TO THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING. SAMPLING WAS CONDUCTED BY THE CUSTOMER. THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING IS NOT RESPONSIBLE FOR THE SAMPLING. THIS DOCUMENT MAY NOT BE PARTIALLY OR FULLY REPRODUCED (REPRINTED OR COPIED) WITHOUT PERMISSION OF THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING.

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Conclusion on the results of the test:

Position ____________________ Signature ____________________

MINISTRY OF HEALTH OF THE KYRGYZ REPUBLIC
DEPARTMENT OF STATE SANITARY AND EPIDEMIOLOGICAL SURVEILLANCE
ACCREDITED DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING
Address: 535 Frunze Str., Bishkek, 720033
Phone: (0312) 32-31-98

PROTOCOL
of laboratory testing of water
No. 128 dated 10 October 2012

Applicant: *Department of Sanitary and Epidemiological Expertise and Services, referral No. 4153*
Place of sampling: *Water from the well “Narzan” 40° 34' 09,9" 075° 21' 06,6"*
Date of sampling: *07.09.2012, 10:15 (time)*
Date of receipt of the sample: *10.10.2012*
Date of testing: *from 10 September 2012 to 10 October 2012*

DETERMINED INDICATORS, UNITS OF MEASUREMENT	TEST RESULTS	REGULATORY DOCUMENT FOR TEST METHODS
Ammonia (NH_4), mg/dm^3	*2,6 ± 0,6*	GOST 4192-82
Nitrites ($N0_2$), mg/dm^3	*0,016 ± 0,004*	GOST 4192- 82
Hardness, mole/m^3	*75,0 ± 15,7*	GOST R 52407-2005
Dry residue, mg/dm^3	*3256,0 ± 325,6*	GOST 18164- 72
Chlorides (Cl), mg/dm^3	*233,0 ± 35,0*	GOST 4245 - 72
Sulphates, mg/dm^3	*110,8 ± 11,1*	GOST 4389- 72
Manganese, mg/dm^3	*6,5 ± 1,6*	GOST 4974- 72
Iron (Fe, total), mg/dm^3	*18,0 ± 3,2*	GOST 4011-72
Lead (Pb, total), mg/dm^3	*< 0,001*	MU No.08-47/091
Cadmium (Cd, total), mg/dm^3	*< 0,001*	
Copper (Cu, total), mg/dm^3	*< 0,006*	
Zinc (Zn, total), mg/dm^3	*< 0,006*	
Arsenic (As, total), mg/dm^3	*< 0,01*	GOST 4152-89

TESTS WERE CONDUCTED

Laboratory doctors:
Akimbaeva G.N. /signed/
Boobekova M.M. /signed/

Laboratory technicians:
Mamytova N.A. /signed/

Head of Department of Chemical and Analytical Testing Savina S.P.
/signed/ /seal affixed/

NOTE: TEST RESULTS RELATE ONLY TO THE SAMPLES SUBMITTED BY THE CUSTOMER TO THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING. SAMPLING WAS CONDUCTED BY THE CUSTOMER. THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING IS NOT RESPONSIBLE FOR THE SAMPLING. THIS DOCUMENT MAY NOT BE PARTIALLY OR FULLY REPRODUCED (REPRINTED OR COPIED) WITHOUT PERMISSION OF THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING.

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Conclusion on the results of the test:

Position ______________________ Signature ____________________

MINISTRY OF HEALTH OF THE KYRGYZ REPUBLIC
DEPARTMENT OF STATE SANITARY AND EPIDEMIOLOGICAL SURVEILLANCE
ACCREDITED DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING
Address: 535 Frunze Str., Bishkek, 720033
Phone: (0312) 32-31-98

PROTOCOL
of laboratory testing of water
No. 129 dated 10 October 2012

Applicant: *Department of Sanitary and Epidemiological Expertise and Services, referral No. 4153*
Place of sampling: *Water from Chatyr-Kul Lake 40° 34' 16,09" 075° 11' 15,9"*
Date of sampling: *07.09.2012, 12:47 (time)*
Date of receipt of the sample: *10.10.2012*
Date of testing: *from 10 September 2012 to 10 October 2012*

DETERMINED INDICATORS, UNITS OF MEASUREMENT	TEST RESULTS	REGULATORY DOCUMENT FOR TEST METHODS
Turbidity, mg/dm^3	*20,3 ± 4,1*	GOST 3351-74
Ammonia (NH_4), mg/dm^3	*1,3 ± 0,3*	GOST 4192-82
Nitrites ($N0_2$), mg/dm^3	*0,10 ± 0,02*	GOST 4192- 82
Nitrates ($N0_3$), mg/dm^3	*1,0 ± 0,2*	GOST 18826-73
Hardness, $mole/m^3$	*9,3 ± 1,9*	GOST R 52407-2005
Dry residue, mg/dm^3	*373,0 ± 37,3*	GOST 18164- 72
Chlorides (Cl), mg/dm^3	*556,1 ± 83,4*	GOST 4245 – 72
Sulphates, mg/dm^3	*12,1 ± 1,2*	GOST 4389- 72
Manganese, mg/dm^3	*0,22 ± 0,06*	GOST 4974- 72
Iron (Fe, total), mg/dm^3	*0,15 ± 0,04*	GOST 4011-72
Lead (Pb, total), mg/dm^3	*< 0,001*	MU No.08-47/091
Cadmium (Cd, total), mg/dm^3	*< 0,001*	
Copper (Cu, total), mg/dm^3	*< 0,006*	
Zinc (Zn, total), mg/dm^3	*< 0,006*	
Arsenic (As, total), mg/dm^3	*< 0,01*	GOST 4152-89

TESTS WERE CONDUCTED

Laboratory doctors:
Akimbaeva G.N. /signed/
Boobekova M.M. /signed/

Laboratory technicians:
Mamytova N.A. /signed/

Head of Department of Chemical and Analytical Testing Savina S.P.
/signed/ /seal affixed/

NOTE: TEST RESULTS RELATE ONLY TO THE SAMPLES SUBMITTED BY THE CUSTOMER TO THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING. SAMPLING WAS CONDUCTED BY THE CUSTOMER. THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING IS NOT RESPONSIBLE FOR THE SAMPLING. THIS DOCUMENT MAY NOT BE PARTIALLY OR FULLY REPRODUCED (REPRINTED OR COPIED) WITHOUT PERMISSION OF THE DEPARTMENT OF CHEMICAL AND ANALYTICAL TESTING.

----- end of document ------

Conclusion on the results of the test:

Position ______________________ Signature ____________________

CHUI ECOLOGICAL LABORATORY

1a, Kojomberdieva Str. 724411 Kara-Balta, Kyrgyz Republic
Office tel.: (0-3133) 6-24-24, 7-27-38 Fax: (0-3133) 7-24-77

TESTING CERTIFICATE

No.497 as of June 18, 2012
on 3 pages

Purpose: Engineering and environmental exploration prior to the proposed activity on the part of the road in the area of Chatyr-Kul Lake from Tuz-Bel pass to the customs checkpoint Torugart; determination of chemical parameters of the air.

Studied material: atmospheric air.

Sampling by: “Chui Ecological Laboratory” LLC
Analysis by: 1) “Chui Ecological Laboratory” LLC – nitrogen oxides, sulphur dioxide, nonorganic fines, tie-in to the local area, microclimate parameters.
Processing the results of the analysis: “Chui Ecological Laboratory” LLC.
Sampling location: The roadway section in the area of Chatyr-Kul lake from Tuz-Bel pass to Torugart checkpoint, area length is 36 km, 6 sampling locations.

Quantity of samples: gases: sulphur dioxide 17, nitrogen oxides 17, nonorganic fines 30.

Sampling locations: sampling points are located along the automobile road from Tuz-Bel pass to Torugart checkpoint:

1. Location No.1 - 478 m away from the road to Chatyr-Kul Lake in the area of “Narzan” waters well.
2. Location No. 2 – 10 km away from Tuz-Bel pass on the way from Tuz-Bel pass to Torugart pass.
3. Location No.3 – Torugart customs checkpoint.
4. Location No.4 – on the upgrade to Tuz-Bel pass, 50 m from the peak.
5. Location No.5 – between Locations No.1 and 2, 18 km from Torugart customs checkpoint, on the way to Tuz-Bel pass.
6. Location No.6 – 6 km away from Tuz-Bel pass on the way to Torugart pass.

Results of the analysis relate only to the samples submitted to the laboratory and tested.

Sampling date: 01-06.06.2012
Analysis date: 07-11.06.2012

Sampling characteristics: maximum one time sampling (MOT) and daily average sampling (DA) for each sampling location.

Terms of sampling:
- warm season,
- weather conditions during the day varied from clear to partly cloudy and cloudy followed by precipitation in the form of snow, then the precipitation would stop and the sky becomes clear again, sampling was carried out during periods with no precipitation.
- wind direction varied from 40° to 210°, ie from NNE to SW.
- pressure – 504-501 millimeter of mercury

- temperature - -2,2 - +9,2°C,
- humidity – 50-100%

Analysis method: "Chui Ecological Laboratory" LLC

1. Photometric for (NO_2, SO_2) – RD 52.04.186-89,
2. Weight-based for fines – GOST 17.2.4.05-83
3. Instrumental for microclimate parameters – RD 52.04.186-89

Standards: State standard 2.1.6.1388-03 «The maximum permissible concentration (MPC) of pollutants in the air of populated areas».

Director, General
"Chui Ecological Laboratory" /signed/ Usubalieva A.M.

Seal affixed: /Chui Ecological Laboratory: for documents/

Provision of test results:

##	Parameters to be determined	Maximum allowable concentration	Air Sampling Locations					
			1	2	3	4	5	6
1	Coordinates		N=40° 34'07,2" E=075° 21'07,2"	N=40° 32'48,3" E=075° 16'24,9"	N=40° 35'23,4" E=075° 24'52,1"	N=40° 33'55,3" E=075° 05'20,4"	N=40° 31'35,8" E=075° 18'16,0"	N=40° 31'51,8" E=075° 06'22,6"
2	Height above sea level, m		3538	3579	3615	3574	3578	3572
3	Date of sampling		02.06. 2012	03.06. 2012	04.06. 2012	04.06. 2012	05.06. 2012	05.06. 2012
Microclimate parameters								
4	Temperature, °C		+4,6- +6,2	+5 - +6,1	+5,2 - +8,4	+9,2 – 2,2	+5,1	+8,2
5	Humidity, %		69-94	64-89	57-98	48-100	58-96	48-74
6	Wind direction		NE-NW	E-ESE	E-SE-SW	E-SE-calm	E-SE	E-SE
7	Wind velocity, m/sec		0,7-2,8 Wind gusts up to 5,6	1,5-5,2	0,2-5,1	4,2-11,3-0,0	1,5-2,9	2,6-4,2
Indicators of chemical composition, mg/m^3								
8	Fins, mg/m^3	0,3/0,1	0,12/0,04	0,24/0,072	0,42/ 0,147	0,42/ 0,102	0,12/ 0,04	0,24/ 0,07
9	Nitrogen dioxide (NO_2)	0,085/ 0,04	0,0159/ 0,0148	0,0485/ 0,0393	0,1785/ 0,1385	0,2091/ 0,0916	0,0462/ 0,0393	0,0446/ 0,0399
10	Suphur dioxide (SO_2)	0,5/ 0,05	0,2841/ 0,1776	0,6346/ 0,6202	8,4231/ 6,2077	8,0114/ 2,9075	0,5192/ 0,5048	0,7031/ 0,6006

Operators:

Deputy Directors
/signed/ Rashepkina N.A.
Specialists /signed/ Juravleva E.V.
/signed/ Konyaeva G.N.

CHUI ECOLOGICAL LABORATORY

1a, Kojomberdieva Str. 724411 Kara-Balta, Kyrgyz Republic
Office tel.: (0-3133) 6-24-24, 7-27-38 Fax: (0-3133) 7-24-77

TESTING CERTIFICATE

No.498 as of June 18, 2012
on 4 pages

Purpose: Engineering and environmental exploration prior to the proposed activity on the part of the road in the area of Chatyr-Kul Lake from Tuz-Bel pass to the customs checkpoint Torugart; identification of natural and man-made noise characteristics.

Basis: Terms of Reference by TERA INTERNATIONAL GROUP, INC.

Studied material: noise (background sound, natural and anthropogenic) above the surface of the road from the Tuz-Bel Pass to Torugart checkpoint, at various distances from the roadway and different wind characteristics.

Measurements by: “Chui Ecological Laboratory” LLC
Date of Measurements: 02.06.-05.06.2012.

Number of locations explored: 6

1. Location No.1 - 478 m away from the road to Chatyr-Kul Lake in the area of “Narzan” waters well.
2. Location No. 2 – 10 km away from Tuz-Bel pass on the way from Tuz-Bel pass to Torugart pass.
3. Location No.3 – Torugart customs checkpoint.
4. Location No.4 – on the upgrade to Tuz-Bel pass, 50 m from the peak.
5. Location No.5 – between Locations No.1 and 2, 18 km from Torugart customs checkpoint, on the way to Tuz-Bel pass.
6. Location No.6 – 6 km away from Tuz-Bel pass on the way to Torugart pass.

Locations characteristics: 1,5 m above the ground, 5, 10 and 20 m away from the roadway.

Measurement method and valuation: SN 2.2.4/2.1.8.562-96 (construction standard), GOST 23337-78.

Instruments: Noise meter SHUM-1M, №0347 (inspected as of July 30, 2010, Certificate No.189). Inaccuracy – 10-15%.

Director, General
“Chui Ecological Laboratory” /signed/ Usubalieva A.M.

Seal affixed: /Chui Ecological Laboratory: for documents/

The road from Tuz-Bel pass to Torugart checkpoint

	Location description	Date	Factors influencing the occurrence of noise	Wind velocity, m/sec	Wind direction (where the wind blows), in		Equivalent noise level, in dB	
					Degrees	Rhumbs	A	C
1	Location No.1 - 478 m away from the road to Chatyr-Kul Lake in the area of "Narzan" waters well	02.06.12	Wind gusts	Aver.3,6 m/sec, 5,6m/sec	80-100	ENE-E	33	56
			-//-	2,5-2,8	100-120	ESE	30	52
			-//-	0,1	279-305	W-NW	30	46
			-//-	0,7-1,2	40-55	NE	30	70
2	Location No. 2 – 10 km away from Tuz-Bel pass on the way from Tuz-Bel pass to Torugart pass	03.06.12	15m from the roadway	2,8-3,2	90-100	E-ESE	42	52
			200m from the location, 1 truck	1,5-2,9	100-120	ESE	44	58
			15m, 1 truck	-//-	-//-	-//-	54	72
			150m, 2 trucks	2,4-3,0	120-150	SE	45	64
			15m, 1 truck	3,5-5,2	90-120	E-SE	60	72
3	Location No.3 – Torugart customs checkpoint	04.06.12	10m from the roadway, works. 1 truck	1,6-2,6	90-180	E-S	53	68
			10m from the roadway, works. 2 trucks	-//-	-//-	-//-	57	62
			10m from the roadway, works. Beginning of trucks run	2,2-4,1	130-210	SE-SW	68	76
			20m from the roadway, works. Beginning of trucks run	-//-	-//-	-//-	62	68
			10m from the roadway, non-stop run of trucks	0,4-1,7	110-210	SE-WSW	66	74
			10m from the roadway, non-stop run of trucks	2,7-3,3	60-160	NE-SE	67	70
			20m from the roadway, non-stop run of trucks	0,2-0,9	120-210	SE-SW	54	64
			10m from the roadway, non-stop run of trucks	4,5-5,1	130-180	SE-S	68	74
			20m from the roadway, non-stop run of trucks				55	64
			10m from the roadway, non-	1,4-2,8 – 2,4-3,2	80-150 – 90-170	E-SSE	58	62

			stop run of trucks					
			20m from the roadway, non-stop run of trucks				54	62
4	Location No.4 – on the upgrade to Tuz-Bel pass, 50 m from the peak	04.06.12	5m from the roadway, 1 truck going to Torugart	4,2-5,6	100-140	E-SSE	62	74
			5m from the roadway	6,6-9,2	90-120	E-SE	65	82
			5m from the roadway	8,7-11,3	100-130	E-SE	66	87
			Trucks going to Tuz-Bel, locations of measurements are at the distance of 800 m	0-0,1	-	-	46	49
			5m from the roadway	-//-	-	-	57 62	68 72
			5m from the roadway, 1 truck 2trucks	0,0	-	-	66 62	76 70
5	Location No.5 – between Locations No.1 and 2, 18 km from Torugart customs checkpoint, on the way to Tuz-Bel pass	02.06.12	300m from the road, sporadic traffic	0,7-1,2	90-110	E	36	74
		05.06.12	5m from the roadway, 1 truck	1,6-2,6	90-180	E-SE-S	52	66
			5m from the roadway, 1 truck	2,4-30	130-210	SE-SW	54	70
			5m from the roadway, 1 truck	1,8-2,8	-//-	-//-	58	62
6	Location No.6 – 6 km away from Tuz-Bel pass on the way to Torugart pass	05.06.12	10m from the roadway, 1 truck	1,8-2,4	160-200	SE-SW	56	60
			5m from the roadway, 1 truck	1,5-2,9	100-120	SE	54	72
			10m from the roadway, 2 trucks	2,2-3,0	120-150	SE-S	44	66
			5m from the roadway, 1 truck	3,2-4,8	90-120	E-SE	58	70
			200m away from the location of measurements, 1 truck	1,5-2,9	100-120	E-SE	42	54

Note: Characteristic “A” – noise meter frequency characteristic, roughly corresponding to the human ear. For the device Shum-1M, determination of sound pressure level in octave frequency is performed based on the "A" and "C" corrections difference - with the difference in the readings between dBC dBA above 5 dB, the noise should be considered of low-frequency, but with a smaller difference or equal readings – of high-frequency.

Operators:

Deputy Directors		
	/signed/	Rashepkina N.A.
Specialists	/signed/	Juravleva E.V.
	/signed/	Dulatov T.F.

DEPARTMENT OF ENVIRONMENTAL MONITORING
OF THE STATE AGENCY ON ENVIRONMENT PROTECTION AND FORESTRY
UNDER THE GOVERNMENT OF THE KYRGYZ REPUBLIC

720005, Bishkek, Baytik-Baatyra str., 34 Telephone: (996-312) 540765, fax: 540766

SAMPLE PASSPORT
(WATER)

1. Organization name and address: Naryn region, At-Bashy district, Kara-Suu village, Corporation "China Road and Bridge Corporation in Kyrgyzstan", "БНК-3"

2. Sampling location:
1) T_1 The Chatyr-Kul lake No.40^0 57'78" E 75^0 22'33";
2) T_8 The Chatyr-Kul lake No.40^0 58'13" E 75^0 22'80";
3) T_2 The Chatyr-Kul lake No.40^0 57'86" E 75^0 25'61";
4) T_3 The Chatyr-Kul lake No.40^0 57'67" E 75^0 28'74";
5) T_{21} The Lesser lake, southern coast No.40^0 55'22" E 75^0 32'53";
6) T_{19} At Narzan spring No.40^0 56'94" E 75^0 35'14"

3. Sampling purpose: water quality control test

4. Sample type: snap sample

5. Environmental conditions: clear

6. Sampling date and time: 21.06.2013-22.06.2013; 10:12 – 13:30.

7. Sampling method: State Standard 51592-2000 "Water. General sampling requirements"; НВН 33-5.3.01-85 Sampling instructions for waste water analysis.

Representative of the Department of Environmental Monitoring	Chief specialist	Raykeeva R.N.
State inspector Head of Monitoring Department of Karatal-Zhapyryksky State Nature Reserve		Taialiev S.
Leading expert of Issyk-Kul and Naryn Territorial Administration of Environmental Protection		Minazarova N.
Organization representative	Ecologist Chairman of TERA	Nurdinov N. Koichubaev Zh.

Перевод данного документа с русского языка на английский язык выполнен переводческим агентством «ОРАDCOM»
Ул. Абдрахманова (бывшая ул. Советская) 170В, г.Бишкек, Кыргызстан. Тел.: 996-312-66-41-50, 996-312-46-81-86.
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DEPARTMENT OF ENVIRONMENTAL MONITORING
OF THE STATE AGENCY ON ENVIRONMENT PROTECTION AND FORESTRY
UNDER THE GOVERNMENT OF THE KYRGYZ REPUBLIC

720005, Bishkek, Baytik-Baatyra str., 34 Telephone: (996-312) 540765, fax: 540766

Accreditation Certificate
 # KG 417/КЦА.ИЛ.049
dated 5 April 2013

PROTOCOL
WATER SAMPLE ANALYSIS
#119 - 124

1. Organization (applicant) name and address: "Bishkek-Naryn-Torugart-3".

2. Sampling location:

119 - T_1 The Chatyr-Kul lake No.40^0 57'78" E 75^0 22'33";
120 - T_8 The Chatyr-Kul lake No.40^0 58'58" E 75^0 22'80";
121 - T_2 The Chatyr-Kul lake No.40^0 57'86" E 75^0 25'61";
122 - T_3 The Chatyr-Kul lake No.40^0 57'86" E 75^0 25'61";
123 - The Lesser lake, southern coast No.40^0 55'22" E 75^0 32'53";
124 - Narzan spring No.40^0 56'94" E 75^0 35'14"

3. Sampling purpose: to determine water quality.

4. Sampling was conducted by: Raykeeva R.N (specialist for DEM)

5. Sampling date: 21.06.2013; 10.12-13.30

6. Test dates: 24 - 05.06.2013

Ingredient name	Unit measure	Data analysis of sampling locations						MPC*	Normative documents
		119	120	121	122	123	124		
PH		8,98	9,00	8,98	9,07	8,39	6,76	6,5 – 8,5	CMEA (СЭВ), part 1, M. 1977
Sulfates	mg/l	174	175	145	159	24	65	100	Manual (D.O. Alekin)
Chlorides	mg/l	466	474	409	426	27	237	300	Measurement Procedure (МВИ) 2-83
Anionic synthetic detergents	mg/l	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	0,1	State Standard (ГОСТ Р) 51211-98
Copper	mg/l	<0,0006	<0,0006	<0,0006	<0,0006	<0,0006	<0,0006	0,001	МУ 08-47/091
Zinc	mg/l	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	0,01	МУ 08-47/091
Cyanides	mg/l	<0,005	<0,005	<0,005	<0,005	<0,005	<0,005	0,05	Environment Protection Regulatory Document (ПНД Ф 14.1:2.56-96)
Cadmium	mg/l	<0,0002	<0,0002	<0,0002	<0,0002	<0,0002	<0,0002	0,005	МУ 08-47/091
Lead	mg/l	<0,0002	<0,0002	<0,0002	<0,0002	<0,0002	<0,0002	0,006	МУ 08-47/091
Iron	mg/l	0,11	0,07	0,05	0,08	<0,05	<0,05	0,1	
Oil products	mg/l	0,03	0,03	0,03	0,03	0,03	<0,03	0,05	Environment Protection Regulatory Document (ПНД Ф 14.1:2:4.128-98)

- According to the chemical analysis results, water samples from the Chatyr-Kul lake does not meet MPC (maximum permissible concentration) for fishery on sulfates at points: No.119, No.120-1,7 times, No.121-1,5 time; No.122-1,6 time; on chlorides No.119-1.5 time; No.120-1,6 time, No.121, No.122-1,4 time. The other rests at all points meet approved MPC standards.

Department Head *|signature|* **T. Sadykbekov**

* List of commercial fishing standard of MPC and SRLI of harmful substances for the water of water bodies, which have commercial fishing importance
Quality control of surface water, State Committee of Russia on fishery, Moscow 1999

** HS 2.1.5.1315-03, MPC of chemical substances in water of the water bodies of household water use and cultural and general water use
Ministry of Health of Russia, Moscow 2003

An executor does not bear responsibility if a sample is taken by a customer.
The protocol may not be reprinted without the prior permission of testing laboratory.
Test protocol applies to the test samples only.

**DEPARTMENT OF ENVIRONMENTAL MONITORING
OF THE STATE AGENCY ON ENVIRONMENT PROTECTION AND FORESTRY
UNDER THE GOVERNMENT OF THE KYRGYZ REPUBLIC**

720005, Bishkek, Baytik-Baatyra str., 34 Telephone: (996-312) 540765, fax: 540766

SAMPLE PASSPORT
(WATER)

1. Organization name and address: Naryn region, At-Bashy district, Corporation "China Road and Bridge Corporation in Kyrgyzstan", "БНТ-3"

2. Sampling location:
1) No.40° 34'07.2" E 75° 21'07.2";
2) No.40° 32'48.3" E 75° 16'24.9";
3) No.40° 35'23.4" E 75° 24'52.1";
4) No.40° 33'55.3" E 75° 05'20.4";
5) No.40° 31'35.8" E 75° 18'16.0";
6) No.40° 31'51.8" E 75° 06'22.6"

3. Sampling purpose: to determine atmospheric air pollutant concentration

4. Sample type: maximum snap sample

5. Environmental conditions: clear

6. Sampling date and time: 21.06.2013-22.06.2013; 10:00 – 18:00.

6. Sampling conditions: ______________________

7. Sampling date and time: 22.06.2013 10:00 – 18:00

8. Sampling method: Guidelines on Air Pollution Monitoring RD 52.04. 186-89; State Standard (ГОСТ Р 50820-95) Gas-cleaning and dust-collecting equipment. Methods to determine dust level of gas-dust streams; operations manual (ЯВША 413311.012 РЭ, ИБЯЛ 416143004 РЭ, ИБЯЛ 413411.042. РЭ).

Representative of the Department of Environmental Monitoring Chief specialist Raykeeva R.N.

State inspector
Head of Monitoring Department
of Karatal-Zhapyryksky State Nature Reserve Taialiev S.
Leading expert of Issyk-Kul and Naryn Territorial
Administration of Environmental Protection Minazarova N.

Organization representative Ecologist Nurdinov N.
Chairman of TERA Koichubaev Zh.

DEPARTMENT OF ENVIRONMENTAL MONITORING
OF THE STATE AGENCY ON ENVIRONMENT PROTECTION AND FORESTRY
UNDER THE GOVERNMENT OF THE KYRGYZ REPUBLIC

720005, Bishkek, Baytik-Baatyra str., 34 Telephone: (996-312) 540765, fax: 540766

Accreditation Certificate
 # KG 417/КЦА.ИЛ.049
dated 5 April 2013

PROTOCOL
ATMOSPHERIC AIR SAMPLE ANALYSIS
 # 165-170

1. Name of enterprise, organization (applicant):
At-Bashy region, Corporation "China Road and Bridge Corporation in Kyrgyzstan", "Bishkek-Naryn-Torugart-3".

2. Sampling location:
165- No.40^0 34'07.2" E 75^0 21'07.2";
166- No.40^0 32'48.3" E 75^0 16'24.9";
167- No.40^0 35'23.4" E 75^0 24'52.1";
168- No.40^0 33'55.3" E 75^0 05'20.4";
169- No.40^0 31'35.8" E 75^0 18'16.0";
170- No.40^0 31'51.8" E 75^0 06'22.6"

3. Sampling purpose: to determine atmospheric air pollutant concentration

4. Sampling was conducted by: Raykeeva R.N (chief specialist)

5. Sampling date and time: 21.06.-22.06.2013; 10:00 – 18:00

6. Sample type: maximum snap sample

7. Analysis method:
1. Portable gas analyzer (PGA - 200), operations manual (ЯВША 413311.012 РЭ).
2. Suspended Particle Concentration Monitor (ИКВЧ-В3), operations manual (ИБЯЛ 416143004 РЭ).

8. Test dates: 24.06.2013 – 29.06.2013

Ingredient name	Unit measure	Data analysis of sampling locations (sites)											
		165	MPC excess snap sample	166	MPC excess snap sample	167	MPC excess snap sample	168	MPC excess snap sample	169	MPC excess snap sample	170	MPC maximum snap sample
Sulfur dioxide	mg/m^3	0,4±0,10	-	0,4±0,13	-	0,4±0,10	-	1,5±0,38	-	1,5±0,38	3,0	0,5±0,13	**0,5**
Nitrogen oxide	mg/m^3	<0,01	-	<0,01	-	<0,01	-	<0,01	-	<0,01	-	<0,01	**0,085**
Carbon oxide	mg/m^3	1,4±0,35	-	4,1±1,03	-	2,5±0,63		6,5±1,60	-	6,7±1,68	**1,3**	4,3±1,08	**5,0**
Suspended matters	mg/m^3	<0,1	-	<0,1	-	<0,1		<0,1	-	<0,1	-	<0,1	**0,5**

Department Head /signature/ T. Sadykbekov

An executor does not bear responsibility if a sample is taken by a customer.
The protocol may not be reprinted without the prior permission of testing laboratory.
Test protocol applies to the test samples only.

Перевод данного документа с русского языка на английский язык выполнен переводческим агентством «OPADCOM»
Ул. Абдрахманова (бывшая ул. Советская) 170B, г.Бишкек, Кыргызстан. Тел.: 996-312-66-41-50, 996-312-45-81-86.
This document was translated from Russian into English in "OPADCOM" Translation Agency.
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Accreditation certificate of the Kyrgyz Accreditation Centre
#KG 41/КЦА.ИЛ.097 dated 06.10.2010
Physical factor control group of the State Sanitary and Epidemiological Surveillance under the Ministry of Health of the Kyrgyz Republic

PROTOCOL
NOISE MEASUREMENT
#__22 dated 29 June 2013

Legal entity, private entrepreneur or natural person, for whom measurements are carried out by **Office of China Road and Bridge Corporation**

name and legal address

Noise measurement site: **Naryn region, At-Bashy district, 479-539 km of Bishkek-Naryn-Torugart highway**

name and de facto address

Measurement tool name and state verification data:

Measurement tool name	#	Verification certificate		Verified till
		#	Date	
Oktava 101A	# 04A445	394/p	20.12.2012	20.12.2013

Normative (standard) documents, in accordance with which measurements have been carried out: **CH 2.2.4/2.1.8.562-96 "Noise standards in the work place, residential and public buildings and residential construction territories".**

Physical factors and their characteristics: **motor vehicles of the plant.**

Authorized representative of the company who was present at measurement procedures:
Last name, first name, patronymic: ecologist Nurdinov N., head of Karatal-Zhapyryksky State Nature Reserve Toialiev S.

Signature: _____________

	Position	Last name, first name, patronymic	Signature
Measurements were conducted by	engineer	Dzhishanbaev A.	signed
Chief of the laboratory		Arzykulov Zh.	signed

The protocol is made in duplicate, one copy is given to whom it may concern, another one stays in the laboratory.

Conclusion: according to the measurement results noise level on the territory of residential houses does not exceed Maximum Permissible Level (MPL)

Ground: CH 2.2.4/2.1.8.562-96 "Noise standards in the work place, residential and public buildings and residential construction territories".

Sanitary inspector ________________ Arzykulov Zh. T.

Measurement results

#	Measurement site	Character of noise						Sound pressure level in dB in octave bands with mean metric frequencies (Hz)									Sound level dB	
		Spectrum		Intensity														
		Wide-band	Tonal	Constant	Vibrating	intermittent	impulsive	31,5	63	125	250	500	1000	2000	4000	8000		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	20	
	N 40°33.872' E 075°.0531' Sewage level	+				+		73	68	63	60	58	51	47	40	35	57	Fact
2	At passing of lorries							93	79	70	68	58	55	52	52	49	60	
3	N 40°33.352' E 075°.12. 334' Sewage level							90	75	66	59	54	50	47	45	44	55	
4	At passing of lorries							73	79	73	65	54	35	34	35	36	60	
								103	91	83	77	73	70	68	66	64	75	
5	N 40°32.323' E 075°.17.392' Sewage level							80	77	70	62	50	39	35	35.4	36	57	
6	At passing of lorries							93	79	70	68	58	55	52	52	49	60	
7	N 40°34.202' E 075°.21.136' Sewage level							75	72	65	45	35	34	34	35	53	99	
8	At passing of lorries							93	79	70	68	58	55	52	52	49	60	
9	N 40°35.303' E 075°.24.468' Sewage level							83	78	71	63	63	58	54	48	38	64	
10	At passing of lorries							103	91	83	77	73	70	68	66	64	75	
11	N 40°35.470' E 075°.24.928' Sewage level							87	84	80	74	65	54	43	36	36	68	
12	At passing of lorries							103	91	83	77	73	70	68	66	64	75	

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Physical factor control group of the State Sanitary and Epidemiological Surveillance under the Ministry of Health of the Kyrgyz Republic

PROTOCOL
VIBRATION MEASUREMENT
23 dated 29 June 2013

Legal entity, private entrepreneur or natural person, for whom measurements are carried out by: **Office of China Road and Bridge Corporation, Naryn region, At-Bashy district**
name and legal address

Noise measurement site: **Naryn region, At-Bashy district, 479-539 km of Bishkek-Naryn-Torugart highway**
name and de facto address

Measurement tool name and state verification data:

Measurement tool name	#	Verification certificate #	Verification certificate Date	Verified till
Oktava 101B	# 04A445	394/p	20.12.2012	20.12.2013

Normative (standard) documents, in accordance with which measurements have been carried out: **CH 2.2.4/2.1.8.566-96 "Industrial vibration, vibration in residential and public buildings".**

Physical factors and their characteristics: **freight vehicles and operating equipment of the plant.**

Authorized representative of the company who was present at measurement procedures:
Last name, first name, patronymic: ecologist Nurdinov N., head of Karatal-Zhapyryksky State Nature Reserve Toialiev S.

Signature: ____________

	Position	Last name, first name, patronymic	Signature
Measurements were conducted by	engineer	Dzhishanbaev A.	signed
Chief of the laboratory		Arzykulov Zh.	signed

The protocol is made in duplicate, one copy is given to whom it may concern, another one stays in the laboratory.

Conclusion: **according to instrumental measurement results vibration level is changeable, vibration velocity level at the plant does not exceed Maximum Permissible Level (MPL)**

Ground: **CH 2.2.4/2.1.8.566-96 "Industrial vibration, vibration in residential and public buildings".**

Sanitary inspector ________________ Arzykulov Zh. T.

Measurement Results																	
No	Measurement areas	Noise Characters						Level of noice pressure in dB octava strike with average-metric frequencies Hz									dBA Noie level
		by the spector		by the time													
		wideband	Tonal	Constant	vibrate	intermittent	impulsive			1	2	4	8	16	31,5	63	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	20
1	N40^{o}33.872^{1} E 075^{0}. 0531^{1} sewage level									98	82	70	70	67	66	67	82,5
2	passing trucks									78	74	74	97	100	90	98	112
3	N40^{o}33.352^{1} E 075^{0}12.334^{1} sewage level									119	80	76	71	67	67	67	100
4	passing trucks									67	68	70	65	65	66	86	111
5	N40^{o}32.323^{1} E 075^{0}17.392^{1} sewage level									106	154	105	79	75	70	68	104
6	passing trucks									78	70	67	71	66	67	86	114
7	N40^{o}34.202^{1} E 075^{0}21.136^{1} sewage level									86	82	81	81	76	72	68	98,4
8	passing trucks									86	76	72	71	68	66	67	97,8
9	N40^{o}35.303^{1} E 075^{0}24.468^{1} sewage level									128	120	76	78	73	700	68	105
10	passing trucks									84	71	66	65	67	68	82	117
11	N40^{o}35.470^{1} E 075^{0}24.928^{1} sewage level									109	88	81	75	71	74	70	112
12	passing trucks									87	69	72	68	65	67	92	121