REPUBLIC OF KAZAKHSTAN
MINISTRY OF TRANSPORT AND COMMUNICATIONS
COMMITTEE FOR ROADS

SOUTH WEST ROADS PROJECT:

WESTERN EUROPE – WESTERN CHINA INTERNATIONAL TRANSIT CORRIDOR

(CAREC1b & 6b)

ENVIRONMENTAL IMPACT ASSESSMENT

SHYMKENT TO ZHAMBYL REGION BORDER

Section-1 (593-632km) & Section-2 (632 to 674km)

FINANCED BY INTERNATIONAN BANK FOR RECONSTRUCTION AND DEVELOPMENT AND REPUBLIC OF KAZAKHSTAN

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Prepared for:

Committee for Roads
Ministry of Transport, and Communications
Republic of Kazakhstan
47 Kabanbai Batyr Ave.
Transport Tower
Astana City

Prepared by:

SNC•LAVALIN International *in association with* **KazdorNII, Kazakhstan**

SNC-LAVALIN International Inc.
2275 Upper Middle Road East
Oakville, Ontario, Canada, Tel : (905) 829-8808
7 Turan Avenue, 2nd Floor, Astana City
Republic of Kazakhstan

Table of Contents

Shymkent to Border of Zhambyl Region

Section-1: Km 593-632(Border of Zhambyl Region- Zhaskeshu)

Executive Summary

1. INTRODUCTION
   - 1.1 Background
   - 1.2 Scope of Work
   - 1.3. Structure of the Report

2. METHODOLOGY
   - 2.1 Data Collection
   - 2.2 Scope, Resources, Limitations, and Timeframe of the EIA

3. REGULATORY FRAMEWORK
   - 3.1 Administrative and Legal Framework for Environmental Protection in the Republic of Kazakhstan
   - 3.2 World Bank Policies and Guidelines
   - 3.3 Conclusions and Recommendations; Regulatory Framework Analysis

4. PROJECT DESCRIPTION
   - 4.1 Overview
   - 4.2 Project Components, Type and Category of the Project
   - 4.3 Need for the Project
   - 4.4 Project Benefits and Environmental Consideration
   - 4.5 Project Location
   - 4.6 Details of the Project
   - 4.6.1 Preparation of Construction Site
   - 4.6.2 Longitudinal Section
   - 4.6.3 Roadbed and Drainage
   - 4.6.4 Intersections and Junctions
   - 4.6.5 Land Demand
   - 4.6.6 Construction Duration

5. BASELINE CONDITION
   - 5.1 Topography
   - 5.2 Climate
   - 5.3 Geology and Litological Structure
   - 5.4 Soils
   - 5.5 Geotechnical Conditions and Relief

5.6 Hydrology
5.7 Air Quality
5.8 Noise
5.9 Flora and Fauna
5.10 Socioeconomic
5.11 Archaeology and Cultural Sites

6. ENVIRONMENTAL IMPACTS AND MITIGATION
6.1 Approaches to Screening of Environmental Impacts
6.2 Pre-Construction Stage
6.3 Construction Stage
6.4 Air Quality
6.5 Noise
6.6 Vibration
6.7 Hydrology
6.7.1 Contamination of Surface Water Sources
6.7.2 Contamination of Ground Water Sources
6.8 Borrow pits
6.9 Soils
6.10 Waste Generation
6.11 Flora and Fauna
6.12 Social
6.13. Traffic Safety

7. ANALYSIS OF PROJECT ALTERNATIVES

8. ENVIRNMENTAL MANAGEMENT AND MONITORING PLAN

8.1 Environmental Management Plan
8.2 Guiding Principles of EMMP
8.3 Mitigation Measures
8.4. Monitoring Mechanism
8.5 Budget Estimates
8.6 Institutional Framework for Implementation of EMMP
8.7 Management of Project related Impacts

9. PUBLIC CONSULTATIONS

10. INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING

11. CONCLUSIONS AND RECOMMENDATIONS

References.

Tables

Table 4.1 Technical Parameters
Table 4.2 Key Performance Indicator
Table 4.3 Information on Purchased Land Plots under the Project
Table 5.1 Wind Direction and Speed
Table 5.2 Rivers in the Project Area
Table 6.1 Calculation of Maximum Permissible Emissions
Table 6.2 Specific Emissions of Harmful Substances of Construction Equipment
Table 6.3 Fuel Consumption for the Period of Construction of the Road Section
Table 6.4 Calculation of Dust of the Road
Table 6.5 Degree of Dust-raising ability of Dusty Coatings are Divided into Categories
Table 6.6 Value of the Actual Daily Average Dust Concentration
Table 6.7 Water Needs for Drinking and Household use and Generation of Wastewaters during Construction Period
Table 8.1 Environmental Management Plan
Table 8.2 Environmental Monitoring Plan during Construction and Operation
Table 8.3 Summary of Costs of EMP during Construction and Operation

Appendices

Appendix-A: Maps and Diagrams

Appendix -B: Environmental Regulations of Republic of Kazakhstan

Appendix -C: Environmental Monitoring of Selected Parameters, Location and Budget (Sec-1)

Appendix -D: Air and Noise Levels

Units of Measurements

°C	-degree Celsius
Km	-kilometre
Km^2	-square kilometre
m	-metre
m^3	-cubic metre
1USD	-147,35Tenge (April 17, 2012)

Abbreviations

AoI	-Area of Influence
CAREC	-Central Asia Regional Economic Cooperation
CR	-Committee for Roads
CSC	-Construction Supervision Consultant
EIA	-Environmental Impact Assessment
EMMP	-Environmental Management and Monitoring Plan
EMP	-Environmental Management Plan
IBRD	-International Bank for Reconstruction and Development
IEE	-Initial Environmental Examination
MoTC	-Ministry of Transport and Communications
MoEP	-Ministry of Environmental Protection
KZT	-Kazakhstan Tenge (Currency of RK)
O&M	-Operation and Maintenance
MPD	-Maximum Permissible Discharge
MPE	-Maximum Permissible Emission
PAP	-People (Person) Affected by the Project
PCR	-Public cultural resources
PMC	-Project Management Consultant
RAP	-Resettlement Action Plan
RoK	-Republic of Kazakhstan
RoW	-Right of Way
SEE	-State Ecological Expertise
SPZ	-Sanitary protection zone
SPG	-Sanitary protection gap (linear distance)
SPG	-Sanitary protection gap (linear SPZ)
STI	- Sexually Transmitted Infections
USD	- United States Dollar
WB	- World Bank

Glossary

Assessment	- The act of judging or assessing a situation or event
Akimat	-Administration of Oblast, Rayon or Village
IEE	-Environmental assessment undertaken for a regional or pre-feasibility level study for identifying and assessing possible environmental impacts
Oblast	-Region/Province (16 of them in Kazakhstan, including the cities of national level - Almaty and Astana)
Project	- A proposed capital undertaking, typically involving the planning, design and construction of a large-scale plant, facility or structure
PK	-piquets (1 PK=100 meter)
Rayon	- Districts (160 of them in Kazakhstan)
Road Corridor	- An uninterrupted carriageway, which originates from one town or major intersection and terminates to another town or major intersection
SEE	- State Ecological Expertise
Scoping	- Scoping is the process for determining the issues to be addressed, the information to be collected, and the analysis required to assess the environmental impacts of a project
GOST	- State standards, which regulate requirements to almost all kinds of products and activities
MAX	-Maximum Allowable Concentration of a harmful substance in air, soil or water
Tenge	-Currency of Kazakhstan
Screening	-The process by which a decision is taken on whether or not EIA is required for a particular project
SNiP	- Construction norms and rules
FIDIC	- Internationally accepted construction contract template

Executive Summary
Shymkent to Border of Zhambyl Region
Section-1: km 593-632 & Section-2: km 632-674

Introduction

Republic of Kazakhstan signed a loan agreement of KZT 42,516 million with the IBRD to implement the project of International Transit Corridor "West Europe-West China" (CAREC 1b and 6b) in June 2009. This Shymkent-Zhambyl 81km (593 to 674km, splitted in 2 Sections) road development is one of the sub-projects under that Transport Investment Project agreement. The Committee for Roads (CR) is the project executing, implementing and disbursing agency. The objective of the Project is to develop an efficient, affordable, and environmentally sustainable transportation system that forms a part of the north east to south west route of the country.

The Project includes targeted measures and specific facilities such as provision of interchanges, road construction over new alignment, provision of bridges and culverts, bus stops, road marking, underpass to ensure a quick, safe and reliable transport services and guarantee proper physical connection with regions and cities.

Scope of Report

The scope of work includes the following**:**

- Review of RK and WB regulations
- Description of the general environmental baseline;
- Nature of potential impacts of the project, their magnitude, duration, and spatial distribution of impacts; identification of affected groups;
- Information on potential mitigation measures to minimize the impact including mitigation costs;
- Review and analysis of the environmental and social considerations of alternative alignments; and Formulation of an environmental management and monitoring plan.

This EIA Report contains 2 Section, as such Section-1 (593-632km) and Section-2 (632-674km). The estimated construction cost for Section-1 is KZT 19,900 million and 22,616 million for Section-2.

Objectives

The purpose of this report is to provide an assessment of the potential environmental matters that need to be taken into account with regard to the construction and operation of the road from Zhambyl Oblast Border to near Shymkent City. The Project is divided into two Sections, as such Section-1 is Eastern: Zhambyl Oblast Border to Zhaskeshu, (593-km – 632km); and Section-2, Western: Zhaskeshu to Shymkent by-Pass Interchange (632 to 674km) of the A2 highway. The

remaining parts will be finance by other donor agencies, as such ADB from 705 to 742 km and EBRD starting 742 to 806km (up to Uzbekistan Border). The EIA provides an initial screening of the activities to be carried out under the proposed project, with the intention of identifying potentially significant environmental impacts, and determining appropriate environmental management, mitigation and monitoring measures, and identifying if any further investigation is required.

Project Description

The Project involves new construction of approximately 81 km of road, is largely new alignment in an attractive area of predominantly agricultural land. The whole alignment lies within the Arys River valley and its tributaries. The Project will provide an essential link in the route between Western China and Western Europe as part of the international transit corridor. The project includes the construction of a new four-lane asphalt or concrete paved road from (Zhambyl Regional Border towards Shymkent City) and will be prepared and contracted to meet internationally accepted (FIDIC; SNiP) design and construction norms and rules within a new alignment.

Summary of Findings

This EIA study has identified that there is the potential for both positive and negative environmental and social impacts to occur as a result of the Project. The EIA has determined that comprehensive and effective management and mitigation measures are feasible to be implemented through all delivery phases of the Project. Such measures could feasibly mitigate potentially negative impacts and enhance the identified potential positive benefits. Key potential negative impacts identified in this EIA include:

- Impacts to environments are possible from the accidental spillage, leakage or improper management of hazardous substances such as fuels or oils;
- Wastes generated by the accommodation of personnel living and working on site could pollute nearby environments if improperly managed;
- Noise from project construction activities may affect local people or nearby fauna.

The identified potential negative impacts are likely to be able to be minimized and managed effectively with the implementation of the measures detailed in the Environmental Management Plan. Potentially positive impacts that could result from the Project include, safe driving conditions for transit motor transport flows and local residents and higher carrying capacity of the road. The design road is also very much important for the socio-economic development of the population of Shymkent ans Zhambyl Oblast.

The detailed Resettlement Action Plan is under preparation. Results of this EIA suggest that the proposed Project is likely to be able to proceed without resulting in any negative significant

impacts to physical, biological, or socio-economic environments occurring, if appropriate management measures are implemented. As such, the Project will have overall beneficial impact as well as some minor negative impacts that will be carefully monitored and adequately mitigated. Therefore, the completion of this EIA fully meets the CR and WB requirements and submitted to MoEP to obtain Environmental Impact Permit.

1. INTRODUCTION

1.1 Background

1. The Republic of Kazakhstan signed a loan agreement of KZT 42,516 million with the IBRD to implement the road project of International Transit Corridor "West Europe-West China" (CAREC 1b and 6b) in June 2009. This Shymkent-Zhambyl 81km (593 to 674km, splitted in 2 Sections) road development is one of the sub-projects under the Transport Investment Project agreement. The estimated construction cost of this Section-1 is KZT 19,900 million. The Committee for Roads (CR) is the project executing, implementing and disbursing agency. The objective of the Project is to develop an efficient, affordable, and environmentally sustainable transportation system that forms a part of the north east to south west route of the country.

2. The project will focus on the development of transport services linking Almati City, Zhambyl Oblast to Shymkent City. The Project targeted measures and specific facilities such as provision of interchanges, 4 lane road, bus stops, road marking, footbridge or underpass included to ensure a quick, safe and reliable transport services and guarantee proper physical connection with other transport network in the country. The Program was developed as the Government's response to the transportation problems in regional areas, which include large traffic volumes between Shymkent to Zhymbyl route causing increasing delays, as a result of previous under-investment in infrastructure maintenance and expansion.

1.2 Scope of Work

3. This Environmental Impact Assessment (EIA) has been prepared for the route of Section-1 (593-632km), as part of the IBRD supports (IBRD Loan No. 7681-KZ) in undertaking the feasibility/design of the Engineering, Procurement, Construction Management and Supervision of the overall construction of 39km of the road on new alignment. The objective of the study is to help the Government prepare and implement an efficient, safe and sustainable transport network, in accordance with international environmental safeguards.

4. The purpose of this report is to provide an assessment of the potential environmental matters that need to be taken into account with regard to the construction and operation of the road from Zhambyl Oblast Border to near Shymkent City. The Project is divided into two Sections, as such Section-1 is Eastern: Zhambyl Oblast Border to Zhaskeshu, (593-km – 632km); and Section-2, Western: Zhaskeshu to Shymkent by-Pass Interchange (632 to 674km) of the A2 highway. The remaining parts will be finance by other donor agencies, as such ADB from 705 to 742 km and EBRD starting 742 to 806km (up to Uzbekistan Border). The EIA provides an initial screening of the activities to be carried out under the proposed project, with the intention of identifying potentially significant environmental impacts, and determining appropriate environmental management, mitigation and monitoring measures, and identifying if any further investigation is required.

5. In addition, the EIA aims to identify the likely impacts, both positive and negative, and assess the impacts on the environment of the planned road construction project undertaken by the Government through the Committee for Roads (CR). The objective is to ensure that the environment and the local community are not adversely affected by the road development. In order to achieve this objective, all negative impacts have to be mitigated and these costs must be included in the financial and economic analysis of the project. The overall aim is to ensure that the road development project is environmentally sound and sustainable in accordance with international requirements. The recommendations of this report concerning the construction period shall be incorporated into the contractors' specifications of the Project.

6. The scope of work includes the following**:**

- Description of the general environmental baseline;
- Nature of potential impacts of the project, their magnitude, duration, and spatial distribution of impacts; identification of affected groups;
- Information on potential mitigation measures to minimize the impact including mitigation costs;
- Review and analysis of the environmental and social considerations of alternative alignments; and
- Formulation of an environmental management and monitoring plan.

1.3 Structure of the Report

7. The results of the study are structured and presented in accordance with the format suggested by the World Bank:

- Chapter 2 describes the methodology for the preparation of the EIA;
- Chapter 3 reviews the regulatory framework for the EIA;
- Chapter 4 provides a description of the project. The overview, project components, type and category of project, as well as the need for the project, project benefits, location and details of project;
- Chapter 5 describes the baseline environment including the physical, ecological and human living conditions in the project area;
- Chapter 6 describes environmental impacts during construction and operation of the road, and proposes mitigation measures;
- Chapter 7 reviews analysis of alternatives to the project;
- Chapter 8 provides environmental management and monitoring plans;
- Chapter 9 outlines public consultations conducted for the project and
- Chapter 10 presents conclusions and recommendations.

2. METHODOLOGY

8. This EIA follows both the methodology outlined in the WB Operational Policy 4.01 "Environmental Assessment" and the EIA procedures established by the Republic of Kazakhstan. This EIA was prepared based on the following: (i) review of the EIA report prepared by local design consultant "SK-Engineering LLP" in 2011, (ii) review of detailed project design documentation, and (iii) further collection of missing primary, secondary data and information through field visits, surveys, discussions with the SKO Department of CR in Shymkent city, SKO Department of Environmental Protection, and stakeholder consultations.

9. This report covers the description of existing environmental conditions, assessment of environmental impacts of the project during construction and operation, recommended management and mitigation measures and monitoring of selected parameters. The scope of the EIA covers the natural and human environment, their interaction and any induced change brought about by the road reconstruction/development project. The methodology compares the present situation to that in the future both with and without the proposed interventions.

2.1 Data Collection

10. The objective of data collection was to provide a database of existing conditions, to be used for predicting the likely changes that are expected and for monitoring such changes. The first step was to undertake a project reconnaissance followed by scoping of the project's area of influence (regarding direct and indirect / induced impacts), identifying the specific parameters to be considered for the study and to outline the activities for collecting data on each parameter. Most of the existing data was collected from a previously prepared EIA report and other project design documentation, including hydrological and geological reports. In addition, missing data was collected by the design consultant team in 2011; this data was verified by the authors and used in the present document. The field data was cross-checked and ground truthing ensured through site visits, field surveys and on-site observation.

11. Further, Sensitive environmental and social receptors were analyzed in the project area and the results of the analysis were considered in design and planning of mitigation measures. The land acquisition and resettlement issues are considered as a separate document. However, the mitigation measures were integrated within the Environmental Management and Monitoring Plan.

12. The EIA document is structured as main text and annexes. The main body of the text provides concise and logical description of the environmental condition, sensitive receptors, potential environmental impacts and relevant mitigation measures, integrated in the Environmental Management Plan (EMP). The annexes provide more detailed information regarding particular issues, like: the report of the environmental pollution (water, soil and ambient air), the results of traffic pollution modeling. As described above, depending on prevailing topographical conditions, proper implementation of project components, and fulfillment of client's requirement, the project has been divided into 2 Sections (Section-1, km 593 to 632 and Section-2, km 632 to 674).

Data and reports from the following disciplines were also reviewed and incorporated in to the EIA study.

- Engineering
- Hydrology
- Geology
- Land Acquisition and Resettlement (RAP currently under preparation)

2.2 Scope, Resources, Limitations, and Timeframe of the EIA

Scope

13. The Scope of the EIA covers the natural and human environment, their interaction and any direct or induced changes brought about by the proposed road, interchange and a bridge construction.

Staff Resources

14. Initially, an EIA report in accordance with Kazakhstan regulations was prepared by a national consulting firm "SK-Engineering LLP". However, the report was not fully compliant with WB requirements and an international environmental specialist of SNC Lavalin International (Canada) assisted in revising the document with the support of local specialists and design consultants in providing necessary field data.

Limitations

15. Within the limited time frame, effort has been made to ensure quality control of surveyed data and coordination with other disciplines and agencies. A literature review was conducted to provide an understanding of the relevant physical, ecological and legal information available for the project. An assessment of the biodiversity and conservation significance of the project site was also conducted.

Thanks should be acknowledged to the Committee for Roads (CR), concerned agencies, field level personnel, and local people who assisted in the studies.

3. REGULATORY FRAMEWORK

16. Following Republic of Kazakhstan and World Bank's Guidelines and Policies an Environmental Impact Assessment (EIA) has been prepared to meet the requirements of both the Republic of Kazakhstan (RK) and World Bank (WB).

3.1. Administrative and Legal Framework for Environmental Protection in the Republic of Kazakhstan

17. Environment protection in Republic of Kazakhstan is administered by Ministry of Environment Protection (MEP) of RK and its regional departments. The all-encompassing core document that regulates environmental protection in Kazakhstan is "Environmental Code of RK" (2007), which is supported by about 120 supplementary norms, rules, and procedures. This document was developed at the request of the President of RK in 2007 compiling three Laws of RK: "On Environmental Protection", "On Ecological Expertise", and "On Air Protection". The document was developed to incorporate and adopt best international practices in environmental management, regulation and protection.

The Environmental Code of RK has the following fundamental principles

1. Sustainable development of Republic of Kazakhstan.
2. Environmental Safety.
3. Systematic approach to environmental regulation.
4. State regulation of environmental protection and resource management.
5. Preventive approach to any contamination or degradation of the environment.
6. Punishment for violation of environmental legislation of RK.
7. Mandatory compensation for environmental damage.
8. Permitting system and monetary compensation for environmental impact.
9. Use of the most environmentally sound and resource saving technologies, which use natural resources and have a minimal impact on environment.
10. Cooperation, coordination and transparency of state environmental authorities.
11. Encouragement to prevent, decrease and eliminate environment contamination and waste generation.
12. Open access to environmental information.
13. Priority given to national interests in use of natural resources and environmental impact.
14. Harmonization of environmental legislation of RK with principles and requirements of international laws.
15. Details of environmental danger of any planned physical projects and mandatory assessment of impacts on environment and human health when making decision on its implementation.

Environmental Impact Assessment and State Ecological Expertise

18. Environmental Code of RK states that an EIA report is mandatory "For any type of economic and other activities that may have direct or indirect impact on the environment and human health." The following stages of an EIA are required by the Code: (i) initial environmental examination;

(ii) preliminary EIA; (iii) full EIA; (iv) chapter "Environmental Protection" in project design documentation; (v) post-project environmental analysis (mandatory after 1 year from finish of major projects >50$ million).

19. The procedure of conducting and preparing an EIA report is regulated by "Instruction on conducting environmental impact assessment of planned economic activity when developing pre-planning, planning, initial project and project documentation" approved by the Order of the Minister of MEP, 28 June 2007, No. 207-p.

20. The first stage of the EIA – Initial Environmental Examination gives general information on characteristic of natural and socio-economic environment in the project area. In the second stage "Preliminary EIA", potential environmental and socio-economic impacts are determined. The resulting report together with the feasibility study report has to pass the State Ecological Expertise, which is mandatory for receiving a loan for project implementation.

21. Public consultations are regulated by Order of MEP of 2007 "On rules for carrying out public consultations" and required at all stages of the EIA preparation process. The general concept of public consultations is to ensure public participation in project design decisions for any interested person or legal entity, including NGOs and mass media. Results of public consultations should be recorded in minutes of meeting and addressed in the final EIA report.

22. Final project design documentation along with a full EIA report enclosed with minutes of public consultations, together with proposed changes to the design by the community. If proposed changes are not included, it will be necessary to justify any refusal of declining public requests and this has to be approved by State Ecological Expertise (SEE). SEE reviews the documentation together with public requests within 3 months and gives a positive or negative conclusion. In the case of a negative conclusion, the project initiator has to amend the project design according to the comments from SEE or abandon the project.

23. The project design developers usually subcontract a specialized firm, licensed to conduct an EIA according to RK legislation, and normally the final reports pass the SEE. However, in terms of accepted international practices, and particularly compared to WB safeguards requirements, most of the "local" EIA reports have deficiencies in core analysis, description of environmental and social impact, elaboration on project alternatives, and usually do not have a detailed Environmental Management Plan (EMP) and Environmental Monitoring Plan (MP) developed.

Permit system and project categorization

24. The environmental Code of RK establishes a permitting system for emissions and discharges of harmful substances into the environment, depending on the environmental category of the development. This system is aimed at the regulation of environmental pollution quotas in specific

zones and achievement of agreed pollution levels. Estimated levels of emissions and discharges are calculated during the full EIA stage. Based on the results of emission estimations, the project sanitary class is identified (Sanitary Danger classes from 1 to 5), and sanitary protection zone (SPZ) is established (1000m, 500m, 300m, 100m, 50m respectively) for the development .

25. SPZ serves as a protective barrier from environmental impacts of the project facilities and has to be planned and designed with up to 60% of the total area used for landscaping. Residential houses, rest areas, recreation and health resorts, schools, kindergartens, and hospitals are not allowed to be built in a SPZ. For road construction projects, a Sanitary Protection Gap (Linear) adjacent to the road is established based on estimated emission levels. The SPG has the same function as a SPZ, but does not need a detailed landscape plan.

26. Activities with sanitary danger class 1 and 2 fall under Environmental Category I; sanitary class 3, extraction of common minerals, all kinds of forest activities and special water use fall under Category II; Category III covers sanitary danger class 4; danger class 5 and use of fauna, except sports fishery and hunting fall under Category IV. The permit is given only after a positive response from the SEE and it establishes pollutant emission limits for the project, conditions of environment management and monitoring, and other commitments. Permits for Category I are issued by MoEP; other categories may acquire permits at Oblast level. This project is classified as sanitary Class 5 with a SPZ of 50 meters, and Environmental Category IV according to Kazakhstan regulations.

Air, soil, noise, and water quality standards

27. Standards for quality of air, noise, soil and water are established by multiple GOST, SNiP and SanPiN norms and rules, and the principle ones are:

- The Maximum Allowable Concentrations (MACs) for the harmful substances in the air are defined in "Sanitary and Epidemiological Requirements for the Atmospheric Air Quality" approved by the Order of the Ministry of Health of the RoK No 629 dated 18.08.2004.

- The requirements for quality of water are defined in the SanPiN 2.1.4.1 175-02 for non-central supply waters. For surface waters it is in SanPiN “Sanitary and Epidemiological Requirements for the Surface Waters Protection Against the Pollution” No. 3. dd 02.03.04 approved by the Order of the Ministry of Health of the RoK No. 506 dated 28.06.2004.

- Soil pollution levels are regulated by “Standards of the Maximum Allowable Concentrations of the Hazardous Substances, Harmful Microorganisms and Other Biological Materials Being the Soil Pollutants” approved by the Order of the Ministry of Health of the RoK No. 99 dated 30.01.2004 and Order of the Ministry for Environmental Protection of the RoK No. 21P dated 27.01.2004.

- The noise level standard for traffic noise is established in SNiP II-12-77 "Noise Protection". According to this standard, the noise levels from a motor vehicle in the 2 m distance from the buildings is 70 dBA. For residential areas, near schools, kindergartens, playgrounds and other sensitive areas noise levels shouldn't exceed: from motor vehicles – 10 dBA; construction activities – 5 dBA; for time from 7 to 23 – 10 dBA.

28. All discharges and emissions should be permitted by state authorities. Any violation of the abovementioned standards or absence of permits for emissions may serve as reason to suspend the activity under inspection (Appendix-B, Legal Framework).

International Treaties and Conventions Ratified by Republic of Kazakhstan

1. Basel Convention on the Control of Trans Boundary Movements of Hazardous Wastes and Their Disposal (Basel, March 22, 1989). Law of Republic of Kazakhstan issued on February 10, 2003, N 389-II «About joining of Republic of Kazakhstan to Basel Convention on the Control of Tran Boundary Movements of Hazardous Wastes and Their Disposal».
2. Amendment to the Montreal protocol on substances that deplete the ozone layer (London Amendment), June 27-29, 1990, issued on May 7, 2001, N 191-II «About joining of Republic of Kazakhstan to Amendment to the Montreal protocol on substances that deplete the ozone layer (London Amendment), June 27-29, 1990».
3. Convention on Long-Range Trans boundary Air Pollution (Geneva, November 30 1979), issued on October 23, 2000, N 89-II «About joining of Republic of Kazakhstan to Convention on Long-Range Trans boundary Air Pollution».
4. Convention on the Trans boundary Effects of Industrial Accidents (Helsinki, March 17, 1992), issued on October 23, 2000, N 91-II «About joining of Republic of Kazakhstan to Convention on the Tran boundary Effects of Industrial Accidents».
5. The Convention on the Protection and Use of Tran boundary Watercourses and International Lakes (Helsinki, March 17, 1992), Law of Republic of Kazakhstan issued on October 23, 2000, N 94-II.
6. Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters Environment Program (Aarhus, June 25, 1998) Law of Republic of Kazakhstan issued on October 23, 2000, N 92-II «About ratification of Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters Environment Program.
7. Convention on Environmental Impact Assessment in a Transboundary Context (Expo, Finland), February 25, 1991. Law of Republic of Kazakhstan issued on October 21, 2000 N 86-II.
8. The Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES (Washington, March 3, 1973) (with amendments, accepted on 11th conference CITES parties on April 16-20, 2000; on 12th conference of CITES parties (Santiago, November 2002)) Law of Republic of Kazakhstan issued on April 6, 1999 № 372-1 «About joining of Republic of Kazakhstan The Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES».

9. The United Nations Convention to Combat Desertification, Law of Republic of Kazakhstan issued on July 7, 1997, N 149-1.
10. The Energy Charter Treaty (Lesion, December 17, 1994) (with changes, included by Amendment to the Trade-Related Provisions of the Energy Charter issued on April 24, 1998) Decree of the President of the Republic of Kazakhstan issued on October 18, 1995, N 2537 «On ratification of the Energy Charter Treaty and Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects».
11. The Convention on Biological Diversity (Rio de Janeiro, June 5, 1992) Decree of The Cabinet of Ministers of the Republic of Kazakhstan issued on August 19, 1994, N 918 «On approval by Republic of Kazakhstan of The Convention on Biological Diversity and execution of its requirements».
12. Convention for the Protection of World Cultural and Natural Heritage (Paris, November 16, 1972) Ratified on July 29, 1994.

3.2 World Bank Policies and Guidelines

29. In its Safeguard Policies, The World Bank (WB) emphasizes the need to increase efforts in addressing environmental degradation. Environmental concerns are to be reflected in all WB initiatives, whether at the project, sector or national level. The WB's Operational Policies mandate the consideration of environment in all aspects of WB's operations. The Operational Policies, Bank Procedures and Good Practices (OP, BP and GP respectively) relevant to EIA for the present study have been considered:

OP/BP/GP	4.01	Environmental Assessment
OP	4.12	Involuntary Resettlement

30. **Environmental Assessment OP/BP 4.01 (triggered):** The main envisaged potential negative impacts during construction are the operation of borrow areas, generation of waste (construction materials, spent consumables, household waste and wastewater from camps), excessive land use, topsoil destruction and erosion. There is also a potential impact on groundwater and surface water from excessive turbidity and siltation, washing equipment in rivers (e.g. cement trucks) and accidental spills involving fuels and lubricants. During operation of the road storm drainage management, soils, ground and surface water contamination by heavy metals, soot and organic compounds (e.g. PAH), noise, dust, air pollution will be the main issues. Moreover, there is a potential risk of destruction or disruption of natural habitats and ecosystems by poor construction management.

31. **World Bank OP 4.12, Involuntary Resettlement,** is also triggered and sets out planning requirements to be met when proposed projects would cause land acquisition, resettlement or associated impacts. In accordance with the requirements a Resettlement Action Plan (RAP) is being prepared. According to this draft RAP the construction of the by-pass on the alignment agreed and as reported in this document will require the acquisition and demolition of 20 houses and will affect three undeveloped plots zoned for commercial use and will require overall acquisition of 91 hectares (including seven hectares of land owned by the state).

3.3 Conclusions and Recommendations

32. The following conclusions and recommendations address those issues where divergence of standards and subsequent practice between Kazakhstan and the World Bank have been identified that could lead to shortcomings in environmental due diligence during project implementation, because local practice may be rigid and well established and incorporating new elements or changing practices may need extra efforts during project supervision:
33. Kazakhstan has not yet put into practice an iterative process to ensure that project design and environmental analysis have an actively managed interface, and that data and findings from either are incorporated into the other. Usually the design approval process in KZ is quite advanced when EIAs are conducted, which may prevent recommendations for design changes based on the environmental analysis being implemented, as they would require a repetition of the approval processes. Design changes may, however, be introduced during the construction design stage once a contract has been awarded with relatively minor review and approval requirements. This is the recommended approach to mainstream design changes based on environmental findings into the designs submitted by the Contractor to the Client for approval and construction. Such design changes are likely to mainly concern the number and location of under- and overpasses for animals, farm traffic and wildlife.

34. Environmental protection is often seen as compliance with emission or pollution standards, while an understanding of environmental values such as fauna and flora, soils, landscape, biodiversity, esthetics, and the priority in enforcement appears on compensation payments rather than preventive and remedial action to avoid, minimize, mitigate or repair damage. This will require enhanced capacity building and supervision efforts during project implementation, with practical, implementation-focused training's for Contractors, supervising engineers and environmental authorities (incl. those representing forestry, national parks, water). It is recommended to ensure the presence of a consultant with international best practice experience in environmental site supervision and management during the first 6 months of project implementation (starting with Contractor's mobilization) to establish knowledge and compliance practice from early implementation stages onwards.

35. Due to the absence of distinct and practical EMPs in the ESIA reports in Kazakhstan, it is difficult to incorporate proposals of the ESIA reports into contract documents, translating them into enforceable clauses. It is therefore recommended to place special emphasis on this issue during the preparation of the tender packages for the construction works and, if required, seek assistance from international Consultants with specific experience in both procurement and environmental management.

36. The competences and powers of Kazakh environmental authorities regarding site inspections are very limited, with visits legally limited in number and having to be announced several weeks in advance to the project owner. While this practice is unlikely to be changed within the project context, a strong supervision system needs to be contractually embedded, with effective enforcement mechanisms including penalties and arrangements for required remedies (e.g. by third parties with costs deducted from the contracts). It would be recommendable to entrust a project

management consultant with the enforcing mandate that would in countries implementing best practice be with the authorities. In parallel the authorities should be kept well informed on all project activities and included in training and capacity building programs.

4. PROJECT DESCRIPTION

4.1 Overview

37. The Project involves road reconstruction with upgrade from 2 to 4 lanes between km 593 and km 632 with a total length of 39 km. The Eastern Section (Section-1: Zhambyl Border to

Zhaskeshu: 593-632km) is largely new alignment located on the territory of Tyulkubas District, passing through the attractive area of arable irrigated, gardens, vineyard, common pasture and other lands. The whole alignment lies within the Arys River valley and its tributaries. The Project involves the construction of highway A2 on a new alignment, and will provide an essential link in the route between Western China and Western Europe as part of the international transit corridor.

4.2 Project Components, Type and Category of the Project

38. The project includes the construction of a 39km new four-lane asphalt or concrete paved road from (Zhambyl Regional Border towards Shymkent City). The project will be prepared and contracted to meet internationally accepted (FIDIC; SNiP) design and construction norms and rules within a new alignment.

39. Based on the project's estimated air emission calculation results (which looks at a function between traffic density, types of vehicles, meteorological conditions, existing pollution loads and type of adjacent land use) it is classified as sanitary class V (the lowest risk class) as per RK (Republic of Kazakhstan) regulations. Such category should have 50 m distance SPG (linear SPZ for roads) and does not require a detailed EIA report.

40. However, significant potential issues could result from the project, such as erosion, vegetation cutting, impact on biodiversity and rivers, stream habitats (Arys, Zhabagly, rivers, Tastumsyk stream). For reasons of scale and nature of potential impacts the overall roads project (39km) was classified as safeguards category A, and hence this sections requires the preparation of a full EIA.

4.3 Need for the Project

41. The Shymkent-Zhambyl Oblast Border road is part of the Central Asia Regional Economic Cooperation (CAREC) Program. It is included within Transport Corridors 1b and 6b, which connects Western China to Western Europe and meets national, regional and international traffic needs. This link will (i) improve links between Kazakhstan and neighboring countries, as well as nearby regions; and (ii) contribute to development of an integrated transport network that caters for all types of traffic, (iii) minimize negative impacts of the road on local residents and their quality of life. The MoTC of RK considers this Project as one of the priority projects in the country, and it's implementation is a high national priority.

4.4 Project Benefits and Environmental Consideration

42. The Project aims to provide an efficient and safe road transportation system for the movement of passengers, goods and services in an environmentally sustainable manner. The Shymkent-Zhambyl Project will (i) improve transport infrastructure of the region, (ii) accelerate a vital east-south west corridor for the national and international movement of passengers and freight; will facilitate regional trade, support poverty reduction while accelerating growth and development in

the country as a whole, (iii) establish a new and fast link between China and Russia, and (iv) accelerate social and economic development while raising the living standard of local inhabitants.

43. The road re-construction will further promote traffic safety with positive impacts on traffic safety, air quality and noise levels. It will reduce overall emissions by eliminating the multiple deceleration-acceleration cycles currently required when passing through the existing road. Overall the quality of life in the nearby city and villages is expected to increase significantly.

44. Also, the capacity of this section will support the reduction of commercial risks during goods delivery, decrease transport costs and passengers travel time, etc. The Project will also provide a potential boost to tourism revenue, as access will be improved to a number of historical and ecological sites of national and international importance. It is also expected that the Project will enable increased freight volumes to be transported in the districts.

4.5 Project Location

45. The proposed Project is a continuation of highway "Khorgos-Almaty-Shymkent-border of the Republic of Uzbekistan" and this section 593 km -632 km is proposed for new construction, which is located on the territory of South Kazakhstan. The route begins at 0 PK 42°30′38″ of north latitude and 70°34′06″ of east longitude, and ends at 42°32′19″ of north latitude and 70°08′13″ of east longitude. The road stretches from the north-east to the south-west. The beginning is km593 PK 0+00, and end – km 632 PK of A-2 road. The road bypasses settlements of Kyzylasker, Azattyk, Shukyrbulak and T. Ryskulov district center at a distance from 100 to 200 m. PK0 is at km 631+501. Elevation of the project site is between 450 and 900m above the sea level.

46. The Government of Kazakhstan has no regulations on how to define the area of influence (AoI) boundary for the Environmental Study (IEE or EIA) or scoping specifications; therefore internationally accepted standards were applied for this study. The EIA boundaries reflect the distance from the road that potentially significant environmental effects are possible under standard conditions as observed for similar road projects. The distances are based on experts' best engineering judgment of environmental vulnerability, impacts, and available mitigation measures in road construction and operation. Further, these distances assume that there are no endangered or threatened species, wildlife sanctuaries, protected habitats, archaeological or cultural sites located within a 2 km of the road corridor. This has been confirmed for this road corridor project (Appendix-A, Maps and Diagrams).

4.6 Details of the Project

47. The project has been designed to category 1b. Design parameters are approved in accordance with applicable regulations in the Republic of Kazakhstan SNIP RK 3.03-09-2006 "Highways". The main technical parameters used in the design of section 593 km - 632 km are shown in Table 4.1.

Table 4.1 Technical Parameters

Sl.No	Description	Measurement unit	As per RoK SNiP 3.03-09-2006	Used in the Project
1	Technical category	-	1-b	1-b
2	Estimated traffic for 20-year perspective, vehicle/day	vehicle/ night	More than 7000	
3	Design speed	km/hour	120	120
4	Width of sub-grade	m	28.5	28.5
5	Width of carriageway	m	2x7.5	2x7.5
6	Number of lanes	units	4	4
7	Roadside width	m	3.75	3.75
8	The smallest width - Reinforced shoulder stripes - Dividing strip - Reinforced line on dividing strip	m m	 0.75 51	2.50 61
9	Slope of the roadway	%	15	15
10	The same of roadside	%	40	40
11	The largest longitudinal slope	%	70	67.3
12	The smallest radius in the longitudinal profile: convex concave	 m m	1500 0 5000	5000 3000
13	The smallest radius in plan	m	600	600

48. *Other Project features are:*

Length – 40.5 km (construction length of road section)

Width of roadbed – 27.5 m

Width of lane – 3.75 m

Width of centerline – 5.0 m

Maximum height of embankment – 15.0 m

Pavement – concrete

Culverts:

d=1.5m – 21nos.

d=2x1.5m – 2nos.

inlet 2.0x2.0m – 6nos.

inlet 4.0x2.5m – 4nos.

inlet 2(4.0x2.5m) – 2nos.

inlet 3(4.0x2.5m) – 1nos.

Interchanges in different levels – 4nos.

Bridges:

Bridge across Arys River (off-ramp No. 3at the interchange PK0+00);

Bridge across Zhabagly-su River;

Bridge across Arys River PK306+13.5;

Overpasses – 4nos. (at the interchanges);

Underpasses for agricultural equipment – 2 nos.

Lighting – 4 (four) interchanges

49. The design is in accordance with RoK SNIP 3.03-09-2006 and there are no deviations. The route is generally from east to west. The alignment follows over new land as such bypasses Kizilasker settlement, Ryskulov regional center, Kizen, Akbiik settlements and others. PK0 is adopted at the section of 631+501km.

50. The route of the road passes rain-fed, pasture and arable land, crossing natural streams, irrigation channels and discharge channels of the existing irrigation systems. Along the road where it passes irrigated lands the project envisages ditches for uptake and discharge of irrigation water.

4.6.1 Preparation of Construction Site

51. For the preparatory period the detail project includes works as follows:

-to remove the fertile soil layer, including stacking in dumps. The thickness of removed layer is 0.30-0.45m as per the soil map;
-to fell existing trees and vineyards at this site and traffic interchanges PKOv+00, PK 139+18, PK266+49.5;
-to reconstruct underground and air communications
- residual types of works (water pipe d-219mm at PK151+63, PK164+94.22, PK225+00 and traffic interchange PK 139+18; 10 kV OHL lines at PK 164+50 and PK 173+03, PK318+43 and PK388+83.54; 0.4 kV OHL lines at PK360+81.25, PK 384+91.00; 35 kV OHL lines at PK368+32.80, traffic interchange PK139+18; 220 kV OHL lines at PK354+12.28
-to remove from the zone of drilling and blasting works: gas pipeline at PK78v+57 and traffic interchange PK139+18; TU SM LTC -43 cables at PK320+52.37, PK320+64.07, PK320+83.45, PK373+23.13, PK374+92, PK375+53.97 and communication cables at

PK320+32.32; TU SM cables at traffic interchange PK139+18);
-to execute drilling and blasting works.

52. During the road reconstruction, as mentioned above, drilling and blasting works will be performed. Rock outcrops in the contours of the road excavations are located on the border of Zhambyl and Shymkent regions at the section of 593 km to 605 km in survey stake of PK 35+00 , PK 47+00.

53. This is the midland terrain, with an elevation of about 1100 m. The volume of rock excavation in the contours of the road excavations is 1 289 thousand meter. The depth of road excavation is up to 40m, width at the bottom is 34m.

54. Drilling and blasting works will be carried out in order to loosen the rock mass for its subsequent excavation and exploded rock mass will be used for dumping grounds of the road. The rock mass will be loaded by shovel-type excavators and transported by dump trucks with carrying capacity up to 12 tons. Further, drilling and blasting works will be performed by a specialized subcontractor.

55. The rocks subject to blasting are represented by silicified limestones, conglomerates, silicified shale, silicified sandstone and crash limestone. Referring to rigidity, the rocks belong to IX-X group as per SNiP, coefficient of strength as per scale of the professor M. M. Protodjakonov f = 12-14, the average unit weight = 2.8 t/m. On the surface, rocks are covered with gross-gravel soils with the thickness of up to 1.5 m.

56. Based on the geological conditions of exploitation, volume of blasting operations and required granulometric composition of blasted rocks, under the Project the method of vertical borehole charges with a diameter of 105 mm will be applied. Well drilling is carried out by SBU-100G rigs. The calculation of explosive charges is made for ammonite No.6-LH as a standard.

57. Upon mass blasting and removal of rocks, off-standard lumps of rocks will be crushed with blast-hole charges. Wells are drilled according to the technical sheet to be provided for each block separately. Upon drilling, blocks are surveyed to measure actual parameters of wells and their depth. The dangerous zone radius of dispersed rock lumps, in accordance with the RoK standard documentation is 500 m. The following Table 4.2 shows Key performance indicator.

Table 4.2 Key Performance Indicators.

No.	Description	Unit	Quantity
1.	Volume of drilling and blasting works	1000 m	1337
2.	Volume of drilling works	1000 m	165
3.	Number of wells	1000 units	20
4.	Specific consumption of explosives	kg/m	0.75
5.	Amount of explosives, total	t	1003

4.6.2 Longitudinal Section

58. Longitudinal profile till PK268+00 remains unchanged, since all the parameter meet the requirements of RoK SNIP 3.03-09-2006. Further longitudinal profile will be updated based on convex and concave curves allowable as per RoK SNIP 3.03-09-2006. The design was prepared in consideration of climatic, hydrological and soil conditions of the location as per RoK SNIP 3.03-09-2006. Design of longitudinal profile is made using CREDO CAD software. The governing roadbed elevation above the ground is determined considering snow drifts of 1.74m, where 1.2m is elevation of rise embankment over design level of snow cover plus 0.54m of snow cover thickness with the probability of exceeding 5%. The maximum longitudinal slope is about 67.3%, which corresponds to the category of road and SNiP norms (the highest longitudinal slope allowed in the mountain of 70%).

The adopted design solutions (slopes, radiuses, lengths of vertical curves) in accordance with design speed provide visibility in layout and longitudinal profile.

4.6.3 Roadbed and Drainage

59. The roadbed on the left side of dividing line is marked between PKO+00 - 44V+70, on the right side between PK0+00 - 70 and PK 77V+43 - 81V+30. The roadbed is represented by a bulk loam. The most of embankments of the road bed is compacted and only roadsides of high embankments are not compacted. Erosion has occurred on non-compacted soils in high embankments. Rain rills on slopes occur within PK0+00 – 4v+13 and PK 25v+00 - PK27+ 00.
60. Length of rain hills ranges from 2 to 35m, at the depth of 2.5 meters and with width of 0.3 to 2m. The roadbed slopes are covered with grass, sometimes with shrubs.

60. The roadbed is designed as per the standards of 16 technical category under RoK SNiP 3.03.09-2006, Section 7 “Roadbed” and based on conditions to preserve the roadbed geometric shape and stability of pavement and to ensure maximum preservation of irrigated land and minimum damage to the surrounding environment. Engineering and geological conditions of the road section conform to 1 type of the territory according to the soil upper layer moisture and the nature of surface drainage.
61. The route is covered with light silty loam on almost all the way, except for sections PK 350+10 – PK 357+30, PK 362+10 – PK 363+15 with gruss soil, p.32. Soils are generally not saline. Ground water not revealed to the depth of 6 m.
The roadbed width is 28.5m and it is represented by four types:

- Type 1 – embankment is up to 3m, steepness of slopes is 1:4;
- Type 1 a - embankment is up to 1.5m, slope steepness is 1:4, side ditched depth is up to .6m;
- Type 2 - embankment is up to 6m, slope steepness is 1:1.5;
- Type 3 - embankment is greater than 6 m slope steepness is 1:1.5-1.75;
- Type 4 – excavation, interior slopes are 1:4, outer slopes are up to 1:10, 1:1.5.

4.6.4 Intersections and junctions.

62. Throughout the route of the road "Khorgos - Almaty - Shymkent - Border of the Republic of Uzbekistan" 593-632km it crosses local roads: PK0v+00 – "Badam-Zhaskeshu-Tulkubas" highway; at PK77v+75 – "Tastumsyk-Michurino" highway; at PK13 9+18 – "T.Ryskulov-Tulkubas" highway; at PK 266+49.5 "Akbiik-Zhabagly" highway.
Under existing conditions the roads have parameters of IV technical category, with pavements of cold asphalt mix H-10cm. For crossings the project envisages traffic interchanges at different levels to ensure the safety and well-organized traffic of transportation.

4.6.5 Land demand

63. Allocation of land will require for construction yard, storage yard for materials, parking lots of construction vehicles and machinery. The required estimated area of is about 311.14 and categories are as follows:

-pasture- 139,45 ha;
-irrigated lands – 108,4 ha;
-not irrigated lands – 48,49 ha;
-gardens – 5,9 ha;
-vineyards – 4,1 ha;
- other lands – 4,8 ha.

The area allocated for temporary use is pasture measuring 16 ha.

64. Besides, the project provides for compensation of loss associated with lands in permanent and temporary use pursuant to the standards regarding farming lands due to their withdrawal for using for purposes not related to agriculture, in line with Resolution of the Government of the Republic of Kazakhstan as of 8 October 2003 No. 1037.Table 4.3 provides information on purchased of land plots under the Project.

Table 4.3 Information on Purchased Land plots under the Project

Sl.No	Name of Rayon	Number of land plots	Governmental lands	Structures on land plots
1.	Tyulkubas	241	11	10
2.	Sairam	284	40	15

		525	51	25

Note: Most of structures are cafes and fuel stations

4.6.6 Construction Duration

65. The standard duration of road construction is determined according to RoK SNiP 1.04.03-2008. However, construction period of 24 months is therefore required for each section.

5. BASELINE CONDITION

5.1 Topography

66. The area for the road passage has been linked to mountainous alluvial-proluvial plain. Relief of the inclined plain, on the whole, is wavy, slope-valley, where positive forms alternate with wide depression. Sides of slopes and hills are gentle, depressions are with flat bottom. In some places

the relief is considerably cut with valley of rivers and streams and waterless valleys. The highway crosses the rivers Arys, Zhabagly, Kizen, Tastumsyk stream, a lot of irrigated ditches and streams.

67. In general, South-Kazakhstan Oblast has been located in desert area. Rivers mainly belong to the basin of Aral Sea (main Syrdariya). Most part of the territory is a plain, only in the East and Central part of the mountain. The plain consists of horizontally deposited tertiary and quaternary sediments and occupied by sand deserts. The designed road section runs through the highland, which in its turn has been located within mountainous plain, with common incline of the territory towards Arys River.

68. Engineering-geological conditions for the surveyed road section km 632-593 are represented by light clay of light brown color – from tight ductile to hard consistence, with capacity more than 6 m except for section PK260+00-PK264+00, represented by pebble soil with boulders and lumps. Soils everywhere have not been salted. Land surface of the section between PK0v+00-PK84v+00 , where some types of works for road construction have been already executed, is even, aligned, and only in the area of excavation PK20v+50-PK 25в+00, has been digged up.
The lane of the highway has been crossed by ditches, channels and ravines, as well as sand clay roads and roads with asphalt concrete pavement.

69.The largest ravines (gullies) have been located at PK25v+99; PK 28v+57; PK 77v+43 and PK81v+81, PK106+46, PK243+40, PK260+70, 323+00, PK359+88, PK371+73. The depth of the ravines is from 2 to 9 meters; the slopes are of medium steepness and steep to vertical.
The streams with permanent drain run along the bottom of the ravines.

70. Depending on the rate of the executed works for the construction of the highway, the road section PK0v+00-PK84v+00 can be divided into five parts with similar conditions:
The first part of the road section, where only top soil has been removed:

- between PK 44v+70-81v+00 along left lane;
- between PK 44v+70 – 70v+50 and PK81v+30 – 84v +00 along the right lane.

71. The second part of the road section is between PK 20v+50 - PK25v+00, where excavations have been carried out. This part has been digged up, height of the slopes for excavations is up to 8m, slopes are of medium steepness.

72. The third part of the road section, where only subgrade has been filled, without pavement, height of the embankment at an average is up to 1.5 m, and only at the start of the road and within ravines the height of the embankment has been changed from 2 to 8 m. It is between PK 0v+00 - PK4v+13, PK 25v+00 - PK26v+15 and PK 77v+43- PK81v+30 along the right lane of the road.

73. The fourth part of the road section is, where the subgrade has been filled and roadbase has been arranged. Between PK4v+13 - PK5v+88, PK 8v+00 - PK9v+28, PK 16v+56- PK20v+50, PK 28v+15 - PK 29v+85, PK 37v+74 - PK44v+70 – along the left lane of the road and between PK4v+13 - ПК9v+28, PK 16v+56 - PK20v+50, PK26v+65 - PK30v+04, PK37v+74 -PK44v+80 and PK 70v+50 - PK77v+43 – along the right lane of the road.

74.The fifth part of the road section is, where all the works have been executed, and asphalt concrete has been laid from one to three layers. It is between PK 9v+28 - PK16v+56, PK34v+66 -PK37v+74 along the left and right lane of the road.

For the rest length of the road the works were not executed. The land surface is even with gentle slopes of small hills. Between PK216+ and PK223 is a wide valley with slopes of medium steepness and depth of cutting up to 27 m. The stream with permanent drain runs along the bottom of the valley.

75. For the rest part of the road shallow not deep hollows (ravines) without permanent drain cross it, there is a drain of surface water through it only during rains and melting of snow.
Valley of Arys River at PK303-PK308 has the depth of cutting up to 5 m, high-water bed consists of pebble soil. From the valley of Arys River (elevation mark is 970 m) there is a permanent common increase of the land surface with well expressed hills and small hills on the territory. From RKZ 49+00 there are exits to the surface of rocks, difference of from the bottom of mountains and their peaks is about 75 m, the lowest mark on the bottom of mountainous valley is 1090 m, the slopes are of medium steepness. Land surface of the road from PK363+00 to PK394+38 are weak inclined with small gentle slopes of small and medium hills.

5.2 Climate

76. The climate is continental, desert. Winters are short duration, the average January temperature from -2 ° to -9 °. Even in the cold of winter thaws and rain occurs. Spring is short, at this time the greatest amount of precipitation falls. Summer is hot, prolonged, with many sunny days, the average July temperature is +22 °, +24 °. Autumn is long, warm, slightly overcast
Data of meteorological station, Shymkent Tyulkubas.

Road-climatic zone IV. Wind district - 3. Outdoor air temperature ° C:

- Maximum +44
- Minimum -34
- Annual average +12.7
- The coldest days -25 (0.92)
- The coldest five days -17 (0.92) Regulatory freezing depth:
- Loam 0.38, the penetration depth of 0 ° - 0,48 m.
- Gravel 0m.
- Average annual precipitation - 951 mm.

The estimated thickness of snow cover (with 5% probability of exceeding this) -54 cm
The maximum of average wind speeds by points in January - 4.3 m/sec. The number of days with wind speeds exceeding - 15m/sec - 5 days.

The number of days with hail – 5; with icing – 3; with frost - 2

Duration of the period with average temperature <0 ° C; days - 61 days. The average duration of snow cover -83 days. Wind direction is shown in Table 5.1.

Table 5.1. Wind Direction and Speed

Index description	Month	Unit	Point Indexes							
			N	NE	E	SE	S	SW	W	NW
Frequency of winds	Jan	%	4	8	32	24	6	11	8	6
Average Speed	Jan	m/sec	1.6	2.7	2.6	2.8	5.4	5.1	2.9	2.2
Frequency of winds	July	%	9	**22**	25	12	3	6	8	15
Average Speed	July	m/sec	3.6	5.6	2.9	2.7	3.8	4.2	3.3	3.2

5.3 Geology and Litological Structure

77. In geological structure of the road alluvial-proluvial sediments have been deposited, which is represented by clay sand, clay loam, pebbles, rocks. Clay loam is light pulverescent, deposited between PK501s-PK359+50 under its profile, light brown, macro porous, solid, semi-solid consistence. Between PK272+00 and PK349+00, PK363+50 and PK394+35 at the bottom part of cutting the loam clay is dark brown, lumpy, semi-solid to tight plastic consistence inclusive gravel and pebble up to 25%.

78. Clay sand pulverescent is deposited in the end of the road as separate streaks and lens, the color of clay sand is brownish-grey. In floodplains and within river valleys, as well as foothill part the pebble soil with sand-clay sand aggregate is up to 40%. Detritus, which is well and average rolled, consists mainly from sediments.

79. Gravel soil – alluvium, is found in mountainous valley, making its bottom and slopes, clay sand is the aggregate for gravel soil. Rock soil, making mountainous massive consists of alternation: flinted slates, quartz sandstones and their conglomerates in limey cement. Rock soils are solid, weak weathered. Underground water has not been opened by excavations into the depth of 1-15m. According to the seismic zoning map as per SNIP 3.03-04-2001, the project area is situated in the active zone where the average seismicity of 8-point grade. The category of soil under seismic properties is *second.*

5.4 Soils

80. Within roadside zone (side reserve), subgrade of working layer of the road and bottom of culverts under nomenclatural type in accordance with ST-25100 and SNiP RK 3.03-09-2006 seven engineering-geological elements (EGE) have been selected.

81. *First EGE* – filled soil from clay loam light pulverescent, compacted, embankment of roadbed, solid consistence inclusive gravel up to 10%,35-v

Second EGE – clay loam light pulverescent, natural structure, deposited under the first EGE and within roadside lane, subsidence 35-v

Third EGE – clay loam pulverescent, dense with gravel, pebbles, non-subsidence.

Fourth EGE – clay sand pulverescent, solid with gravel, pebbles, dense, non-subsidence

Fifth EGE – gravel-pebble soil, type 6-v

Sixth EGE – gruss soil, type 32

Seventh EGE — rock soil, type 30-g

82. Soil of *second* engineering-geological element has subsidence properties only from external load while watering.

83.While watering the subsidence of soil from its own weight does not exceed 5 cm.
Type of soil conditions for the lane of the road under its subsidence is *first.*

5.5 Geotechnical conditions and relief

84. Engineering and geological conditions of the surveyed road section 632km-593kn are loam light of golden brown color – having from tough to solid consistency, with a capacity of more than 6 m, except in section PK260+00-PK264+00- 00 represented by pebble gravel with boulders and rocks. Soils are generally not salted.
85. The surface of the land area between PK0v+00-PK84v+00, where separate types of construction works are already performed, is smooth, well-planned and pitted only in the area of PK20v+50+00-PK 25V+00. Ditches, canals and logs cross the road as well as dirt roads and asphalted roads. The largest logs (clough) are on PK 25B+99, PK 28v+57, PK 77+43 and PK81v+81, PK106+46, PK243+40, PK260+70, 323+00, PK359+88, PK3717+73 . The depth of logs is from 2 to 9 feet, the slopes are moderately steep and steep to vertical. On the rest of the road the works have not been performed. The surface is flat with gentle slopes, low ridges and hills. The rest of the road crosses small shallow hollows with no constant water track. Surface waters flow only during rains and snow melting.

86. Valley of Aris river PK303 - PK308 has a depth of 5m, plain flood is flat and composed of pebbly soil. From the Valley of Arys River (elevation, 970m) there is a constant overall rise in the surface with well-defined areas on hills and small ridges. Rocks' outcrop starts from PKZ 49+00, drop of height from the base of the mountains to peaks is about 75 m, the lowest level at the bottom of the mountain valley is 1090m, and the slopes are of average slope. The land surface of the road from PK363+00 to PK394+38 is flat beds with gentle slopes of ridges and hills.

Geological and Lithological Composition

88. Alluvial and proluvial deposits underlay in geological structure of the road strip. It is represented by sandy loam, loam, gravel and rocky soils. Clay is light, silty loam light, which lies between PK501s-PK359+50 alone profile it is light brown, macroporous, solid and of semi-solid consistency. Between PK272+00 and PK349+00, PK363+50 and PK394+35 in the lower part of section it is loam of dark brown color, lumpy and from semi-solid consistency to low-plastic with inclusion of gravel and pebbles up to 25%.

89. Sandy loam with gravel and dusty gravel lies at the end of the route in the form of separate layers and lenses, color loam is brownish-gray. In the floodplain and within the river valleys, as well as in the foothills there is a pebble soil with sandy loam filler in a number of 40%. Fragmentary material is good and moderately rolled and consists mainly of sedimentary rocks.

5.6 Hydrology

Surface Water

90. The hydrographic network is represented in the form of permanent and temporary streams. The essential element in the hydrography of the territory is irrigation canals and small channels formed in places of groundwater availability. The highway crosses Aris River at 603 km in the upper reaches and the transport interchange PK0v+00 access track #3, PK11v+48.74. The river originates in Chakpak area located in the saddle between Talas crest and Karatau from springs at the altitude of 2550m. The River runoff is generated at low altitudes, so it can be classified as snow-and-rain-fed river. The total length of the river is 346 km, water catchment area is 13870km^2.

91. The area of the river basin at 603 km is 38.6 km^2 . The riverbed at this point is well defined. The channel width is 4-5m. The banks are steep with a height of 2-3 m. The bed over grown with reeds and sedges. The route crosses Zhabaglysu river at 605 km. The river originates on the southern slope of the Talas crest in Alatau mountains at the height of 3300m. The basin area at the cross-section of the bridge is 202 km^2, the length of river is 34.2 km. Zhabaglysu river at the bridge area is narrow. The bed is composed of gravel-pebble soil having thickness of 0.5 to 1.5 m. Loam is below this layer. The natural channel of the river approaches the bridge with several beds, divided among itself by small terraces, formed by remote friable fragmental material. There is no vegetation in the channel.

92. All streams are considered to be midlevel watercourses. The outstanding maximum flows on these streams were confined to showers in the melted stream flow. The main features of water collection regime are melt-water that forms the main phase of the water regime - spring floods. 70-90% of annual stream flow is made of spring flooding. Floods begin on average in March and April. Early spring flooding occurs in late February, late flood falls on to early May. The flood lasts on average - 160 days. Duration of flooding is caused by prolonged melting of snow in the mountains. Peak rivers floods in cross-sections of bridges, in average, fall on mid-April. At the end of spring flow autumn low water comes. During low water on the rivers short-term rises in water level caused by rainfall may occur. The amplitude of the fluctuations in the level of this period is small and usually does not exceed 0.2m. Only large streams crossed by the route of the road, flow regime have been monitored. But flow observation in these rivers was of not high

quality - the absence of observations of flood peak or high water, their intermittency, as well as water flows were not counted.

Table 5.2 Rivers in the Project Area

Sl. No.	**River**	**Period of observation**	**F, km^2**	**Q m^3/s**	**Flow layer, mm**	**Overflow К**
1	Zhabaglysu Novo Nikolaevka village	from 1936	172	156*	-	-
2	Aksu, Podgornoe village	from 1926	462	138*	819	0,005
3	Mashat – Antonovka village	from 1920	441	300*	-	-
4	Badam- Kyzyldzharsky gate	from 1953	1970	379	307	0,006

Groundwater reserves

93. Groundwater reserves are concentrated along the highway nearby the existing roads. All concentrated groundwater reserves are associated with the road with local roads with surfacing and without it. Groundwater depths vary between 1 and 15m.

5.7 Air Quality

94. In the Project area of influence, there are no major industrial zones or large production facilities that might have significant contribution to air contamination levels. In the project area, air pollution mainly occurs from exhaust gases of motor vehicles and agricultural equipment.
Detailed in Annex-4.

5.8 Noise

95. For the Project area, no measurements of current noise levels were conducted. It is considered that, levels are to be typical for comparable Kazakhstan rural settings, where main source of noise is traffic.
Detailed in Annex-4

5.9 Flora and Fauna

Flora

96. The project is located in the Asian desert region, the Irano-Turanian sub-region of the West Tien Shan province, in the foothills of the short grass semi-savanna. Vegetation of the undulating plains is represented by short grass ephemeroid-ephemeral semi-savanna consisting of ephemeroids (bulbous bluegrass, sedge carp) of ephemera: cheat grass and Japanese, goat grass, and lentoostnik etc. Forage yield in average is 3-5 kg/ha. To the above-mentioned groups the following is mixed: wheat grass, yarrow, licorice, etc. Arys River and its tributaries are specified by significant diversity of vegetation. Its floodplain is characterized by a dense and rich species composition of stand grass.

97. The most widely spread are bluegrass, brome, white and pink clover. The yield is 10 quintal/ha and more. Willow, goof occurs sometimes in the riverbed of the valleys. The main weed of pastures of rural district is lentoostnik long-haired, covering about 90% of all pastures. Along all the territories non-eatable poisonous weeds are distributed such as brunets and caper, significantly reducing the yield of pastures. Winter cereals (wheat, barley) are grown on the territory as well as alfalfa, sunflower, corn, cotton and melons on irrigated land. The predominant weeds found are bitterling, guma, field bindweed, *cynodondactylon* and cane.

Fauna

98. Rodents throughout the area of the road route such as squirrels, jerboa and field mouse. Representatives of insectivores are hedgehogs, ground-Royko, as reptiles are lizards and snakes. Domestic animals are sheep and cattle. Dogs and horses are used for various uses by the famers and are common in the area. Places of permanent nesting and habitation of animals are not found in the areas adjacent to the road route. A literature review was carried out of fauna characteristics in Shymkent Oblast. The Fauna throughout Shymkent Oblast is rich and diverse due to the extensive areas of deserts and mountains. However within the area of the alignment the wildlife is less diverse and many of the larger mammals are not generally found.

99. Nevertheless there are significant populations of rodents, badgers, rabbits, gerbils and others. Bird populations in the Oblast are extensive and various eagles, kites, harriers are recorded in the Oblast generally. The Great Bustard, Quail, Gray Crane, Sand Grouse, Jays and Sparrows are to be found. Pheasants are to be found. Since there are no large areas of water within or near to the alignment there are no significant resident populations of ducks, geese, swans etc. Similarly the extensive agricultural land within the alignment reduces the numbers and variety of birds within the area.

100. There is no record of rare, endangered or vulnerable species of animals and birds in the area. There is no record of any populations of Kazakhstan red list animals such as Saiga, Marmot or Gazelle. Here are no large areas of wilderness or natural habitats including forest areas close to the alignment. In the vicinity of the proposed road there are no large areas of water or wetlands. There are no sensitive areas or areas of high landscape value within the immediate vicinity of the road

and there are no known proposals to include any part of the area as a legal protected area. Based on the Consultant field work within the alignment and the knowledge and fieldwork of the Design Engineers there is no evidence to show that the alignment has any sensitive fauna or flora.

101. The Aksu Zhabagly Reserve area opened in 1927 as the first protected area in Central Asia. The reserve is rich with flora and fauna and lies in the mountain area approximately 8 km south of the alignment. There are more than 55 species of birds and animals and over 200 plant species in the reserve, many of which are listed in the Red Book. According to experts at the Aksu Zhabagly Reserve documentation prepared 30-40 years ago indicated that there was movement of fauna between the Aksu reserve and mountain area. In recent years however there is no evidence or record to show that there is any migration or general movement of large mammals across the valley between the two mountain areas. It is believed that the increase in traffic and various new developments in the valley have been the major cause of this change in habits. During the Wildlife Survey of the area there were no wildlife sightings of any larger animals.

5.10 Socioeconomic

102. Tyulkubas Rayon was founded in 1928 and is located in south-eastern part of South-Kazakhstan region. The District administrative center is village Turar Ryskulov. Total Population is around 88.2 thousand people and territory is 2300 square kilometers. The district includes: rural districts Mashat, Arys, Balykty, Zhaske-shu, Tastumsyk, Michurin Kemerbastau, Vannovka, Akbiik, Shakpak, Ryskulov, Keltema-shat, Zhabagyly and village districts and Tulkubas Sastobe. There are 13 constitutional departments. The institutes available in the region are: 1 High School, 1 college of agricultural business and tourism, 1 department of the South-Kazakhstan State University named after M. Auezov, 1 vocational school # 22, and 57 secondary schools.

103. The region features a large variety of agricultural products: cereals, oil, melons and potatoes, grapes and fruits. Food processing plants comprise 40% of the industrial sector. There are two large flour mill complexes belonging to LP “Sana Corporation”.

Development of mineral resources and mineral deposits has become another trend in industrial production. The only plant in Kazakhstan for the production of colored cement is located in Tyulkubas region. Tulkubasskiy lime plant has nearly 80-year history.

104. The total amount of product in the region in the first half of 2007 in comparison to the reporting period of 2006 is increased by 107.9% and equals to KZT 4 408 million (the first half of 2006 - KZT 4 083 million). Industrial products among them are – KZT 1 967 million (44.6%), agricultural products – KZT 2 441 million (55.4%).

The region earned established reputation of a region with an excellent yield of agricultural products. Traditional cultivation of different varieties of apples, pears, apricots, grapes were established several decades ago, and juicy and environmentally safe fruits are one advantages of Tyulkubas area

Land Acquisition and Resettlement

105. Land acquisition and resettlement is limited and details will be found in the Resettlement Action Plan currently under preparation.

5.11 Archaeology and Cultural Sites

No such sites are available around the Project Area of Influence.

6. ENVIRONMENTAL IMPACTS AND MITIGATION

6.1 Approaches to Screening of Environmental Impacts

106. The approach to screening of environmental impacts for the Project follows the guidance contained in a range of documents relevant to environmental assessment of road projects including the following key document.

- World Bank (WB) Environmental Assessment Sourcebook, Vol.2, Guideline for Environmental Assessment for Roads and Highways Projects,1991

107. Potential impacts on various environmental components due to different project activities

during preconstruction, construction and O/M stages have been identified. The following detailed investigations are being carried out to assess the impacts:

- Detailed review and analysis of available spatial databases for all environmental parameters in project areas such as terrain, soils, geology, rivers, land use, and population
- Geotechnical investigations through boreholes and soil analysis
- Environmental quality baseline of air, noise, surface water, and groundwater,
- Ecological surveys comprising vegetation and wildlife
- Review of engineering designs
- Hydrological calculations.
- Review of archeological reports
- Stakeholder, focus group discussions and public consultations.

108. Issues for inclusion in the environmental screening were identified through the EIA scoping process. Based on knowledge of the existing environment, the project characteristics and experience with the typical potential impacts of road and highway development, those issues for which environmental impacts were likely to occur were identified.

109. A range of technical investigations was carried out for each of the identified environmental issues to determine the effect that the project may have on a particular characteristics of the surrounding environment. Potential impacts were categorized according to the project phases, i.e. pre-construction, construction or operation, in which they occurred. Impacts with the potential to occur during decommissioning or as a result of accidents or unforeseen conditions were also identified. This process was carried out to ensure mitigation measures could be developed which were appropriate to each project phases.

110. For those identified impacts for which it was possible and/or necessary, mitigation measures were developed. The following hierarchy of mitigation strategies (from highest priority to lowest priority) was implemented:

- IMPACT AVOIDANCE: Changing project location, design and construction methods to avoid impacts;
- IMPACT MINIMIZATION: Where impacts cannot be avoided, implementing mitigation measures to reduce the impact to acceptable levels;
- COMPENSATION: Arranging compensation where impacts cannot be avoided or sufficiently mitigated;
- ENHANCEMENT: Measures, which, at insignificant cost to the project, give appreciable social or developmental benefits

111. Cumulative impacts of the project were considered separately. Cumulative impacts are complex impacts that arise from the Project acting in combination with other past, present and future activities and development. Cumulative impacts can be:

•Additive: impacts that result from the combined effect of a number of smaller impacts

•Compensatory: impacts that occur when the effects of one project or activity act to offset the effects of another

•Synergistic: impacts that result when smaller impacts combine to create different or more significant impacts - the overall impact is greater than the sum of the individual impacts

•Masking: impacts of multiple projects overlap in a way that there is no perceived additional impact, usually for an initial period of time after which impacts become one of the other types of cumulative impacts

Classification of Environmental Impacts of the Project

112. In this EIA report, (negative) environmental impacts of the Project are classified into 5 levels in accordance with international classifications with specific conditions of the project site taken into account.

- No impact: means unapparent and negligible influence on the natural and socio-economic environments at the project site and its surroundings.
- Minor impact (or low, small impact): means slight influence on a small portion of population or a small area of natural ecosystems (for example, less than 1.0 ha at each site).
- Intermediate (or medium impact): means influence on a portion of population or a relatively large area of natural ecosystems (for example 1.0 – 10.0 ha of forest at each sites).
- Major impact (or high): means significant influence on a large portion of population (various communes inside and around the project ROW) or a large area of natural ecosystems (more than 10.0 ha each site in this project).
- Unknown impact: means influence that is unpredictable as lacking information or data (for instance, impacts due to sea level rise, earthquake, heavy flood, etc in this project area).

113. Each impact is also determined as short-term or long-term, recoverable or irrecoverable, unmitigatable or mitigatable.

A detailed environmental management and monitoring plan has been prepared for all the identified impacts and is presented in Chapter 8 (Table-8.1).

6.2 Pre-Construction Stage

114. In Pre-Construction Stage the main activities of the project are:

(i) Study to select best alignment of the road.

(ii) Further investigation on geo-engineering to detailed design the road and bridge.

(iii) Design roads, bridges and other technical facilities.

(iv) Acquire land, relocate houses and infrastructural facilities; remove vegetation covers within the project ROW for construction of road, bridges and other technical facilities.

(v) Implement resettlement action plan (RAP).

6.3 Construction Stage

115. Generally, construction impacts are expected to last for a relatively short time period and are expected to cease soon after the completion of construction. Construction impacts are considered to be minimal as all the construction works will be carried out within the site on designated land and will be controlled via the mitigation measures defined in this EIA. If Contractor does not comply with the environmental specifications, serious long term environmental problems could emerge.

Some of the main environment impacts during construction and operation of roads are:

- pollution by exhaust gases by road transport;
- pollution by road-building machines and mechanisms, used during construction;
- contamination by dust and wearing of road surface and tires when driving motor vehicles, as well as during transportation of road construction materials;
- contamination during extraction of road building materials, excavation, arrangement of roadbed and pavement;
- pollution of surface runoff from the roadway, surface water sources adjacent to the road
- pollution of different types of vegetation;
- disturbance to habitats of animals;
- pollution of roadside by industrial and household wastes;

116. The route of the road bypasses such settlements as Kyzylasker, Azattyk Shukyrbulak and Ryskulov district center at a distance of 200m to 500m, so noise and emissions from vehicles will virtually have no harmful effects on population. Nevertheless emission calculations have been made. Based on the projected levels of traffic these emissions are within normal limits.

130. The Project has incorporated the following principles into the design and construction of the road alignment:

- Selection of location of the route to minimize disturbance to occupied land;
- Maximum use of natural landscape, preservation of green space (cutting down trees is only going to be carried out where necessary and replacement planting will be incorporated as a separate contract if required. ;
- Maintaining of existing irrigation network, arrangement of small artificial structures of concrete pipes of various diameters in agreement with the land user;
- To protect the soil from erosive processes strengthening of drainage ditches as well as reinforcement of man-made structures of bridges;
- Removal and storage of soil and fertile layer with its subsequent use for rehabilitation on temporarily occupied lands. The construction site after construction should be cleared of construction and household debris. All debris shall be removed into the body

of mound and household to dump.

117. Environmental contamination occurs during the process associated with construction of the road. Although impacts during construction can be significant it should be noted that environmental pollution in construction is of a temporary nature and its cumulative impact is less than during operation of the road.

Road construction can be divided into two main activities:

- Site clearance and removal of vegetation and major cut and fill activities for cuttings and embankments;
- Construction of road base and surface and provision of services and markings.

Each of these processes is different in nature and degree of impact on the environment.

6.4 Air Quality

Emission of pollutants

132. The amount and content of exhaust emissions is determined by design of vehicles, mode of engine operation, technical condition, quality of road surface, type of fuel and weather conditions. The main pollutants are as follows:

Carbon dioxide, CO_2 (carbon dioxide) is the most widespread, greenhouse gas affecting climate change. Emissions of this gas are proportional to the quantity of fuel used and fuel consumption essentially depends on road conditions.

S**ulfur dioxide SO_2** is emitted from diesel engines. Sulphur dioxide is colorless, but has a sharp irritating odor, dissolves in water to form "Acid rain" – solution of sulfuric and sulfurous acid is a characteristic phenomenon for many industrial and construction areas. It potentially damages vegetation far beyond the borders of emission sources.

118. The largest group of toxic substances composed by **hydrocarbons**, which are formed mainly in terms of lack of oxygen (methane, propane, aldehyde). Aldehydes are referred to highly carcinogenic substances which cause cancer disease.

Carbon monoxide CO violates the oxidative processes in the human body, reacts with hemoglobin in the blood at a rate of 200 times greater than oxygen.

Nitrogen oxides, NOx - oxides formed during high temperature oxidation of atmospheric nitrogen and low temperature oxidation of nitrogen compounds of fuel when released into the atmosphere is transformed into more stable dioxide NO2. This can have significant impact on human health. Emissions from vehicles, tend to create multiple increase in concentration of NO2. The presence of nitrogen in the atmosphere is of one of the main causes of the dangerous phenomenon of photochemical smog.

119. Emissions from vehicles and road equipment also include "solid particles". Their main component is soot, on the surface of its particles different hydrocarbons adsorb, threatening public health. Special consideration is required to be paid to environmental pollution by emissions of heavy metals, the first place of which is taken by lead.

120. A calculation has been made to determine the mass of harmful substances contained in exhaust gases, taking into account the projected growth of traffic. The traffic projection was based on the Basic Design data of a traffic flow in 25 years of 8714 units/day throughout the eastern part of the alignment.

Proposals to establish maximum permissible emissions, MPE

136. Emissions as well as fuel consumption depend on the mode of operation. Speed significantly affects the volume of emissions. This draft figure was calculated for maximum permissible emissions on a formula taking into account the emissions for each passing car and summing up all of emissions from individual vehicles, taking into account levels and types of transport.

Table 6.1 presents Calculation of maximum permissible emissions into the atmosphere during operation.

Table 6.1 Calculation of Maximum Permissible Emissions

Description	**Cars**	**Buses**	**Trucks**			**Total**
			up to 5t	**5-10t**	**More than 10t т**	
Design average daily rate of vehicles per day	6190	1018	110	527	869	**8714**
Number of passages of vehicle per year	2259350	371570	40150	92355	317185	
Mileage million miles a year on 39.433 km of road	89.09	14.65	1.58	7.58	12.51	
Total specific emission of CO, NO_2, CmHn. SO_2, CO_2, Pb g/km	191.6	1069.5	944.6	934.3	1644.4	
Coefficient of influence of factors (traffic and road conditions)	1.1	1.1	1.1	1.1	1.1	
MPE tons/year	**18776**	**17235**	**1642**	**7790**	**22629**	**68072**
including solid particles:			**0.71**	**3.42**	**18.72**	**22.85**

121. Based on calculation results the annual maximum allowable emission of harmful substances of vehicles into the atmosphere (MPE) is calculated using traffic projections for year 25 amounts to 68.072 tons/year.

122. A calculation has also been made for the maximum allowable emissions for the period of construction works. The calculation is based on amount of work on all structural elements of the road, and type of road construction machinery and vehicles used in construction and their performance (Tale 6.2, fuel consumption in Table 6.3).

Table 6.2 Specific Emissions of Harmful Substances in the Work of Construction Equipment (tons per ton of fuel burned)

No	Description of emissions	Designation	U.O.M	Engine emissions	
				carburetor	Diesel
1.	Carbon oxide	CO	tons	0.42	0.047
2.	Hydrocarbons	CmHn	tons	0.046	0.019
3.	Nitrogen dioxide	NO2	tons	0.027	0.033
4.	Carbon black	C	tons	0.001	0.009
5.	Sulfur anhydride	SO2	tons	0,002	0,010
6.	compounds of lead	Pb	tons	0.00037	-

Table 6.3 Fuel consumption for the Period of Construction of the Road Section (593-632 km)

Sl.No	Source emissions of harmful substances	Type of fuel	Fuel consumption kg/hour	Time of mechanism work m/hour	Fuel consumption, ton
1	*2*	*3*	*4*	*5*	*6*
1.	Dumptrucks Kam A35511-	diesel	5.33	201000	1071.33
2.	Motor grader 99kW (135 h.p.)	diesel	13.8	9496.81	131.1
3	Watering machine 6000 l.	diesel	9.54	33060.75	315.4
4.	Bulldozers 80h.p.	diesel	6.68	1113.69	7.44
5.	Bulldozers 108 h.p.	diesel	7.85	122350.65	960.45
6.	Asphalt distributors 7000 l	petrol	9.54	91.74	0.88
7.	Bulldozers 130 h.p.	diesel	13.90	313.62	4.36
8	Propelled smooth rollers 8 tons, 13 tons	diesel	4.51	45737.8	203.53
9	Propelled pneumatic rollers 16 tons, 25 tons	diesel	9.54	23057.8	219.97
10.	Truck cranes, 6.3 tons	petrol	6.04	41208.2	248.9
11	Truck cranes, 10 tons	diesel	6.25	207.54	1.298

12	Profiler grounds	diesel	3.50	49218.69	172.27
13	Cranes on tracks, 25 tons	diesel	6.36	344.1	2.19
14	Aggregate for the distribution of film-forming materials for cement concrete pavement	petrol	3.20	16406.23	52.5
15	Machines for grass cultivation on slopes of subgrade	diesel	8.40	695.9	5.85
16	Tractor 79 kW 108 h.p.	diesel	7.63	955.2	7.28
17	Excavator on tracks 0,25m^3, 0,40m^3, 0,50m^3	diesel	4.36	245.5	1.07
18	Excavator 0,65 m^3, 1,0m^3	diesel	8.47	85903.6	727.6
19	Road marking machines	diesel	1.70	312.1	0.53
20	Drilling machine to a depth of 3.5 m on a tractor 85 kW	diesel	13.80	336.1	4.64
21	Self-propelled road cutter	diesel	11.40	4542.3	51.8
22	Asphalt pavers	diesel	3.71	1704.24	6.3
23	Cutter of joints in freshly laid cement concrete	diesel	2.54	9250.17	23.5
24	Pneumatic rammers	diesel	17.50	27287.82	477.54
25	Hole borer on a tractor 79 KW	diesel	7.63	245.192	1.87
26	Scraper 8,0 m^3 /track/	diesel	9.2	8414.7	77.42
27	Hydraulic lifts H-25m	petrol	6.5	186.46	1.2
28	Machine for filling joints	diesel	12.0	5280.6	63.37

Dust

123. Another source of air pollution is dust from transportation of construction materials, brake pads, clutch plates of cars as well as products of evaporation from the road surface and lubricants. Dust is formed as a result of wear surfaces under the influence of climatic factors and cars, tire wear, dirt road paving vehicles entering the roadway with dirt roads, vehicular movement on roads with transition-type pavement, transportation, road construction materials.

124. The calculation of dust of the road taken by the "Recommendations on accounting requirements for the protection of the environment when designing roads and bridges", Moscow 1995. The values of maximum permissible concentrations of dust Cpdk

Table 6.4 Calculation of Dust of the Road

Object	The coating material (rock)	C mpc, mg/m^3
Population aggregate	All kinds of non-toxic	0,15
Working area	Quartzite, sandstone	1,0
	Granite, Zion, basalt, gabbro, gneiss, etc.	2,0
	Limestone, marl, dolomite	6,0

	Dust-silicate containing less than 10% free SiO2	4.0
	Clay, mineral, and mixtures containing no free SiO2	6.0
	Cement, clays, other fine fractionation of minerals and mixtures containing no free SiO	6,0
Note: In accordance with Standard 12.1. 005-76 attributed to the work area space outside the settlements of up to 2 meters above the ground.		

125. Paving divided into dusty and non-dusty. By non-dusty coverings include asphalt and cement. By dusty - broken stone, gravel, gravel-sand, improved soil, ground. According to the degree of dust-raising ability of dusty coatings are divided into categories listed in the table.

Table 6.5 Degree of Dust-raising Ability of Dusty Coatings are Divided into Categories

Categories ability to dust	Dust emission mg/m³	Priority dust control
Strongly dusty	More than 60	1-st
Average dusty	10-60	2-nd
Slightly dusty	Less than 10	3-d

Table 6.6 Value of the Actual Daily Average Dust Concentration

Description of pavement	Cf, mg/m³
Grit, gravel and other materials treated with binders	1-3
Grit from other species, constructed by the method of wedges	10-20
Gravel	20-40
Grit (limestone), a mixture of selected	40-60
improved ground	60-100
Ground	More than 100

Conclusion: Construction and Operation Periods

126. *Construction:* The detailed calculations for construction and operation periods yield results that are within the limit values prescribed by Kazakh legislation. Also, since the alignment passes through predominantly open rural land with only a few sensitive uses the adverse impact on any communities will be minimal. It will be essential to ensure no depots or worksites are located in these areas. Regular monitoring of air pollution against Kazakh standards (and international, e.g. WHO, for any parameters not covered by local regulations) shall be carried out throughout the

construction period. The party responsible for monitoring will be the Contractor, who will be obliged to report to the Engineer as well as local environmental authorities.

143. *Operation:* The results show that the magnitude of the impact of transport on the air quality does not exceed the maximum allowable concentrations to a distance of 20 m from the nearest traffic lane. During the operation phase concentrations of toxic substances contained in exhaust gases within the areas adjacent to the road are within the allowable MAC, and do not adversely impact on the environment or sensitive uses. However, some mitigation measures are suggested below (Appendix-D, Air Quality Calculations).

Mitigation during Construction Period

127. The concentration of pollutants for each source of contamination when working on the construction of the road shall not exceed the maximum allowable limits set by the Kazakh standard SanPiN RK № 3.03.015-97. Various measures to comply with this requirement and to reduce the intensity and toxicity of emissions during road construction can be summarized as follows;

- Reducing unnecessary movement of vehicles on unpaved roads and construction sites;
- Ensuring that all construction vehicles and equipment are maintained in accordance with manufacturer's recommendations and that any repairs are carried out immediately in accordance with manufacturers recommendations. ;
- Ensuring the uniform and proper operation of paving machinery, sealing equipment and asphalting machines that will help prevent unacceptable concentrations of pollutants (e.g. aliphatic and aromatic hydrocarbons, including carcinogenic benz-a-pyrene, PAH) the working area and the surrounding areas.
- No mixing of materials (concrete, asphalt), storage of materials or construction camps or depots to be located within 200 meters of any sensitive areas.
- Regular monitoring of air pollution shall be carried out throughout the construction period.

Mitigation during Operation Period

128. During operational period mitigation measures are suggested as:

- The design of the road will ensure more regular speeds and air pollution will be minimized.
- Improved maintenance of the road to ensure good surface conditions.
- The use of unleaded gasoline is increasing in Kazakhstan and leaded gasoline will be phased out, which will progressively reduce lead emissions into the environment.
- Regular monitoring of air pollution should be carried out throughout the operation period to determine any areas where air pollution exceeds the MAC.
- Mitigation by alignment design: distance of traffic flow to human receptors increased significantly in comparison to baseline situation.

129. **Dust Mitigation During Construction and Operation**

To reduce dust pollution during construction and repair work on the road during operation the following mitigation should be carried out:

- Maintaining, cleaning and watering of road sections where there is intensive dust formation. When choosing dust prevention materials, preference should be given to Calcium / Magnesium Chloride combined with Phosphates (CCP).
- Periodic watering of dirt roads at a rate of 2 l/m^2 per watering cycle;
- Set and enforce speed limit on sections of roads subject to intense dust formation;
- Ensure that the transport of all potentially dusty materials is done in covered trucks or the material is contained in secure bags.

6.5 Noise

Overview

130. During construction, the potential sources of noise are due to operation of construction related vehicular traffic, earth moving equipment, heavy machinery, and pile driving activities can generate high noise and vibration levels. Noise and vibration will have impact on people, fauna, livestock and natural environment. Noise level is measured in decibels (dB). The extensive exposure to noise can cause irritation, fatigue, increased stress and sleep disturbance.

131. *Transport factors:* traffic volume, fleet composition, speed of traffic, transportation and operational condition of the roads has the greatest impact on the noise level. The noise level is also dependant on the type of vehicle. Trucks, especially from diesel engines cause noise levels on all modes of operation to 15 dB higher than passenger cars. A special problem are the noise of heavy trucks, working in quarries, where their limited speed capabilities and high noise levels while operating in idle mode stroke. The noise level of motorized traffic on the road and road construction machinery used in the overhaul of the road can be very high, about 70 - 75 dB. There is significant noise from bulldozers, scrapers, pneumatic hammers, vibrators and other machines: noise from a scraper is 83-85 dB, while unloading dump 82-83 dB, soil compaction rollers 76-78 dB. Higher noise levels are generated by the simultaneous operation of several roads building machinery.

132. For a car the noise level varies significantly depending on the speed and load. At a speed of 75-80 km / hour and full load, the car noise mainly comes from the engine, but at a speed exceeding 80 km / h tire noise becomes dominant. When driving there are fluctuations caused by irregularities in the road, as well as any imbalance between the engine and transmission.

133. Acoustic enclosures around the pile drivers will reduce the noise levels by 60 decibels and are strongly recommended. Regular maintenance of construction equipment and vehicles in accordance with manufacturers' maintenance procedures will greatly reduce the noise levels. Contractors are recommended to monitor the noise levels regularly at the construction sites and take necessary measures to comply with the national standards. High efficiency mufflers are to be fitted to the noise generating equipment. The construction related activities will be restricted

between 0600 to 2100 hours within 150m of settlements and 500m from sensitive receptors (hospitals and schools).

134. The level of traffic noise is calculated by the norms of SNiP II-12-77 "Protection from noise." Maximum permissible level of noise generated by the automobile transport two meters away from buildings, converted in the direction of the noise source, according to the SNiP II-12-77 (Table 1.2) is 70 dB. The maximum permissible noise level adopted for the areas immediately adjacent to residential homes, recreational sites and micro-district and group homes, playgrounds childcare facilities, school sections, as amended:

- The noise generated by means of transport 10 dBA.
- An existing residential area 5 dBA.
- For day time from 07.00 till 23.00, 10 dBA. Noise reduction in the presence of single-row woodland belt, the distance between rows and 3 m is from 4-5 dB to 10-12 dB.

Exposure to noise during construction

135. Processes in the construction of roads are a source of intense noise, which can affect humans adversely. The intensity of the ambient noise of road machinery depends on the working body, the type of drive, work mode and the distance from the workplace to residential development. Much noise is created by the work of bulldozers, vibrators, compressors, excavators, diesel trucks. The noise produced during construction is temporary and localized.

According to GOST 12.1.003-83 "Noise" Noise standards are set maximum permissible level of 70-80 dB with noise level areas above 80 dB must be designated by safety signs.

6.6 Vibration

136. Vibration, like noise, leads to annoyance, loss of sleep and in extreme cases sicknesses. Vibrations arise mainly due to rotational or translational motion of the unbalanced mass of motor vehicles and mechanical systems. The main sources of vibration impact on the environment during the works will be the construction machinery, in particular piling machinery and other equipment.

137. Anti-vibration device screens, ie, trenches in the ground filled with discrete materials can reduce vibration. The width of the trench must be at least half the length of the longitudinal wave, or at least 0.5 meters and the depth should be not less than the length of the transverse waves and travel an average of 2 m to 5 m. These anti-vibration screens reduce transmission of vibrations through the ground to about 80%. Anti-vibration screens should be located as close as possible to the source of vibration, which increases their efficiency while reducing the depth of the trench. When placing the anti-vibrating screens on 5 - 6 m from the source of fluctuations in their effectiveness drops sharply.

Noise Mitigation During Construction

138. Reducing construction noise is achieved through the following activities:

- Impose a speed limit of traffic during construction to 60km/h. This can reduce noise by 7 dB (as compared to 80 km/h);

- Effective soundproofing of all vehicles and equipment by the use of foam, rubber and other soundproofing materials, as well as through the use of hoods with multilayer coatings; ensure that Contractors either have modern equipment that fulfill noise reduction norms, or that equipment is retrofitted to meet the required standards;
- Stationary units (e.g. aggregates or compressors) shall be placed in sound-absorbing areas or tents, which can reduce the noise level by up to 70%.
- The definition of road construction zones with high sound levels above 80 dBA must be designated with safety signs, and workers in this area should be provided with personal protective equipment (ear mufflers of plugs).
- As a means of reducing annoyance to and potential harmful impacts eliminate nighttime construction operation within the vicinity of the sensitive uses. No plants for batching and mixing of materials, for asphalt or concrete production, and no storage sites, lay down areas or construction camps shall be located within 200 meters of these sensitive areas.
- Regular monitoring of noise levels near any sensitive areas (especially zone 2) must be carried out to ensure there is minimal disturbance to residents. If acceptable night time noise levels are exceeded the community must be consulted and additional mitigation methods such as the installation of temporary noise control barriers should be considered.
- Noise Mitigation During Operation
- Normally the provision of a tree screen consisting of 5 m high trees will decrease levels at Kazhymukan to 69.8 dBA. Further consultation with the community and those potentially impacted will be carried out during the construction period to determine whether the use of noise barriers or noise bunds - which would be effective mitigation measures - will be acceptable and desirable to the residents.
- Generally the extensive tree planting, which will take place throughout the project corridor, will reduce noise levels at all other non critical locations throughout the alignment.
-

Conclusion: Construction Period

139. In view of the generally isolated characteristics of the area through which the road passes it is concluded that there will be only limited construction noise impact on any housing or sensitive uses. From experience and engineering judgment it is still predicted that noise levels will remain below the levels recommended in the regulations referred to above. There will be an increase in construction traffic using the existing main road and the minor roads leading to the road alignment. On the main road it is unlikely that the construction traffic will have a significant impact on traffic flows and noise disturbance to the existing communities but this will need to be reviewed and monitored in detail prior to the commencement of the construction period. For the minor roads that cross the new alignment and for any access routes, construction traffic will significantly increase traffic flows and potential noise disturbance. A traffic count on all possible access roads to road construction site together with a regular monitoring program will be prepared prior to the commencement of the construction period as part of the environmental due diligence and management measures.

Conclusion: Operation Period

140. In conclusion during the operation period the predicted noise impact to any residential or sensitive uses will be minimal, and where required can be further reduced by appropriate engineering measures, such as sound barriers, plantations and landscaping elements. This approach has successfully been implemented in the World Bank financed "South West Roads Project" which has similar objectives, approach, dimensions and issues. During operation regular monitoring of the noise situation and characteristics along the alignment and the access roads will be necessary. If any additional mitigation measures are considered necessary they will be included in the repair and maintenance budget on a running basis and carried out within those activities. No changes to the design of the alignment will be necessary.

6.7 Hydrology

6.7.1 Contamination of Surface Water Sources

141. The Project road crosses 3 major rivers (Arys River, Zhabagly-su River and Aksu River) and streams could affect the surface runoff flow pattern. During design, all drainage works are designed based on the historical flood data and flood forecasting. Embankments of the Project road will obstruct surface runoff and culverts are proposed for all small drains including agricultural drains.

142. The potential sources of impact on the water quality are the: (i) bridge construction which will increase silt load in the river during construction at bridge sites and accidental spillage of concrete into the river, (ii) embankments and construction materials (fill, sand, and gravel) are subject to wash out with rainwater, (iii) hydrocarbon leakage and spills from storage, mixing plants and washing of vehicles and equipment. It is therefore vital that prompt action is taken in the event of any potential water pollution incident, and (iv) discharge of sewerage from work sites and construction camps to the water resources; or percolation through seepage and contamination of the local water table.

143. Further, pollution of water bodies caused by road operation activities include emissions from vehicles, products, wear coatings, tires, brake pads, dust and materials used for the icing, construction and agricultural goods, which, when washout by rain and melted snow lead to saturation water runoff by various pollutants. Among the pollutants should be noted are particulate matter (mineral and organic origin, provided Suspension particles of sand, clay, silt, plankton, etc.), petroleum products (gasoline, diesel fuel, oil, fuel oil), lead and chlorides.

144. All streams that cross the route of the road, basically, except for existing rivers, are temporary. Surface runoff is formed mainly by melt water and occurs only in wet years. Rain floods - a rare phenomenon and volume are negligible. Underground power to the temporary water is virtually nonexistent.

145. Calculations of maximum water flow were carried out in accordance with the recommendations of "Handbook to determine the hydrological characteristics of the settlement" and SNIP 2.01.14-83. Therefore, the calculation of maximum permissible discharge (MPD) to water is not produced.

146. Road drainage system, developed by the project consists of several measures designed to prevent waterlogging and roadbed to intercept and divert water flowing to the subgrade. For surface water diversion project provides a device side drainage ditches (ditches), pipes for the passage of watercourses and water under the roadbed and prevent any possibility of stagnation, it's close to the road for a long time, which can lead to waterlogging of the road adjacent to the territory. Culverts are arranged at the intersections of roads with streams, dry valleys, irrigation channels and waste channels. In this project, taken round and rectangular tubes made of metal and concrete (40 units.).

Mitigation Measures During Construction

147. The key mitigation measures are, (i) divert the water flow near the bridge piers. In sections streams earths and stones will be stored properly so that they do not block rivers and streams. (ii) open surface will be covered by grasses and creepers to reduce wash-away material; (iii) hydrocarbons will be stored minimum 100 m away from rivers and dry gorges within the bunded areas; (iv) construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and contractors will submit a simple sewage management plan; (v) discharge of sediment-laden construction water directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge; and (vii) drainage system will be periodically cleared so as to ensure adequate storm water flow.

148. Water quality monitoring will be taken up during construction works at all major bridge site quarterly to assess the impact of bridge construction on water quality and implementation of necessary mitigation measures. Stream crossings that are dry during the work period will be kept unobstructed at all times and the channels will not be altered. Bridge construction will be scheduled in dry season to avoid adverse impact on fishery and river water quality.

Mitigation Measures During Operation

149. During operation to prevent contamination, the road will include drainage channels and culverts for removing storm water from the carriageway surface, to collect it and guide it to settlement and evaporation ponds (under the climatic conditions most storm water is expected to evaporate before reaching any natural surface watercourse). Drainage from the roadway and bridges shall be treated in settlement ponds where necessary (especially at Arys bridge), before reaching natural streams and rivers, or canals.

Water Needs for Construction Period

150. The construction work on the site of the proposed road will require water for construction activities and for drinking and domestic needs of the construction workers. Consumption of water for construction for compaction of sub grade and washing of road-building materials is estimated to be 451 733 m^3. The required amount of water is based on "Estimated ratios and costs for construction work.". Water consumption for drinking water supply is calculated in accordance with the legislation of the Republic of Kazakhstan. The water consumption for the period of construction of the road is based on and average of 27 l / day per person according to SNIP 2.04. 01-85. Consumption of water for domestic needs (washing, cooking etc), based on

the number of employees - 600 people and the projected construction period (24 months) are shown in Table 6.7.

Table 6.7 Water needs for drinking and household use and generation of wastewaters during construction period

Water use type	Number of workers	Number of working days	Consumption norm, m^3/day	Discharge norm, m^3/day	Water use		Wastewater	
					m^3/day	m^3/yr	m^3/day	m^3/yr
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Drinking	600	347	0,002	0,002	1,2	416,4	1,2	416,4
Domestic Uses	600	347	0,025	0,025	15	5205	15	5205
Total					**16,2**	**5621,4**	**16,2**	**5621,4**

151. Water take for construction and domestic use will use existing wells located along the projected road. All Rayon administrations have prepared letters authorizing use of water wells in their areas for construction. The water for drinking purposes can be transported by water tanker from the public supply systems of the nearest towns. Prior to construction all proposals for extraction of water for any purpose must be presented and discussed first with the local or regional organizations and bodies of the Sanitary and Epidemiological Department.

Water Resources Conclusion Construction Period

152. Based on the water requirements during the construction period and the abundance of estimated reserves of ground and other water resources (Shelek River alone has an average water flow of 5-7 m³/'sec) and it is considered that there is adequate water for all construction activities and total resources will not be affected.

Water Needs for Operation Period

153. A continuous supply of water will be required for routine cleaning and maintenance requirements and for cleaning after accidents. Water will also be required for the various uses within the rest/service areas.

Water Resources Conclusion Operation Period

154. Based on the potential water requirements during the operation period and the known reserves of surface and groundwater there is adequate water for all operation activities and total resources will not be affected

6.7.2 Contamination of Ground Water Sources

155. Within Section 1 the groundwater is generally at a depth of 5 to 10 meters. The majority of the road will be constructed on embankment at an average height of 2-4 meters above present ground level. There are no cuttings in Section 1. Except at bridge construction locations any impact on groundwater levels is likely to be minimal and contamination will be unlikely. It is unlikely that any groundwater resources will be impacted by the construction activities. The groundwater used for household use or irrigation at depths of 10 meters or more which will not be impacted by any construction activities.

156. Possible pollution sources during operation may be roadside filling stations, service stations, workshops, points of inspection and locations where vehicles are cleaned. Also a potential pollutant is salt and chemicals used for deicing, which, when washed out by rain and melted snow can lead to concentrations of various pollutants in runoff water. Additionally, there is the risk of unwanted spills of hazardous or toxic substances due to road accidents. Among the more serious pollutants would be particulate matter such as soot (which may be enriched by lead due to the lead content still added to some gasoline), rubber particles and heavy metal containing abrasives from brake pads, and liquids such as fuels, oil and lubricants containing aliphatic and aromatic hydrocarbons, PAH (polycyclic aromatic hydrocarbons) and phenols.

157. During intensive run off by heavy rainfall which normally occurs in the period March to June accumulated dust may become mobilized and contaminate runoff water and subsequent recipients. Calculations of maximum water flow were carried out in accordance with the recommendations of "Handbook to determine the hydrological characteristics of the settlement" and SNIP 2.01.14-83.

Conclusion on Contamination of Groundwater Resources: Construction and Operation Periods

158. Based on the groundwater levels within Section 1 and design characteristics of the same Section, it is concluded that pollution of Groundwater Resources during the construction period will not occur. There will be no substantive subsoil works such as major cuts or deep. Water for the construction activities as well as the camps will be extracted in relatively small quantities from existing wells or the public supply system. Generally water availability is unconstrained in the project area. There will be spill prevention measures in place. Also, only the uppermost aquifer, which is commonly not used for drinking water extraction, could at all be impacted by the project activities.

159. Also during the operation period pollution of groundwater will not occur provided that the provisions of good practice are reflected by the design and properly implemented. Examples of key design features to be implemented for groundwater protection can be effective drainage systems that convey storm water quickly towards the surface drainage network and avoid stagnant ponds that may infiltrate. Also, although the total pollutant loads over the Section are significant, the concentrations expected during runoff will be relatively small.

6.8 Borrow pits

160. Possible borrow pits have been defined by the design engineers but these are not part of the approved design since the contractor will make the final decision on the selection of borrow pits. The existing borrow pits have received EIA approval from the Rayon and it thus may be assumed that they will not be interfering with sensitive aquifers that have any significance as drinking water resource. Moreover, aside from accidental spills (by themselves unlikely) the operation of borrow pits has little contamination potential. The main risk is the failure to properly close and recultivate the pits, which may lead to their conversion into illegal waste deposit sites, which would have a substantial contamination potential. An important part of closure will thus be to dismantle and / or block all access roads.

161. The environmental impacts from river bed extraction are likely to be acceptably low where such operations are carried out under valid licensing and supervision by the authorities. Generally the high dynamics of the rivers in the project area, especially the very high sediment loads due to the proximity of the mountains, and the floods in spring that carry these loads down the river beds, speak for a low environmental sensitivity of these rivers towards gravel extraction. This potential source of construction materials, especially aggregates, thus need not a priority be excluded due to environmental considerations

6.9 Soils

Construction Period

162. Potential impacts on soil during construction period are topsoil damage, soil contamination, soil erosion. During the construction period it is important that the contractor undertakes all activities in accordance with good housekeeping, technical standards and regulations, contract specifications and manages all site activities in an environmentally sustainable manner.

To ensure soil is not polluted it is essential to undertake the following activities:

- Ensure, through proper construction management (especially precision of secure fuel storage and handling facilities, well maintained equipment and vehicles, strict enforcement of traffic safety on construction site), that oil and other spills do not occur, and that if they do immediate action is taken to minimize impacts on the soil.
- Storage of construction materials only takes place in properly prepared locations;
- Immediate sorting and removal of construction debris to an offsite landfill;

- Dismantling after use the base of construction sites and access/haul roads
- Apply topsoil on all vacant sites as soon as practical;
- Operation Period

163. During operational period all liquid wastes of any kind must be taken from the road and disposed of in an approved landfill. It will be the responsibility of the road agency to ensure speedy and full clearance of all waste from the road and from its vicinity.

6.10 Waste Generation

164. Construction waste will include, inert mineral materials such as excavated earth, sand and gravel asphalt and concrete rubble, which can be entirely recycled (categorized regarding geotechnical properties, broken and sorted) and used as construction materials for filling, grading and landscaping. Potentially noxious or hazardous materials will include concrete slurries from washing plants, barrels and containers from fuels, lubricants and construction chemicals, scrap metal including nails and bolts and steel bars, and spent welding electrodes. Construction waste will also include timber from felled trees and other organic matter from the clearing of the alignment. Waste from the construction camps will include normal domestic waste and toilet effluent.

Mitigation

165. The Contractor shall in accordance with Kazakh specifications ensure that all domestic and other non construction waste is collected and disposed of in a manner that does not cause any potential for contamination of surface and groundwater and contamination of soil. The default disposal pathway will be the deposition of domestic mixed waste on existing authorized waste management facilities.

6.11 Flora and Fauna

166. The alignment mostly passes through new fellow land minor agricultural and grazing land. Therefore any damage to biodiversity, habitats or sensitive flora and fauna is likely to be minimal. However, field surveys indicate that, 2293 of trees will be fallen during construction period for clearing areas for the proposed road.

Mitigation

167. Mitigation of flora impacts include: plantation of 16,046 of trees of native species along the RoW after construction of road. Other measures considered as, minimizing damage to topsoil vegetation; limit encroachment and damage to plants beyond project site; suppress dust formation; maintain roadside plantations by watering and fertilizing soil; sore and handle all topsoil in

accordance with contract specifications, planting more bushes and trees which will be included in a separate landscaping and planting contract.

6.12 Social

168. Potential negative indirect impact on the local community during the construction period may include: community tension due to unfamiliar people coming to the village; damage to existing roads by road construction equipment and heavy haul trucks; damage to private property and assets; traffic access interruptions; traffic safety on existing roads, etc,.

Mitigation

169. Mitigation measures include review the possible installation of temporary noise barriers or other means to reduce construction noise; water spraying and limiting movement speeds of equipment and vehicles near residential areas.

170. Other mitigation includes project information campaigns to support image of contractors and their staff, enforcing contractor employees' discipline; repair and maintain existing roads in satisfactory condition; prevent or compensate incurred losses of any asset owners affected by the contractor; organize proper signing and appoint traffic regulators on access roads and their exits; conduct information campaign to workers on HIV/AIDS, to prevent spreading of such diseases.

6.13. Traffic Safety

187. The new road is likely to be significantly safer than the existing road. However there will be instances where accidents may occur: animals getting on to the carriageway; speeding drivers may lose control of their vehicle; climatic impacts, such as snowstorms, heavy rains, hail, etc. But these are likely to be generally rare and reduced in comparison to the current baseline, i.e. the road will be significantly safer and traffic will be free flowing with more uniform travel speeds.

7. ANALYSIS OF PROJECT ALTERNATIVES

Environmental Impact of a Do Nothing Alternative

171. Do nothing would involve no new capital investment in the road and the present road would take all future traffic flows. This would create significant environmental disturbance to the existing communities along the present alignment. There would be increased noise and vibration, air pollution, and danger to local communities and road users, in particular pedestrians. Crossing the road would become more hazardous and the roadside communities could become physically segregated between the different sides of the road. Traffic congestion would increase and the economic disadvantages of this would be significant. Overall the quality of the environment and social conditions would slowly deteriorate along the present road.

Environmental Impact of a Widening Alternative

172. The widening alternative would involve the widening of the present carriageway to 4 lanes with a dividing strip. This would generally mean a widening of the ROW. In the existing communities there would be the need to purchase a strip of land and some resettlement would be necessary which would be much greater and more expensive than the recommended new alignment. In the existing communities many buildings, including sensitive uses, would be exposed to higher noise and vibration levels and air quality reduction due to the reduced distance to the road, and the increased traffic flow. As with the do nothing alternative the communities would be physically separated between each side of the road. To reduce physical segregation of both sides of the road it will be necessary to provide numerous pedestrian crossings; either bridges or pedestrian controlled lights.

Conclusion

173. Both the do nothing and widening alternatives of the Eastern Section would have larger adverse impacts on the environment and on the social conditions within the existing communities along the exiting road. Danger to local road users and pedestrians would increase, particular from the do nothing alternative. The selected alternative which involves a significant portion of green-field alignment avoids all settlements and impacts on local communities will be minimal. There will be some disturbance to agricultural activities during construction and some smaller long term impacts on agriculture. There are no significant impacts on natural habitats associated from this alternative. Overall it is considered that the selected alignment offers the best environmental approach to solving the problems with the present alignment and encouraging greater economic and social links between China and Kazakhstan.

8. ENVIRNMENTAL MANAGEMENT AND MONITORING PLAN

8.1 Environmental Management Plan

174. This Section deals with a set of management and monitoring measures to be taken during the project implementation to: Avoid, Reduce, Mitigate, or Compensate for adverse environmental impacts.
Efforts have been made to avoid and reduce adverse environmental impacts in the Project Design and additional recommendations to further avoid or reduce impacts.

8.2 Guiding Principles of EMMP

175. Environmental Management and Monitoring Plan (EMMP) is prepared for all the identified environmental impacts during pre-construction, construction and O&M stages due to implementation of various Project activities. The methodology followed for preparing the EMMP

consists of the following steps:

- Deriving mitigation/protection measures for identified impacts for each of the Project activity and environmental component;
- Recommend mitigation, compensation and enhancement measures for each identified impacts and risks;
- Developing a mechanism for monitoring the proposed mitigation measures,
- Estimating budget requirements for implementation mitigation and monitoring measures, and
- Identifying responsibilities of various agencies involved in the Project for implementation and monitoring of mitigation measures

176. The EMMP prepared in accordance with the above framework is given in Table 8.1 and Table 8.2 and each of the components in the framework is discussed in the following sections. The EMMP will be included in all the bid documents of the Project and will become a part of the civil works contract. The strict implementation of the EMMP and project management's strict enforcement of the adequate construction practices and standards will greatly reduce the negative impacts of the Project.

8.3 Mitigation Measures

177. This section includes the principles, procedures and mitigation measures that are necessary for ensuring the most appropriate environmental mitigation and enhancement plans applicable during different stages of project implementation. To avoid and minimize the impacts resulting from the activities of the project, measures/ management plans are based on appropriate technological design, improvements or adjustments, good site operational practices etc.
178. The mitigation plan has been recommended to highlight the action to avoid/minimize/ control the impacts arising out of different project phases i.e. pre-construction, construction and operation, for each of the anticipated impact as described in EIA Report. Mitigation measures have been identified to avoid or ameliorate potential negative impacts.

8.4 Monitoring Mechanism

179. Monitoring of environmental components and mitigation measures during construction and operation stages is a key component of the EMP to safeguard the protection of environment. The objectives of the monitoring are to (i) monitor changes in the environment during various stages of the project life cycle with respect to baseline conditions; and (ii) manage environmental issues arising from construction works through closely monitoring the environmental compliances. A monitoring mechanism is developed for each identified impact and it includes:

- Location of the monitoring (near the Project activity, sensitive receptors or within the Project influence area)
- Means of monitoring, i.e. parameters of monitoring and methods of monitoring (visual inspection, consultations, interviews, surveys, field measurements, or sampling and analysis)

- Frequency of monitoring (daily. weekly, monthly, seasonally, annually or during implementation of a particular activity)

180. The monitoring program will also include regular monitoring of construction activities for their compliance with the environmental requirements as per relevant standards, specifications and EMP. The purpose of such monitoring is to assess the performance of the undertaken mitigation measures and to immediately formulate additional mitigation measures and/or modify the existing ones aimed at meeting the environmental compliance as appropriate during construction.

181. The environmental parameters that may be qualitatively and quantitatively measured and compared are selected as 'performance indicators' and recommended for monitoring during project implementation and O&M stages. These monitoring indicators will be continuously monitored to ensure compliance with the national, WB or other applicable standards and comparison with the baseline conditions established during design stage. The list of indicators and their applicable standards to ensure compliance are given below:

- Air quality (PM), S02, N02, and CO) - Kazakhstan National Standard.
- Noise levels – Kazakhstan National Standards
- Surface Water Quality (TDS, DO, Turbidity, pH) -Standards from the Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group (April 2007) are used.
- Groundwater Quality (pH, Mg, Na, Coliform) - Standards from the Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group (April 2007) are used.
- Number of identified critical wildlife species and migratory birds - Comparison with Baseline Environment.

182. During the preconstruction period, the monitoring activities will focus on (i) checking the contractor's bidding documents, particularly to ensure that all necessary environmental requirements have been included; and (ii) checking that the contract documents' references to environmental mitigation measures requirements have been incorporated as part of contractor's assignment and making sure that any advance works are carried out in good time.

183. Construction environmental monitoring is a function of supervision, and the essential purpose is to ensure adherence to the EMP. The monitoring is a day to day process, which ensures that departures from the EMP are avoided or quickly rectified, or that any unforeseen impacts are quickly discovered and remedied. Specific actions in the EMP that are to be monitored are included in the Monitoring Plan. During construction, environmental monitoring will ensure the protection of side slopes, and embankment from potential soil erosion, borrow pits restoration, quarry activities, siting of work sites and material storages, siting of batch, concrete and asphalt plants especially close to the nature reserve, preservation of religiously sensitive locations, community

relations, and safety provisions.

184. Post monitoring evaluation will be carried to evaluate the impacts of the Project during first 3 years of operation of the Project. Regular monitoring of the condition of the road surface, bridges, culverts, drainage structures and slope protection structures is important from an environmental management point of view, but takes place as part of regular road maintenance. In addition to this activity, information on the locations, type and consequences of traffic or traffic related accidents is required, in co-operation with traffic police. Recommended air, noise and water quality monitoring, greening and landscaping and community feedback are also included in the Monitoring Plan.

185. The monitoring plan and details of monitoring locations for environmental condition indicators of the project during the construction and operation stage are presented in Table 8.2 (Appendix-C, Environmental Monitoring and Budget)

Monitoring Schedule and Performance Indicator

186. The monitoring schedule has been developed based on the possible occurrence of adverse impacts and required mitigation actions. However, this schedule is subject to change depending on the analysis results obtained. The performance indicators and protocol for changing the monitoring schedule is given below (selected IECs).

- Tree Plantation

187. The 75% survival rate of re-plantation shall be monitored on the first year of the operation phase. If the survival rate is found below 75%, necessary measures will be taken to increase the survival rate and monitoring shall be again taken up on the third year of operation. This cycle should continue until the 75% survival rate is achieved.

- Soil Erosion and Drainage Congestion

188. No significant soil erosion problem is anticipated due to the project either in the construction phase or in the operation phase. However, in the construction phase, some localized soil erosion may be noticed owing to construction activities. However, if soil erosion is noticed during construction and operation phase, the corrective action shall be initiated and frequency of check be increased to assess the tendency of occurrence.

189. The cross drainage structure shall be free from siltation. Visual check shall be made periodically to identify any drainage congestion or water logging along the road. Appropriate corrective action shall be taken to clear the congestion and prevent reoccurrence.

- Air and Noise Quality

190. Due to the variability of the construction activities, namely changes in batch composition, type of construction activity and other anthropogenic influences, the ambient air quality of the project area may change. If the air quality with respect to any parameter exceeds of its last

monitored value, the monitoring frequency shall be increased and cause of the increase investigated.

- Water Quality

191. No significant change in water quality is perceived due to the project in the operation phase. However, in the construction phase, the monitored values for pH, BOD, COD, TDS, DO and Oil & Grease might change owing to construction activities. Hence, it is suggested that if the monitored value for any water quality parameter exceeds of its last monitored status the monitoring frequency shall be increased.

8.5 Budget Estimates

192. Cost estimates are prepared for all the mitigation and monitoring measures proposed in the EMMP. The details of the cost estimates and the budget during construction stage and first three years of operation stage for the mitigation measures are given in Table 8.3. The cost estimates for some of the mitigation measures that were already part of civil works contract or resettlement plans are not included in the EMMP. The cost estimates also includes the budget for environmental monitoring, consultants for EMMP implementation, institutional strengthening and capacity building of Environmental Section of CR and environmental enhancement/compensation measures. The total budget for EMMP implementation is estimated to be about 2,184,200 (USD.14, 823.21).

8.6 Institutional Framework for Implementation of EMMP

193. Institutions responsible for executing and monitoring the environmental aspects of this Project are:

> CR is responsible for planning, construction, operation and maintenance of national and regional infrastructures in Kazakhstan and Regional CR is responsible for overall implementation and management of roads.
> During O&M period, Environmental Personnel of the CR will undertake periodic and random monitoring of the specific environmental management plans (EMP) addressed in this EIA.
> MoEP will be consulted if complicated issues arise during construction and operation stages.

194. Contractor is responsible for implementation of EMMP during construction works and Construction Supervision Consultant (CSC) is primarily responsible for supervision of monitoring of the implementation of the EMP. CR will hire 'external monitoring consultant' to monitor implementation and supervision of EMMP.

195. Each Contractor procured under this Project will be recommended to be a compliant of ISO 14001, 2004 Environmental Management System (EMS) certification. Each contractor will be recommended to have one Environmental Specialist and one Occupational, Health and Safety

(OHS) Specialist, who will be working in close coordination with the environmental staff of CSC and CR.

196. CSC will be responsible to monitor all activities of all contractors procured under the Project. As several contractors will be working simultaneously for timely and speedy implementation of the project, it is important that CSC has an environmental unit to effectively supervise and monitor the environmental activities being implemented in the field. The CSC is also responsible to update or make necessary changes to the EMMP if required based on the revised designs and locations.

8.7 Management of Project Related Impacts

197. An EMP has been prepared for each identified impact and presented in Table 8.1 and Table 8.2 presents monitoring plan during construction and operation periods. This EMP is divided into three sections, pre-construction, construction, and O/M. Again each section is further divided into Project activity to address activity wise impacts. Each impact in the EMP is addressed by the following steps.

- Activity
- Impact
- Mitigation measures
- Implementation agency
- Supervision agency

Table 8.1 Environmental Management Plan

Project Activity	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibility	
			Implementation	Supervision
A. Design Phase/ Preconstruction				
Detail Design	Potential impacts caused by drilling wells for geotechnical investigation	Properly cover and seal drilled wells after completion of investigation	Design Consultant	CR
Preparation of CEMP	Contractual requirement	(i)Selection of sites for material exploitation and storing; (ii) plans for material transportation routes and timing, (iii) identification of specific disposal sites for unsuitable soils, (iv) soil erosion control measures including soil stabilization measures at disposal sites, (v) construction camp management, (vi) quarry/aggregate/borrow site management and restoration, (vii) traffic management, (viii) noise reduction measures including construction of temporary noise barriers, (ix) dust suppression measures, (x) handling and storage of hazardous substances such as fuel, etc. (xi) occupational and community health and safety,	Contractor	CSC; CR
Hydrology	Project road crosses rivers and streams, and will affect the natural hydrological and flood water flow.	Hydrological analysis was carried out for all the rivers and streams in the Project area	Design Consultant	CR
Severance	Severance of communities	The project road is designed as access	Design Consultant	CR

	and villages	restricted highway (freeway) and overpasses are recommended for all local roads with interchanges with all major regional roads. Hence the project road will not interference with the local traffic		
B. Construction Phase				
Clearing of sites	Striping of top soils (20 cm depth) Excess soil, rock	Collect/strip top soil before earth filling and store and reuse it for final surfacing of road embankment and free plantation; Most part of cut spoils will be used for filling the embankments.	Contractor	CSC, CR Monitor
Establishment of camps	Lack of proper services in camps such as safe drinking water and sanitation	Provision of necessary facilities in construction camps	Contractor	CSC, CR (Regional)
Maintenance of camps	Contamination from solid waste	Implement waste management Activities; All construction materials will be reused, recycled and properly disposed off; All worn out parts, equipment and empty containers must be removed from the site to a proper storage location designated by CR & Municipality (*Akimat*); There will be no site specific landfills established by the contractors. All solid waste will be collected and removed from the work camps and disposed in local waste disposal sites	Contractor	CSC, CR (Regional), Municipality Monitor
STI and HIV trainings		Conduct for all construction workers	Contractor	CSC, CR

		induction training on STI and HIV issues as well as basic sanitation and health issues		Monitor
Large quantities of material import	Exploration of illegal source	Environmental permits of suppliers from relevant authority	Contractor	CR
Mobilization of equipment and materials through road	Road safety and Traffic Management	Implement Road Transport and Road safety Management	Contractor	CSC, CR Government, Police
Operationsat Construction Yards and Construction Sites	Air, noise pollution from material storage sites and mixing sites	Implement Air Quality Management Standard; Implement National Standard on Nose and Vibration Management	Contractor	CSC, CR
	Solid Waste, excess materials	Implement Procedure on 'Waste Management'; Develop appropriate construction waste management strategy along with its strict adaptation; Develop waste handling training material and conduct monthly waste management induction trainings	Contractor	CSC, CR
Operation and Maintenance Phase				
Vehicular movement	Increase noise level because enhanced traffic volume	Put signage for noise regulations at sensitive locations (school, hospitals, health care units) with clear instructions of not using horns and running vehicles with limited/allowable speeds	CR	MoEP
	Drainage leading to	Connect water pockets to the nearest	CR	MoEP

	water logging and impacting on surrounding lands	drainage structures/canals by constructing roadside drainage canal		
Landscape and Erosion Protection	Long term degradation of natural landscape at land strips and slopes; Visual impacts Change of drainage patterns, erosion, degradation of	Restoration of the landscape to the natural shape (at the sites not occupied permanently by the carriageways and road facilities, and where reinstatement is possible).	Provincial/Rayon CR in long term perspective through Contractors	CR, MoEP
Protection of Flora and Fauna Protection of Flora and Fauna	Mortality of animals during road crossing	Flora and fauna monitoring will be carried out during first 3 years of operation including monitoring of mortality of fauna due to project roads	Provincial/Rayon CR in long term perspective through Contractor	CR, MoEP

Note: *CR- Committee for Roads, CSC-Construction Supervision Consultants, MoEP- Ministry of Environmental Protection*

Table 8.2 Environmental Monitoring Plan during Construction and Operation

Parameter	Monitoring	Means of Monitoring	Frequency	Responsible Agency	
				Implemented by	Supervised by
During Construction					
Material supply	Work sites	Possession of official approval or valid license of the suppliers for asphalt, cement, quarry and borrow materials	Before an agreement for the supply of material is finalized	Contractor	CSC, CR
Operation of borrow and quarry sites	Quarry sites	Visual inspection of quarry sites	Monthly	Contractor	CSC, CR
Top soil	Construction corridor	Top soil of 0.15m depth should be excavated and stored properly	Beginning of earth works	Contractor	CSC, CR
Erosion	Side slopes of the embankment and material storage sites	Visual inspection of erosion prevention measures and occurrence of erosion	At the end of filling activity	Contractor	CSC, CR
Landslide/Rock fall control	Active rock fall sections and steep mountainous slopes	Visual Inspection, monitoring the construction of rock fence	Monthly	Contractor	CSC, CR
Hydrocarbon and chemical storage	Construction camps	Visual Inspection of storage facilities	Monthly	Contractor	CSC
Air Quality (dust, smoke)	Construction sites	Visual inspection to ensure good standard equipment is in use and dust suppression measures (spraying of waters) are in place.	Weekly	Contractor	CSC
	Asphalt Plant	Visual inspection to ensure asphalt plant is located >500 m from residential areas	Monthly	Contractor	CSC

	Material storage sites	Visual inspection to ensure dust suppression work plan is being implemented	Monthly	Contractor	CSC
Air Quality (PM, NO_2, SO_2, CO)	Near the sensitive sites and settlements (as directed by CSC)	Air quality monitoring	Quarterly	Contractor through a nationally recognized laboratory	CSC
Noise	Construction sites	Visual inspection to ensure good standard equipment are in use	Weekly	Contractor	CSC
	Construction sites	Ensure work restriction between 21:00-06:00 close to the sensitive locations/settlements	Weekly	Contractor	CSC
Surface water quality	At all streams near the bridge construction sites near down stream	Sampling and analysis of surface water quality (TDS, DO, Turbidity, pH)	Weekly	Contractor through a nationally recognized laboratory	CSC
Waste Management	Construction camps and construction sites	Visual inspection that solid waste is disposed at designated site	Monthly	Contractor	CSC, CR
Drinking water and sanitation	In construction sites and construction camps	Ensure the construction workers are provided with safe water and sanitation	Weekly	Contractor	CSC, CR
Floral and faunal Monitoring	Project area	Survey and comparison with baseline environment	Yearly	CR through nationally recognized institute	CSC
Safety of workers	At work sites	Usage of Personal Protective equipment Monitoring and reporting accidents	Monthly	Contractor	CSC, CR

Traffic Safety	Haul Roads	Visual inspection to see whether proper traffic signs are placed and flagmen for traffic management are engaged	Monthly	Contractor	CSC
Reinstatement of Work Sites	All Work Sites	Visual Inspection	After completion of all works	Contractor	CSC, RD
During Operation and Maintenance					
Air quality	At the Baseline Monitoring Sites	24 hours air quality monitoring of PM, S02, N02 and CO	Yearly	CR through nationally recognized laboratory	External Monitor
Noise Quality	At random selection along the approach roads	Hourly, day and night time noise levels (dB) monitoring using noise meters	Yearly	CR through nationally recognized laboratory	External Monitor
Floral and faunal Monitoring	In the Project area	Detailed monitoring plan developed on species assessment.	Yearly	Contractor and CR	External Monitor
Landscape	Along project alignment	Visual inspection of long-term degradation of natural landscape at land strips and slopes adjacent to road	Quarterly	CR	MoEP

Table 8.3 Summary of Costs of EMP during Construction and Operation

Parameter	**Total cost, KZT**
Atmospheric air	1,246,000
Surface water	332,400
Soil cover	224,000
Noise	168,000
Vibration	128,800
Radiation and chemical safety	85,000
Total	2,184,200 (USD.14,823.21)

Annex- C: Environmental Monitoring of Selected Parameters, Sites and Budget

9. PUBLIC CONSULTATIONS

198. Public consultations were organized in accordance with World Bank requirements, since at that stage all road sections were potentially suitable for World Bank financing, and the Borrower (Committee for Roads) has adopted World Bank procedures for the entire construction site. The announcement for public consultation was published in the state and Russian languages 20 days prior to public hearings. Further, the announcement of public hearings was placed on web-site (www. mtk.gov.kz) on 12.04.2011 and published in the district newspaper of Tyulkubas district. Public consultations were organized with sufficient place to sit. All attendants were recorded. The consultation meeting was attended by Local representatives of executive authorities (Tyulkubas district); SKR representative from the Road Committee; Representative of LLP ”SK Engineering” and local villagers (Tyulkubas district).

199. Consultations mainly were about project design decisions (road characteristics, bridges, underpasses for animals and farm traffic, fencing etc), land acquisition, and resettlement procedures, road impact on the environment, safety and risks of accidents during the construction and operation. All PAPs were given information on compensation procedures and contact details of local and international resettlement specialists.

10. INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING

200. At present there are two experts in the CR, they are assigned to look after environmental and social issues of development projects. They are guided by the Management of Technical Policy of Committee for Roads (CR). Considering the present situation, it is recommended that CR should hire the positions before starting the Project. To further strengthen the monitoring and compliance to environmental issues recommended in the EMMP, the following specialists are recommended for Contractors and CSC to be hired under the Project.

- Construction Supervision Consultant:
  - Environmental Specialist-International
  - Environmental Specialist-National
  - Social and Resettlement Specialist-International
  - Social and Resettlement Specialist-National

- Contractor:
  - Environmental Specialist
  - Occupational Health and Safety Specialist

A series of capacity building programs are proposed for both the environmental and social staff of CR through continuous and oriented trainings on:

- Environmental & Social safeguards, their importance and benefits
- Preparation of EIA such as screening and/or scoping and adequacy of impact assessment, EMP provisions, Costing etc.
- Preparation of LARP.
- Preparation of ToR, and other documentation
- Some of the senior representatives should receive environmental and social safeguard training under a recognized program (national and/or overseas).

11. CONCLUSIONS AND RECOMMENDATIONS

201. The EIA for Shymkent to Zhambyl Region (*Oblast*) Border Road has been prepared to ensure that the Project is environmentally sound and sustainable as well as in compliance with the safeguard requirements of the WB and Republic of Kazakhstan.

202. The present EIA reveals that there will be both negative and positive impacts due to the construction activities. Recommendations are made to mitigate expected negative environmental impacts with adequate funds provided to cover environmental monitoring and mitigation cost.

203. The major positive impact of the Project will be less air pollution and dust, less congestion, and improved traffic safety in the new road, and better accessibility. Additional positive impacts are the increased growth in the economy of the region, substantial income and employment opportunities, improved living conditions, reduced poverty, and better access to village produce.

204. Road safety will be improved by installing road safety barriers including proper traffic engineering signs and display boards. Soil erosion and rock falls will be minimized after Project completion. The contractor will prepare a spoil and waste disposal plan in consultation with MoEP and submit to CR for approval. Quarries and borrow materials will be collected from the pre-approved sites and will be properly restored after the extraction of materials.

205. Potential negative impacts are 327.14 ha of land acquisition and 2293 of trees will be fallen during construction period for clearing areas for future road, changes in land use and resulting damage potential of geo-hazards, borrow pits and quarry sites. Construction related activities will have impact on the natural drainages, generation of excess materials, noise and air pollution.

206. Construction works will generate a number of short time negative impacts on the environment. The temporary construction works could create more impacts than the activities related to the permanent works. For this reason, environmental management and monitoring program is developed for both temporary and permanent works covering construction and operation stages and is estimated to cost KZT. 2,184,200.

207. Proper and timely implementation of various provisions of the EMP in terms of mitigation measures, monitoring and capacity building will minimize adverse environmental impacts during project construction and operation. To ensure that adverse impacts due to project implementation will be adequately addressed, the tender and contract documents for civil works for the entire project shall include the EMP. Regular monitoring and reporting on the status of EMP implementation shall be undertaken to ensure that mitigation measures are implemented as required and to allow for formulation and implementation of corrective actions, as necessary.

208. Environmental Consultants of CSC will be responsible for monitoring of implementation of EMP and ensure compliance. Environmental Staff of CR is also responsible for supervision of construction works and compliance to EMP in coordination with supervision consultants and hiring of external/independent monitoring consultants. Capacity building programs are proposed to strengthen the capacity of the staff responsible for Environmental Issues in the CR.

209. The Project will have overall beneficial impact as well as some negative impacts that will be carefully monitored and adequately mitigated. Therefore, the completion of this EIA fully meets the CR and WB requirements and submitted to MoEP to obtain Environmental Clearance.

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Environmental Impact Assessment

Shymkent to Zhambyl Border Region

Section-2: Km 632-674
(Zhaskeshu to Shymkent Bypass Interchange)

Table of Contents

Shymkent-Border of Zhambyl Region

Section-2: Km 632-674 (Zhaskeshu to Shymkent Bypass Interchange)

1. INTRODUCTION
- 1.1 Background
- 1.2 Scope of Work
- 1.3 Structure of the Report

2. METHODOLOGY
- 2.1 Data Collection
- 2.2 Scope, Resources, Limitations, and Time frame of the EIA

3. REGULATORY FRAMEWORK
- 3.1 Administrative and Legal Framework for Environmental Protection in the Republic of Kazakhstan
- 3.2 World Bank Policies and Guidelines
- 3.3 Conclusions and Recommendations of Regulatory Framework Analysis

4. PROJECT DESCRIPTION
- 4.1 Overview
- 4.2 Project Components, Type and Category of the Project
- 4.3 Need for the Project
- 4.4 Project Benefits and Environmental Consideration
- 4.5 Project Location
- 4.6 Details of the Project
- 4.6.1 Preparation of Construction Site
- 4.6.2 Longitudinal Section
- 4.6.3 Roadbed and Drainage
- 4.6.4 Central Dividing Strip
- 4.6.5 Artificial Structures
- 4.6.6 Construction Materials
- 4.6.7 Construction Management
- 4.6.8 Concrete Pavement
- 4.6.9 Asphalt Concrete Pavement
- 4.6.10 Land Requirement
- 4.6.11 Construction Duration

5. BASELINE CONDITION
- 5.1 Topography
- 5.2 Climate
- 5.3 Geological Structure

5.4 Soils
5.5 Hydrology
5.6 Air Quality
5.7 Noise
5.8 Flora and Fauna
5.9 Socioeconomic
5.10 Archaeology and Cultural Sites

6. ENVIRONMENTAL IMPACTS AND MITIGATION
6.1 Approaches to Screening of Environmental Impacts
6.2 Pre-Construction Stage
6.3 Construction Stage
6.4 Air Quality
6.5 Noise
6.6 Hydrology
6.6.1 Contamination of Surface Water Sources
6.7 Borrow Pits
6.8 Soils
6.9 Waste Generation
6.10 Flora and Fauna
6.11 Social Impact and Mitigation
6.12Traffic Safety

7. ANALYSIS OF PROJECT ALTERNATIVES

8. ENVIRNMENTAL MANAGEMENT AND MONITORING PLAN

8.1 Environmental Management Plan
8.2 Mitigation Measures
8.3 Monitoring Mechanism
8.4 Institutional Framework for Implementation of EMMP
8.5 Management of Project related Impacts
8.6 Institutional Strengthening and Capacity Building

9. PUBLIC CONSULTATION

10. CONCLUSIONS AND RECOMMENDATIONS

References

Tables

Table 4.1 Technical Parameters of Roads
Table 4.2 Key Performance Indicator
Table 5.1 Wind Direction and Speed
Table 5.2 Major Rivers
Table 6.1 Calculation of Maximum Permissible Emissions
Table 6.2 Specific Emissions of Harmful Substances of Construction Equipment
Table 6.3 Calculation of Dust of the Road
Table 6.4 Degree of Dust-raising Ability of Dusty Coatings are Divided into Categories
Table 6.5 Value of the Actual Daily Average Dust Concentration
Table 8.1 Environmental Management Plan
Table 8.2 Environmental Monitoring Plan during Construction and Operation

Appendices

Appendix-A: Maps and Diagrams

Appendix -B: Environmental Regulations of Republic of Kazakhstan

Appendix -C: Environmental Monitoring of Selected Parameters, Location and Budget (Sec-1)

Appendix -D: Air and Noise Levels

Units of Measurements

°C	-degree Celsius
Km	-kilometre
Km^2	-square kilometre
m	-metre
m^3	-cubic metre
1USD	-147,35Tenge (April 17, 2012)

Abbreviations

AoI	-Area of Influence
CAREC	-Central Asia Regional Economic Cooperation
CR	-Committee for Roads
CSC	-Construction Supervision Consultant
EIA	-Environmental Impact Assessment
EMMP	-Environmental Management and Monitoring Plan
EMP	-Environmental Management Plan
IBRD	-International Bank for Reconstruction and Development
IEE	-Initial Environmental Examination
MoTC	-Ministry of Transport and Communications
MoEP	-Ministry of Environmental Protection
KZT	-Kazakhstan Tenge (Currency of RK)
O&M	-Operation and Maintenance
MPD	-Maximum Permissible Discharge
MPE	-Maximum Permissible Emission
PAP	-People (Person) Affected by the Project
PCR	-Public cultural resources
PMC	-Project Management Consultant
RAP	-Resettlement Action Plan
RoK	-Republic of Kazakhstan
RoW	-Right of Way
SEE	-State Ecological Expertise
SPZ	-Sanitary protection zone
SPG	-Sanitary protection gap (linear distance)
SPG	-Sanitary protection gap (linear SPZ)
STI	- Sexually Transmitted Infections
USD	-United States Dollar
WB	-World Bank

Glossary

Assessment	- The act of judging or assessing a situation or event
Akimat	-Administration of Oblast, Rayon or Village
IEE	-Environmental assessment undertaken for a regional or pre-feasibility level study for identifying and assessing possible environmental impacts
Oblast	-Region/Province (16 of them in Kazakhstan, including the cities of national level - Almaty and Astana)
Project	- A proposed capital undertaking, typically involving the planning, design and construction of a large-scale plant, facility or structure
PK	-piquets (1 PK=100 kilometer)
Rayon	- Districts (160 of them in Kazakhstan)
Road Corridor	- An uninterrupted carriageway, which originates from one town or major intersection and terminates to another town or major intersection
SEE	- State Ecological Expertise
Scoping	- Scoping is the process for determining the issues to be addressed, the information to be collected, and the analysis required to assess the environmental impacts of a project
GOST	-State standards, which regulate requirements to almost all kinds of products and activities
MAX	-Maximum Allowable Concentration of a harmful substance in air, soil or water
Tenge	-Currency of Kazakhstan
Screening	-The process by which a decision is taken on whether or not EIA is required for a particular project
SNiP	- Construction norms and rules
FIDIC	- Internationally accepted construction contract template

1. INTRODUCTION

1.1 Background

1. The Republic of Kazakhstan signed a loan agreement of KZT 22,616 million with the IBRD to implement the Shymkent to Zhambyl Region Border (632 to 674km) Transport Investment Project. The Committee for Roads (CR) is the project executing, implementing and disbursing agency. The objective of the Project is to develop an efficient, affordable, and environmentally sustainable transportation system that forms a part of the road of A2 "Khorgos-Almati-Shymkent to Border of Uzbekistan".

2. The project will focus on the improvement of the existing transport services linking Almati City, Zhambyl Region (*Oblast*) to Shymkent City. The Project targeted measures and specific facilities such as provision of interchanges, provision of 4 lane road, bus stops, road marking, footbridge or underpass included to ensure a quick, safe and reliable bus services and guarantee proper physical connection with other transport network in the country. The Program was developed as the Government's response to the transportation problems in regional areas, which include large traffic volumes between Shymkent to Zhymbyl route causing increasing delays, as a result of previous under-investment in infrastructure maintenance and expansion.

1.2 Scope of Work

3. This Environmental Impact Assessment (EIA) has been prepared for the whole route, as part of the IBRD support (IBRD Loan No. 7681-KZ) in undertaking the feasibility/design of the Engineering, Procurement, Construction Management and Supervision of the overall construction of 81km of the road on new alignment. The objective of the study is to help the Government prepare and implement an efficient, safe and sustainable transport network, in accordance with international environmental safeguards.

4. The purpose of this report is to provide an assessment of the potential environmental matters that need to be taken into account with regard to the construction and operation of the 42km road from km 632 to near Shymkent City. As described, the Project is divided into two Sections, as such Section-1 is Eastern: Zhambyl Oblast Border to Zhaskeshu, (593-km – 632km); and Section-2, Western: Zhaskeshu to Shymkent by-Pass Interchange (632 to 674km) of the A2 highway. The remaining parts will be finance by other donor agencies, as such ADB km 705 to 742 and EBRD km 742 to 806 (up to Uzbekistan Border). The EIA provides an initial screening of the activities to be carried out under the proposed project, with the intention of identifying potentially significant environmental impacts, and determining appropriate environmental management, mitigation and monitoring measures, and identifying if any further investigation is required.

5. In addition, the EIA aims to identify the likely impacts, both positive and negative, and assess the impacts on the environment of the planned road construction project undertaken by the Government through the Committee for Roads (CR). The objective is to ensure that the environment and the local community are not adversely affected by the road development. In order to achieve this objective, all negative impacts have to be mitigated and these costs must be included in the financial and economic analysis of the project. The overall aim is to ensure that the

road development project is environmentally sound and sustainable in accordance with international requirements. The recommendations of this report concerning the construction period shall be incorporated into the contractors' specifications of the Project.

6. The scope of work includes the following**:**

- Description of the general environmental baseline;
- Nature of potential impacts of the project, their magnitude, duration, and spatial distribution of impacts; identification of affected groups;
- Information on potential mitigation measures to minimize the impact including mitigation costs;
- Review and analysis of the environmental and social considerations of alternative alignments; and
- Formulation of an environmental management and monitoring plan.

1.3 Structure of the Report

7. The results of the study are structured presented in accordance with the format suggested by the World Bank:

- Chapter 2 describes the methodology for the preparation of the EIA;
- Chapter 3 reviews the regulatory framework for the EIA;
- Chapter 4 provides a description of the project. The overview, project components, type and category of project, as well as the need for the project, project benefits, location and details of project;
- Chapter 5 describes the baseline environment including the physical, ecological and human living conditions in the project area;
- Chapter 6 describes potential environmental impacts during construction and operation of the road, and proposes mitigation measures;
- Chapter 7 reviews alternatives to the project;
- Chapter 8 provides environmental management and monitoring plans;
- Chapter 9 outlines public consultations conducted for the project;
- Chapter 10 highlights conclusions

2. METHODOLOGY

8. This EIA follows both the methodology outlined in the WB Operational Policy 4.01 "Environmental Assessment" and the EIA procedures established by the Republic of Kazakhstan. This EIA was prepared based on the following: (i) review of the EIA report prepared by local design consultant "SK-Engineering LLP" in 2011, (ii) review of detailed project design documentation, and (iii) further collection of missing primary, secondary data and information through field visits, surveys, discussions with the SKO Department of CR in Shymkent city, SKO Department of Environmental Protection, and stakeholder consultations.

9. This report covers the description of existing environmental conditions, assessment of environmental impacts of the project during construction and operation, recommended management and mitigation measures and monitoring of selected parameters. The scope of the EIA covers the natural and human environment, their interaction and any induced change brought about by the road reconstruction/development project. The methodology compares the present situation to that in the future both with and without the proposed interventions.

2.1 Data Collection

10. The objective of data collection was to provide a database of existing conditions, to be used for predicting the likely changes that are expected and for monitoring such changes. The first step was to undertake a project reconnaissance followed by scoping of the project's area of influence (regarding direct and indirect / induced impacts), identifying the specific parameters to be considered for the study and to outline the activities for collecting data on each parameter. Most of the existing data was collected from a previously prepared EIA report and other project design documentation, including hydrological and geological reports. In addition, missing data was collected by the design consultant team in 2011; this data was verified by the authors and used in the present document. The field data was cross-checked and ground truthing ensured through site visits, field surveys and on-site observation.

11. Further, Sensitive environmental and social receptors were analyzed in the project area and the results of the analysis were considered in design and planning of mitigation measures. The land acquisition and resettlement issues are considered as a separate document. However, the mitigation measures were integrated within the Environmental Management and Monitoring Plan.

12. The EIA document is structured as main text and annexes. The main body of the text provides concise and logical description of the environmental condition, sensitive receptors, potential environmental impacts and relevant mitigation measures, integrated in the Environmental Management Plan (EMP). The annexes provide more detailed information regarding particular issues, like: the report of the environmental pollution (water, soil and ambient air), the results of traffic pollution modeling. As described above, depending on prevailing topographical conditions, proper implementation of project components, and fulfillment of client's requirement, the project has been divided into 2 Sections (Section-1, km 593 to 632 and Section-2, km 632 to 674).

Data and reports from the following disciplines were also reviewed and incorporated in to the EIA study.

- Engineering
- Hydrology
- Geology

2.2 Scope, Resources, Limitations, and Time frame of the EIA

Scope

13. The Scope of the EIA covers the natural and human environment, their interaction and any direct or induced changes brought about by the proposed road, interchange and a bridge construction

Staff Resources

14. Initially, an EIA report in accordance with Kazakhstan regulations was prepared by a national consulting firm "SK-Engineering LLP". However, the report was not fully compliant with WB requirements and an international environmental specialist of SNC Lavalin International (Canada) assisted in revising the document with the support of local specialists and design consultants in providing necessary field data.

Limitations

15. Within the limited time frame, effort has been made to ensure quality control of surveyed data and coordination with other disciplines and agencies. A literature review was conducted to provide an understanding of the relevant physical, ecological and legal information available for the project. An assessment of the biodiversity and conservation significance of the project site was also conducted.

Thanks should be acknowledged to the Committee for Roads (CR), concerned agencies, field level personnel, and local people who assisted in the studies.

3. REGULATORY FRAMEWORK

16. Following Republic of Kazakhstan and World Bank's Guidelines and Policies an Environmental Impact Assessment (EIA) has been prepared to meet the requirements of both the Republic of Kazakhstan (RK) and World Bank (WB).

3.1. Administrative and Legal Framework for Environmental Protection in the Republic of Kazakhstan

17. Environment protection in Republic of Kazakhstan is administered by Ministry of Environment Protection (MEP) of RK and its regional departments. The all-encompassing core document that regulates environmental protection in Kazakhstan is "Environmental Code of RK" (2007), which is supported by about 120 supplementary norms, rules, and procedures. This document was developed at the request of the President of RK in 2007 compiling three Laws of RK: "On Environmental Protection", "On Ecological Expertise", and "On Air Protection". The document was developed to incorporate and adopt best international practices in environmental management, regulation and protection.

The Environmental Code of RK has the following fundamental principles

16. Sustainable development of Republic of Kazakhstan.
17. Environmental Safety.
18. Systematic approach to environmental regulation.
19. State regulation of environmental protection and resource management.
20. Preventive approach to any contamination or degradation of the environment.
21. Punishment for violation of environmental legislation of RK.
22. Mandatory compensation for environmental damage.
23. Permitting system and monetary compensation for environmental impact.
24. Use of the most environmentally sound and resource saving technologies, which use natural resources and have a minimal impact on environment.
25. Cooperation, coordination and transparency of state environmental authorities.
26. Encouragement to prevent, decrease and eliminate environment contamination and waste generation.
27. Open access to environmental information.
28. Priority given to national interests in use of natural resources and environmental impact.
29. Harmonization of environmental legislation of RK with principles and requirements of international laws.
30. Details of environmental danger of any planned physical projects and mandatory assessment of impacts on environment and human health when making decision on its implementation.

Environmental Impact Assessment and State Ecological Expertise

18. Environmental Code of RK states that an EIA report is mandatory "For any type of economic and other activities that may have direct or indirect impact on the environment and human health." The following stages of an EIA are required by the Code: (i) initial environmental examination; (ii) preliminary EIA; (iii) full EIA; (iv) chapter "Environmental Protection" in project design

documentation; (v) post-project environmental analysis (mandatory after 1 year from finish of major projects >50$ million).

19. The procedure of conducting and preparing an EIA report is regulated by "Instruction on conducting environmental impact assessment of planned economic activity when developing pre-planning, planning, initial project and project documentation" approved by the Order of the Minister of MEP, 28 June 2007, No. 207-p.

20. The first stage of the EIA – Initial Environmental Examination gives general information on characteristic of natural and socio-economic environment in the project area. In the second stage "Preliminary EIA", potential environmental and socio-economic impacts are determined. The resulting report together with the feasibility study report has to pass the State Ecological Expertise, which is mandatory for receiving a loan for project implementation.

21. Public consultations are regulated by Order of MEP of 2007 "On rules for carrying out public consultations" and required at all stages of the EIA preparation process. The general concept of public consultations is to ensure public participation in project design decisions for any interested person or legal entity, including NGOs and mass media. Results of public consultations should be recorded in minutes of meeting and addressed in the final EIA report.

22. Final project design documentation along with a full EIA report enclosed with minutes of public consultations, together with proposed changes to the design by the community. If proposed changes are not included, it will be necessary to justify any refusal of declining public requests and this has to be approved by State Ecological Expertise (SEE). SEE reviews the documentation together with public requests within 3 months and gives a positive or negative conclusion. In the case of a negative conclusion, the project initiator has to amend the project design according to the comments from SEE or abandon the project.

23. The project design developers usually subcontract a specialized firm, licensed to conduct an EIA according to RK legislation, and normally the final reports pass the SEE. However, in terms of accepted international practices, and particularly compared to WB safeguards requirements, most of the "local" EIA reports have deficiencies in core analysis, description of environmental and social impact, elaboration on project alternatives, and usually do not have a detailed Environmental Management Plan (EMP) and Environmental Monitoring Plan (MP) developed.

Permit system and project categorization

24. The environmental Code of RK establishes a permitting system for emissions and discharges of harmful substances into the environment, depending on the environmental category of the development. This system is aimed at the regulation of environmental pollution quotas in specific zones and achievement of agreed pollution levels. Estimated levels of emissions and discharges are calculated during the full EIA stage. Based on the results of emission estimations, the project sanitary class is identified (Sanitary Danger classes from 1 to 5), and sanitary protection zone (SPZ) is established (1000m, 500m, 300m, 100m, 50m respectively) for the development .

25. SPZ serves as a protective barrier from environmental impacts of the project facilities and has to be planned and designed with up to 60% of the total area used for landscaping. Residential houses, rest areas, recreation and health resorts, schools, kindergartens, and hospitals are not allowed to be built in a SPZ. For road construction projects, a Sanitary Protection Gap (Linear) adjacent to the road is established based on estimated emission levels. The SPG has the same function as a SPZ, but does not need a detailed landscape plan.

26. Activities with sanitary danger class 1 and 2 fall under Environmental Category I; sanitary class 3, extraction of common minerals, all kinds of forest activities and special water use fall under Category II; Category III covers sanitary danger class 4; danger class 5 and use of fauna, except sports fishery and hunting fall under Category IV. The permit is given only after a positive response from the SEE and it establishes pollutant emission limits for the project, conditions of environment management and monitoring, and other commitments. Permits for Category I are issued by MoEP; other categories may acquire permits at Oblast level. This project is classified as sanitary Class 5 with a SPZ of 50 meters, and Environmental Category IV according to Kazakhstan regulations.

Air, soil, noise, and water quality standards

27. Standards for quality of air, noise, soil and water are established by multiple GOST, SNiP and SanPiN norms and rules, and the principle ones are:

- The Maximum Allowable Concentrations (MACs) for the harmful substances in the air are defined in "Sanitary and Epidemiological Requirements for the Atmospheric Air Quality" approved by the Order of the Ministry of Health of the RoK No 629 dated 18.08.2004.

- The requirements for quality of water are defined in the SanPiN 2.1.4.1 175-02 for non-central supply waters. For surface waters it is in SanPiN "Sanitary and Epidemiological Requirements for the Surface Waters Protection Against the Pollution" No. 3. dd 02.03.04 approved by the Order of the Ministry of Health of the RoK No. 506 dated 28.06.2004.

- Soil pollution levels are regulated by "Standards of the Maximum Allowable Concentrations of the Hazardous Substances, Harmful Microorganisms and Other Biological Materials Being the Soil Pollutants" approved by the Order of the Ministry of Health of the RoK No. 99 dated 30.01.2004 and Order of the Ministry for Environmental Protection of the RoK No. 21P dated 27.01.2004.

- The noise level standard for traffic noise is established in SNiP II-12-77 "Noise Protection". According to this standard, the noise levels from a motor vehicle in the 2 m distance from the buildings is 70 dBA. For residential areas, near schools, kindergartens, playgrounds and other sensitive areas noise levels shouldn't exceed: from motor vehicles – 10 dBA; construction activities – 5 dBA; for time from 7 to 23 – 10 dBA.

28. All discharges and emissions should be permitted by state authorities. Any violation of the abovementioned standards or absence of permits for emissions may serve as reason to suspend the activity under inspection (Appendix-B, Legal Framework).

International Treaties and Conventions Ratified by Republic of Kazakhstan

10. Basel Convention on the Control of Trans Boundary Movements of Hazardous Wastes and Their Disposal (Basel, March 22, 1989). Law of Republic of Kazakhstan issued on February 10, 2003, N 389-II «About joining of Republic of Kazakhstan to Basel Convention on the Control of Tran Boundary Movements of Hazardous Wastes and Their Disposal».
11. Amendment to the Montreal protocol on substances that deplete the ozone layer (London Amendment), June 27-29, 1990, issued on May 7, 2001, N 191-II «About joining of Republic of Kazakhstan to Amendment to the Montreal protocol on substances that deplete the ozone layer (London Amendment), June 27-29, 1990».
12. Convention on Long-Range Trans boundary Air Pollution (Geneva, November 30 1979), issued on October 23, 2000, N 89-II «About joining of Republic of Kazakhstan to Convention on Long-Range Trans boundary Air Pollution».
13. Convention on the Trans boundary Effects of Industrial Accidents (Helsinki, March 17, 1992), issued on October 23, 2000, N 91-II «About joining of Republic of Kazakhstan to Convention on the Tran boundary Effects of Industrial Accidents».
14. The Convention on the Protection and Use of Tran boundary Watercourses and International Lakes (Helsinki, March 17, 1992), Law of Republic of Kazakhstan issued on October 23, 2000, N 94-II.
15. Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters Environment Program (Aarhus, June 25, 1998) Law of Republic of Kazakhstan issued on October 23, 2000, N 92-II «About ratification of Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters Environment Program.
16. Convention on Environmental Impact Assessment in a Transboundary Context (Expo, Finland), February 25, 1991. Law of Republic of Kazakhstan issued on October 21, 2000 N 86-II.
17. The Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES (Washington, March 3, 1973) (with amendments, accepted on 11th conference CITES parties on April 16-20, 2000; on 12th conference of CITES parties (Santiago, November 2002)) Law of Republic of Kazakhstan issued on April 6, 1999 № 372-1 «About joining of Republic of Kazakhstan The Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES».
18. The United Nations Convention to Combat Desertification, Law of Republic of Kazakhstan issued on July 7, 1997, N 149-1.
19. The Energy Charter Treaty (Lesion, December 17, 1994) (with changes, included by Amendment to the Trade-Related Provisions of the Energy Charter issued on April 24, 1998) Decree of the President of the Republic of Kazakhstan issued on October 18, 1995, N 2537 «On ratification of the Energy Charter Treaty and Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects».
20. The Convention on Biological Diversity (Rio de Janeiro, June 5, 1992) Decree of The Cabinet of Ministers of the Republic of Kazakhstan issued on August 19, 1994, N 918 «On approval by Republic of Kazakhstan of The Convention on Biological Diversity and execution of its requirements».

21. Convention for the Protection of World Cultural and Natural Heritage (Paris, November 16, 1972) Ratified on July 29, 1994.

3.2 World Bank Policies and Guidelines

29. In its Safeguard Policies, The World Bank (WB) emphasizes the need to increase efforts in addressing environmental degradation. Environmental concerns are to be reflected in all WB initiatives, whether at the project, sector or national level. The WB's Operational Policies mandate the consideration of environment in all aspects of WB's operations. The Operational Policies, Bank Procedures and Good Practices (OP, BP and GP respectively) relevant to EIA for the present study have been considered:

OP/BP/GP	4.01	Environmental Assessment
OP	4.12	Involuntary Resettlement

30. **Environmental Assessment OP/BP 4.01 (triggered):** The main envisaged potential negative impacts during construction are the operation of borrow areas, generation of waste (construction materials, spent consumables, household waste and wastewater from camps), excessive land use, topsoil destruction and erosion. There is also a potential impact on groundwater and surface water from excessive turbidity and siltation, washing equipment in rivers (e.g. cement trucks) and accidental spills involving fuels and lubricants. During operation of the road storm drainage management, soils, ground and surface water contamination by heavy metals, soot and organic compounds (e.g. PAH), noise, dust, air pollution will be the main issues. Moreover, there is a potential risk of destruction or disruption of natural habitats and ecosystems by poor construction management.

31. **World Bank OP 4.12, Involuntary Resettlement,** is also triggered and sets out planning requirements to be met when proposed projects would cause land acquisition, resettlement or associated impacts. In accordance with the requirements a Resettlement Action Plan (RAP) is being prepared. According to this draft RAP the construction of the by-pass on the alignment agreed and as reported in this document will require the acquisition and demolition of 20 houses and will affect three undeveloped plots zoned for commercial use and will require overall acquisition of 91 hectares (including seven hectares of land owned by the state).

3.3 Conclusions and Recommendations

32. The following conclusions and recommendations address those issues where divergence of standards and subsequent practice between Kazakhstan and the World Bank have been identified that could lead to shortcomings in environmental due diligence during project implementation, because local practice may be rigid and well established and incorporating new elements or changing practices may need extra efforts during project supervision:

33. Kazakhstan has not yet put into practice an iterative process to ensure that project design and environmental analysis have an actively managed interface, and that data and findings from either are incorporated into the other. Usually the design approval process in KZ is quite advanced when EIAs are conducted, which may prevent recommendations for design changes based on the

environmental analysis being implemented, as they would require a repetition of the approval processes. Design changes may, however, be introduced during the construction design stage once a contract has been awarded with relatively minor review and approval requirements. This is the recommended approach to mainstream design changes based on environmental findings into the designs submitted by the Contractor to the Client for approval and construction. Such design changes are likely to mainly concern the number and location of under- and overpasses for animals, farm traffic and wildlife.

34. Environmental protection is often seen as compliance with emission or pollution standards, while an understanding of environmental values such as fauna and flora, soils, landscape, biodiversity, esthetics, and the priority in enforcement appears on compensation payments rather than preventive and remedial action to avoid, minimize, mitigate or repair damage. This will require enhanced capacity building and supervision efforts during project implementation, with practical, implementation-focused training's for Contractors, supervising engineers and environmental authorities (incl. those representing forestry, national parks, water). It is recommended to ensure the presence of a consultant with international best practice experience in environmental site supervision and management during the first 6 months of project implementation (starting with Contractor's mobilization) to establish knowledge and compliance practice from early implementation stages onwards.

35. Due to the absence of distinct and practical EMPs in the ESIA reports in Kazakhstan, it is difficult to incorporate proposals of the ESIA reports into contract documents, translating them into enforceable clauses. It is therefore recommended to place special emphasis on this issue during the preparation of the tender packages for the construction works and, if required, seek assistance from international Consultants with specific experience in both procurement and environmental management.

36. The competences and powers of Kazakh environmental authorities regarding site inspections are very limited, with visits legally limited in number and having to be announced several weeks in advance to the project owner. While this practice is unlikely to be changed within the project context, a strong supervision system needs to be contractually embedded, with effective enforcement mechanisms including penalties and arrangements for required remedies (e.g. by third parties with costs deducted from the contracts). It would be recommendable to entrust a project management consultant with the enforcing mandate that would in countries implementing best practice be with the authorities. In parallel the authorities should be kept well informed on all project activities and included in training and capacity building programs. (Annex-A provides details Legislation and Regulations Governing the EIA Process).

4. PROJECT DESCRIPTION

4.1 Overview

37. The Project involves the rehabilitation; upgrading and new construction of approximately 81 km of road, the Eastern Section (Section-1: Zhambyl Border to Zhaskeshu: 593-km – 632km) is largely new alignment in an attractive area of predominantly agricultural land. The whole

alignment lies within the Arys River valley and its tributaries. The Project involves the construction of highway A2 from km593 to 632 on a new alignment, and will provide an essential link in the route between Western China and Western Europe as part of the international transit corridor.

4.2 Project Components, Type and Category of the Project

38. The project includes the construction of a 39km new four-lane asphalt or concrete paved road from km 593 to 632 (Zhambyl Regional Border to 632km towards Shymkent). The project will be prepared and contracted to meet internationally accepted (FIDIC; SNiP) design and construction norms and rules within a new alignment.

39. Based on the project's estimated air emission calculation results (which looks at a function between traffic density, types of vehicles, meteorological conditions, existing pollution loads and type of adjacent land use) it is classified as sanitary class V (the lowest risk class) as per RK (Republic of Kazakhstan) regulations. Such category should have 50 m distance SPG (linear SPZ for roads) and does not require a detailed EIA report.

40. However, significant potential issues could result from the project, such as erosion, vegetation cutting, impact on biodiversity and rivers, stream habitats (Arys, Zhabagly, rivers, Tastumsyk stream). For reasons of scale and nature of potential impacts the overall roads project (39km) was classified as safeguards category A, and hence this sections requires the preparation of a full EIA.

4.3 Need for the Project

41. The Shymkent-Zhambyl Oblast Border road is part of the Central Asia Regional Economic Cooperation (CAREC) Program. It is included within Transport Corridors 1b and 6b, which connects Western China to Western Europe and meets national, regional and international traffic needs. This link will (i) improve links between Kazakhstan and neighboring countries, as well as nearby regions; and (ii) contribute to development of an integrated transport network that caters for all types of traffic, (iii) minimize negative impacts of the road on local residents and their quality of life. The MoTC of RK considers this Project as one of the priority projects in the country, and it's implementation is a high national priority.

4.4 Project Benefits and Environmental Consideration

42. The Project aims to provide an efficient and safe road transportation system for the movement of passengers, goods and services in an environmentally sustainable manner. The Shymkent-Zhambyl Project will (i) improve transport infrastructure of the region, (ii) accelerate a vital east-south west corridor for the national and international movement of passengers and freight; will facilitate regional trade, support poverty reduction while accelerating growth and development in the country as a whole, (iii) establish a new and fast link between China and Russia, and (iv) accelerate social and economic development while raising the living standard of local inhabitants.

43. The road re-construction will further promote traffic safety with positive impacts on traffic safety, air quality and noise levels. It will reduce overall emissions by eliminating the multiple deceleration-acceleration cycles currently required when passing through the existing road. Overall the quality of life in the nearby city and villages is expected to increase significantly.

44. Also, the capacity of this section will support the reduction of commercial risks during goods delivery, decrease transport costs and passengers travel time, etc. The Project will also provide a potential boost to tourism revenue, as access will be improved to a number of historical and ecological sites of national and international importance. It is also expected that the Project will enable increased freight volumes to be transported in the districts.

4.5 Project Location

45. The proposed passes through Tyulkubas and Sairam districts of South Kazakhstan Region (SKR) between km 632 and 674 (route begins at 42°30′38″ North latitude and 70°34′06″ of East longitude, and ends at 42°31′29″ North latitude and 690°54′60″ East longitude). The road stretches from the north to the south direction. The nearest settlements are Sastobe, Akzhol, Aksukent, and Karabulak. This same route continues up to near Shymkent city (Appendix-A, Maps and Diagrams).

4.6 Details of the Project

46. The project has been designed to category 1b. Design parameters are approved in accordance with applicable regulations of the Republic of Kazakhstan SNIP RK 3.03-09-2006 “Highways”. The main technical parameters used in the design of section 632 km - 674 km are shown in Table 4.1.

47. In accordance with design of the road “Khorgos - Almaty - Shymkent - Republic of Uzbekistan border” refers to 1b category. The main technical norms for design are provided in the following Table.

Table 4.1 Technical Parameters of Road

Sl.No	Description	Measurement unit	As per RoK SNiP 3.03-09-2006	Used in the Project
1	Road category	-	1b	1b
2	Estimated traffic for 20-year perspective, veh /day	veh/night	More than 7000	
3	Design speed	km/hour	120	120

4	Number of lanes	m	4	4
5	Width of lanes, m	m	3.75	3.75
6	Width of carriageway	units	2x7.5	2x7.5
7	Roadside width	m	3.75	3.75
8	The least width of reinforced lane	m	2.5	2.5
9	The least width of dividing strip between various traffic directions		5	5
10	The least width of reinforced lane on dividing strip		1	1
11	Roadbed width	m	27.5	27.5
12	Cross slope of carriageway and reinforced lane	%	15	15
13	Cross slope of shoulder	%	40	40
14	Greatest longitudinal slope		40	40
	on cross country		50	50
	in highlands		70	70
15	Least visibility distance	m		
	a) for stop		250	250
	b) oncoming vehicle		450	450
16	Least radiuses of curves			
	a) in plan		800	300
	b) in longitudinal profile			
	- convex	m	15000	15000
	- convex for cross country		10000	10000
17	- convex for highlands		2500	2500
	- concave	m	5000	5000
	- concave for cross country		3000	3000
	- concave for highlands		1500	1500
	Turns with one-fall profile traffic area, curve radiuses in plan		Less than 2000	Less than 2000

48. *Other Project features are:*

Length – 42.0 km (construction length of road section)

Width of roadbed – 27.5 m

Width of lane – 3.75 m

Width of centerline – 5.0 m

Maximum height of embankment – 15.0 m

Pavement – concrete

Culverts:

Metal (dive culvert) d=0.75m – 4nos.

d=1.0m – 3nos. (at junctions)

d=1.5m – 24nos.

d=2x1.5m – 2nos.

Maintenance of culverts with inlet 2.0x2.0m – 4nos.

Interchanges – 3nos.

Bridges:

Bridge – 1nos. (in Aksu);

Overpasses – 5 nos. (including 3 nos. At interchanges and 2 nos. across railroad);

Underpasses – 3 nos.

Lighting –3 (three interchanges)

49. The design is in accordance with RoK SNIP 3.03-09-2006 and there are no deviations. The route is generally from east to west. The alignment follows over new land as such bypasses Kizilasker settlement, Ryskulov regional center, Kizen, Akbiik settlements and others. PK0 is adopted at the section of 631+501km.

50. The route of the road passes rain-fed, pasture and arable land, crossing natural streams, irrigation channels and discharge channels of the existing irrigation systems. Along the road where it passes irrigated lands the project envisages ditches for uptake and discharge of irrigation water

Project details for Section- 2 are provided in Annex-B

4.6.1 Preparation of Construction Site

51. For the preparatory period the detail project includes works as follows:

-to remove the fertile soil layer, including stacking in dumps. The thickness of removed layer is 0.30-0.45m as per the soil map;

-to fell existing trees and vineyards at this site and traffic interchanges PKOv+00, PK 139+18, PK266+49.5;

-to reconstruct underground and air communications

- residual types of works (water pipe d-219mm at PK151+63, PK164+94.22, PK225+00 and traffic interchange PK 139+18; 10 kV OHL lines at PK 164+50 and PK 173+03, PK318+43 and PK388+83.54; 0.4 kV OHL lines at PK360+81.25, PK 384+91.00; 35 kV OHL lines at PK368+32.80, traffic interchange PK139+18; 220 kV OHL lines at PK354+12.28

-to remove from the zone of drilling and blasting works: gas pipeline at PK78v+57 and traffic interchange PK139+18; TU SM LTC -43 cables at PK320+52.37, PK320+64.07, PK320+83.45, PK373+23.13, PK374+92, PK375+53.97 and communication cables at PK320+32.32; TU SM cables at traffic interchange PK139+18);
-to dismantle the existing road pavement with removal to the base to be used for repair of local roads;

-to execute drilling and blasting works.

52. During the road reconstruction, as mentioned above, drilling and blasting works will be performed. Rock outcrops in the contours of the road excavations are located on the border of Zhambyl and Shymkent regions at the section of 593 km to 605 km in survey stake of PK 35+00 , PK 47+00.

53. This is the midland terrain, with an elevation of about 1100 m. The volume of rock excavation in the contours of the road excavations is 1 289 thousand meter. The depth of road excavation is up to 40m, width at the bottom is 34m.

54. Drilling and blasting works will be carried out in order to loosen the rock mass for its subsequent excavation and exploded rock mass will be used for dumping grounds of the road. The rock mass will be loaded by shovel-type excavators and transported by dump trucks with carrying capacity up to 12 tons. Further, drilling and blasting works will be performed by a specialized subcontractor.

55. The rocks subject to blasting are represented by silicified limestones, conglomerates, silicified shale, silicified sandstone and crash limestone. Referring to rigidity, the rocks belong to IX-X group as per SNiP, coefficient of strength as per scale of the professor M. M. Protodjakonov f = 12-14, the average unit weight = 2.8 t/m. On the surface, rocks are covered with gross-gravel soils with the thickness of up to 1.5 m.

56. Based on the geological conditions of exploitation, volume of blasting operations and required granulometric composition of blasted rocks, under the Project the method of vertical borehole charges with a diameter of 105 mm will be applied. Well drilling is carried out by SBU-100G rigs. The calculation of explosive charges is made for ammonite No.6-LH as a standard.

57. Upon mass blasting and removal of rocks, off-standard lumps of rocks will be crushed with blast-hole charges. Wells are drilled according to the technical sheet to be provided for each block separately. Upon drilling, blocks are surveyed to measure actual parameters of wells and their depth. The dangerous zone radius of dispersed rock lumps, in accordance with the RoK standard documentation is 500 m. The Table 4.2 shows Key performance indicator.

Table 4.2 Key Performance Indicators

No.	Description	Unit	Quantity
1.	Volume of drilling and blasting works	1000 m	1337
2.	Volume of drilling works	1000 m	165
3.	Number of wells	1000 units	20

4.	Specific consumption of explosives	kg/m	0.75
5.	Amount of explosives, total	t	1003

4.6.2 Longitudinal Section

58. The route has one axis at the center of the dividing strip. The total length is 42 000 meters. At curves with radiuses less than 2000 meters, their will be one-slope cross profile – a turn. Practically, throughout the entire length the route axis runs on the existing road with a maximum use of its roadbed. At places of bridge crossings and junctions the route runs on axes of artificial structures considering widening to the left. At the km 651+500 - km 653+000section, the route plan will be improved to increase the safe viewing distance and ensure the traffic safety.
59. Minimum radiuses of curves, in accordance with RoK SNiP 3.03-09-2006 (for highlands) are 300 m. Maximum longitudinal slope is 6% at the 2000 m-long km 651 - km 653 section in rising passes, which complies with road category and SNiP. Existing slope here reached up to 8%. The embankment will be raised by 9 m. and excavated to 27 m. At some areas the longitudinal profile will be improved due to existing sub-standard profile - "depressions" at lowered relief where embankment will be heightened to 3.0 m or sharp hillocks where the existing roadbed will be cut to 1.0m.

4.6.3 Roadbed and Drainage

60. The Rain rills on slopes occur within PK0+00 – 4v+13 and PK 25v+00 - PK27+ 00. The roadbed slopes are covered with grass, sometimes shrubs.
Works on the roadbed recovery were performed earlier throughout the site. According to the survey it was revealed that the existing roadbed needs to be improved. Slopes of excavations require significant improvements.

61. The roadbed is designed as per the standards of 1b technical category as per RoK SNiP 3.03.09-2006, Section 7 “The roadbed” and based on conditions of preservation of the roadbed geometric shape and stability of pavement and ensuring maximal preservation of irrigated land and minimum damage to the surrounding environment.

62. The route is composed of light silty loam on almost all the way except for sections PK350+10 - PK357+30, PK362+10 - PK363+15 which is composed of rotted rocks p.32. Soils are generally not saline. Ground water (to the depth of 6 m is not revealed).

The roadbed width is 28.5m and it is represented by four types:

- Type 1 – embankment is up to 3m, steepness of slopes is 1:4;
- Type 1 a - embankment is up to 1.5m, slope steepness is 1:4, side ditched depth is up to 0.6m;
- Type 2 - embankment is up to 6m, slope steepness is 1:1.5;
- Type 3 - Embankment is greater than 6 m slope steepness is 1:1.5-1.75;
- Type 4 – Excavation, interior slopes are 1:4, outer slopes are up to 1:10, 1:1.5.

63. Ditches shall be arranged on road sections with small embankments up to 1.5m for water drainage. In order to avoid erosion by surface water the slopes are secured with grass on the layer of vegetable soil with 15cm of thickness. The outer slopes of excavation are accepted as 1:10 for further use in agriculture.

64. Checking the stability of more than 12m embankment slopes was made with the help of CAD CREDO software and methodology of Central Scientific Research Institute of Construction. Calculation results showed that the stability of slopes' soil surface layers is ensured, and resistance against slip out of separate soil blocks is not ensured. Additional measures are provided in the project to ensure stability of slopes such as dumping of coming down part of the embankment of macro-fragmental rock materials, strengthening of the roadbed slope by seeding perennial grasses, longitudinal trays along the edge of the roadway to drain water from the roadway. In addition the stability of the embankment is also ensured by its location in the saddle area.

65. On road sections with small embankments up to 3.0m ditches are envisaged for water drainage. In order to avoid erosion by the surface water slopes are strengthened with sowing of grass on a fertile soil layer of 20cm height. For construction of the roadbed off-route reserves of soil will be used. Ground reserve No.1 is located 1.5km to the right from PKO+00. The soils are light loam p.35v (RoK CN 8.02-05-2002). Maximum length of haul is 2km. Ground reserve No. 2 is located in Amangeldy village PK 78+00 within 5 km. The soils are represented by solid sandy loam p.36b (RoK CN 8.02-05-2002). The maximum length of haul is 16km, considering the difficultly of excavation the soil refers to group 1. Transportation is carried out along unpaved soil-carrying roads, including 3 km with repair and maintenance. Ground reserve No.3 is located on PK 320. Soils are represented by light loam p.35v (RoK CN 8.02-05-2002). Maximum length of haul is 11 km.

4.6.4 Central Dividing Strip

66. Cross roadbed profiles conform to the model project 503-0-48.87 "Sub-grade of general-purpose roads". Roadbed width at straight-line sections - 27.5m; Cross slope - 3 %; Up to 3 embankment slopes –1:4, at greater heights - 1: 1.5. Cut slopes - 1:1, 1:1.5. Water drainage is provided with trapezoidal ditches – depth 0.7-0.7 m, and 0.4 m -wide on the bottom. When the cut slope height is 2 to 6m, 1m-wide off-ditch shelve are installed when the cut depth is over 6 m, 2 m -wide. Sub-grade is made with soil from cuts. In widening of the roadbed, in order to ensure better cohesion of the existing roadbed ground, embankment slopes will be loosened, including provision with benches. Water drainage from the traffic area will be provided by cross slopes.

4.6.5 Artificial Structures

67. Culverts are designed of a capital type for HK-180 loading in accordance with RoK SNiP 3.03-09-2006 and RK ST 1684-2007. The route crosses a number periodically running watercourses. The base of foundations where soft grounds occur, pipes will be installed on the cast-in-place concrete base, where hard grounds – on a gravel-sand cushion. Pipe blocks – prefabricated reinforced concrete. Inlet and outlet of pipes are reinforced with cast-in-place concrete on the gravel layer. At crossovers, ravines and lowered terrains: inlet of pipes - 8 cm-thick cast-in-place concrete on the 10- cm thick gravel layer, outlet – 12 cm-thick cast-in-place concrete on the 10-cm thick gravel layer. Besides, rock filling at the outlet, diameter of stones - 25 cm. The projected

road has several crossings at two levels (road junctions), and also crossings with large water streams with bridges.

4.6.6 Construction Materials

68. The main source of road construction materials is Zhabaglysu deposit - stone for protective works, gravel and grit mixture. Hot asphalt and concrete mixture is produced in Shymkent and is delivered to the site by road.

69. Cast-in-place concrete is produced on mixing plants located at Zhabaglysu. Asphalt, precast concrete blocks of rectangular tubes and elements of spans is delivered by rail from Almaty to Tyulkubass station and precast concrete – from Shymkent. Bricks for construction of toilets and enclosed bus stop get on Ryskulov brick factory. Water for industrial purposes comes from Zhabagly river and drinking from near-by villages.

Electricity for construction needs - from mobile Zh power station-60.

4.6.7 Construction Management

70. The project envisages construction of 39.433 km of road of category 1b with concrete pavement. Organization of construction includes:

-Strict adherence to safety rules;
-Compliance with environmental protection requirements.

In the preparatory period it is necessary to perform the following works:

-Removal of fertile layer by bulldozer 79kW with movement to up to 50m in temporary dumps in the area of excavation;

-Felling trees and uprooting of stumps and trees by uprooting collecting machine by tractor 79kW (108hp);

-Reconstruction of underground and air communication (water pipe d-200 mm, reconstruction of power lines 10kV 3-wire, power line 0.4kV, 35kV transmission line, 220kV transmission lines, cables TUSM LTC-43 and TUSM, gas pipeline);

-Destruction of existing pavement with removal to places of temporary storage at the base;

-Demolition of building “Abroad Post”.

4.6.8 Concrete Pavement

71. Two-layer concrete pavement will be laid as per German technology (based on experience of PAPENBURG Company) by laying machine “Wiutgen” which consists of two concrete-placing machines “Wiutgen” SP 1500 LP and a working pier of Wiutgen TCM 1800 type. All used machines are equipped with electronic control and four mechanism of caterpillar drive, turned

hydraulically thus reclining during transportation. Along with rod and T-vibrators automatically controlled machine is used to install dowels and pins.

72. Concrete is prepared on concrete mixing plant "TWINMIX" 3.00 CBM. Mixing plant is a linear unit with conveyor loading and batch mixer with a capacity of approx. 240m/hour. For concrete preparation small debris and sand are used as aggregates.

4.6.9 Asphalt Concrete Pavement

73. On the ready base track coat will be made by bitumen and coating of hot asphalt mixture is laid layer-by-layer with bitumen track coat between the layers. Coating is laid by asphalt paver and compacted with self-propelled roller of 6 tons for 5 passes by one track and finally smooth roller mill weighing 11-18 tons for 6-8 passes on one track. Compaction will be made directly after it is laid, while maintaining temperature.

74. Distribution of black rubble at black gravel surface treatment is made by trailed stone spreader at the temperatures above 15°C on clean, dusty and dry surface and roll by motor roller 6 tons for 3 passes and motor road roller 10 tons for 3 passes on each track. Bottling and delivery of diluted bitumen is made by binder distributor DS-40 (D-64).

75. Finishing and grading of the roadbed shall be made by bulldozer 79kW or motor grader D-144 with additional equipment and at embankment and excavation of more than 6 meters - excavator with interchangeable equipment.

4.6.10 Land Requirement

In accordance with standard documents provided for a period when design and estimate documentation is developed, the width of the right of way for the road was calculated subject to cross profiles under the project, depending on the embankment height and excavation depth. Temporary use for the road construction period covers the allocation of lands for construction sites, which are storage yards for road building materials, parking lots of vehicles and road machinery. The construction site for road building materials for the main road will be selected by the contracting organization. Land plots of temporary and permanent allocation may not be used until their borders are established, and territorial bodies managing land resources issue documents confirming the right to use lands (acts of land use right).

The area of a land plot allocated for permanent land use regarding the existing road totals 308.7 ha, including:

- pasture- 2.05 ha;
- irrigated lands – 14,27 ha;
- not irrigated lands – 21,8 ha;
- other lands – 15,25 ha.

The area allocated for temporary use is pasture measuring 16 ha.

4.6.11 Construction Duration

76. The standard duration of road construction is determined according to RoK SNiP 1.04.03-2008. However, construction period of 24 months is therefore required for each section.

5. BASELINE CONDITION

5.1 Topography

77. The road alignment passes through piedmont alluvial valley. The sloping plain relief is wavy and steeply-sloping where positive forms alternate with flat-bottom wide depressions. Slopes of ridges and hills are gentle with flat-bottom depressions. In some areas the relief is strongly dissected with plains of rivers and streams and uplands. The route crosses the Mashat and Aksu rivers, numerous irrigated aryks and currents. Further, some stretched of the Project area passes along hills, which is located within the piedmont plain, with a general slope of the area towards the Arys river. According to SNIP RK 2.03-04-2001 seismicity level between section 632-674 km is eight points.

78. The largest river is the Syr-Darya, which flows in the southern and central parts of the region. As Syr-Darya rivers flow to the right: Keles, Aris, Bugun, originating in the mountains. The largest tributary of the Syr Darya - Aris - takes a significant amount of inflows: Badam, Boroldai and other waters of the rivers of South Kazakhstan region are used for irrigation.

79. In the northern areas - the lower reaches of the Chu River, which is lost in the sands Muyunkum. Water in the river within the region is only from April to June, the rest of the year, the river dries up and the water is stored in only a few stretches. In the floodplain of the Syr Darya River are the majority of lakes in the area, which is an ancient riverbed. In the flood period, they are filled with water from the Syr Darya. The lakes are small, 1 to 5km^2.
80. Major soil area - gray soils, there are also gray-brown desert soil and takyr. In the northern and southwestern parts of the region - the sands. The valley of the river Syr-Darya - meadow floodplain soils. Salt marshes mainly distributed in the lower reaches of the Chu River. Absolute elevations ranging is from 450 m to 900m.

5.2 Climate

81. The climate is continental, desert. Winters are short duration, the average January temperature from -2 ° to -9 °. Even in the cold of winter thaws and rain occurs. Spring is short, at this time the greatest amount of precipitation falls. Summer is hot, prolonged, with many sunny days, the average July temperature is +22 °, +24 °. Autumn is long, warm, slightly overcast. Data of meteorological station of Shymkent Tyulkubas is provided as:

Road-climatic zone IV. Wind district - 3. Outdoor air temperature ° C:

- Maximum +44
- Minimum -34
- Annual average +12.7
- The coldest days -25 (0.92)
- The coldest five days -17 (0.92) Regulatory freezing depth:
- Loam 0.38, the penetration depth of 0 ° - 0,48 m.
- Gravel 0m.
- Average annual precipitation - 951 mm.

The estimated thickness of snow cover (with 5% probability of exceeding this) -54 cm

The maximum of average wind speeds by points in January - 4.3 m/sec. The number of days with wind speeds exceeding - 15m/sec - 5 days.

The number of days with hail – 5; with icing – 3; with frost - 2

Duration of the period with average temperature <0 ° C; days - 61 days. The average duration of snow cover -83 days. Wind direction is shown in Table 5.1.

Table 5.1. Wind Direction and Speed

Index description	Month	Unit	Point Indexes

			N	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Frequency of winds	Jan	%	4	8	32	24	6	11	8	6
Average Speed	Jan	m/sec	1.6	2.7	2.6	2.8	5.4	5.1	2.9	2.2
Frequency of winds	July	%	9	**22**	25	12	3	6	8	15
Average Speed	July	m/sec	3.6	5.6	2.9	2.7	3.8	4.2	3.3	3.2

5.3 Geological Structure

82. The South-western part (km 632 to 674) is located in the desert area. The rivers belong mainly the Aral Sea basin (mainly Syr Darya). Most of the territory is a plain, just to the south-eastern and central part of the mountain. The plain is composed of flat-lying Tertiary and Quaternary sediments and sandy deserts Kyzylkum busy (in the south), Muyunkum, Bet-Pak-Dala (North) and the steppes and the Hungry Shardara (on the Syr-Darya). The surface of this part is mainly flat, sometimes hilly, sometimes there is small uplift. For the Kyzylkum characterized meridian elongated sand ridges of 3-15 m. There are sand dunes. In the central part of the mountain pass Xpe bet ¬ Tau, on the south-east - western edge of the Talas Alatau ranges Karzhantau and Ugam. Karatau ridge stretches more than 400 km south-east to north-west, almost parallel to the middle reaches of the Syr Darya. In the central part has a height of from 1,500 to 2,000 meters and more. Ugam ridge has a height of over 4,000m, Karzhantau over 2,800m respectively.

5.4 Soils

83. Seven engineering-geological elements (IGE) are evident along the route (side reserve), road bed according to ST-25100 and RoK SNIP 3.03-09-2006.
First IGE - backfill of silty clay loam of light and compact, roadbed embankment of firm consistency with the inclusion of gravel up to 10%,35$^{-в}$

Second IGE - light loam - silty, of natural composition, lies under the first IGE and within road area, subsiding 35$^{-в}$

Third IGE - light loam - silty, thick with gravel, pebbles, non-subsiding.

Fourth IGE - sandy loam, dusty, solid with gravel, glassine, thick and non-subsiding

Fifth IGE - gravel-pebble soil, p. 6$^{-в}$

Sixth IGE - grassy ground, p. 32

Seventh IGE - rocky ground, 30$^{-г}$

5.5 Hydrology

Surface Water

84. The hydrographic network is represented by permanent and temporary streams. The essential element in the hydrography of the territory in question is irrigation channels and small river beds

formed in places of groundwater wedging. The surface water source is rivers, streams and dry ravines are located at the altitudes of 500-2100 m above the sea level. Water collection areas are different and vary from 0.1 km^2 to 2120 km^2. Practically all watercourses having the water collection area of over 10km preserve insignificant drain during the year. The highway crosses the Mashat River at the border of Tyulkubas and Sairam districts at KM 651+182 . River is a left tributary of the Arys River. At km 669+69 the route crosses the Aksu river, which is the right tributary of the Arys River. At KM 669+069 the road crosses the River Aksu. Streams of rivers form a little heights, therefore they may be referred to the category of snow and rain feed.

85. The main source of river flood is melt water that form the main phase of the water regime - spring floods. 70-90% of the annual stream flows fall under spring flooding. Flood begins on average in March and April. In the years of early spring flooding occurs in late February, late floods occur in early May. The flood lasts 160 days on average. Duration of flooding is subject to prolonged melting of snow in the mountains. Peaks of river floods in cross-sections of bridges are observed in mid-April. Flood wave height can reach 1.2-2.0m. The combined effect of snow-melt and rainwater caused a formation of very high flow rates. According to the resources of surface water, the flood of 1958 and 1959 secures about 1%. At the end of spring flow, autumn low water comes. During low water on the rivers, short-term rises in a water level caused by rainfall may occur. The amplitude of the fluctuations in the level of this period is small and usually does not exceed 0.2m.

86. All streams are considered to be midlevel watercourses. The outstanding maximum flows on these streams were confined to showers in the melted stream flow.The main features of water collection regime are melt-water that forms the main phase of the water regime - spring floods. 70-90% of annual stream flow is made of spring flooding. Floods begin on average in March and April. Early spring flooding occurs in late February, late flood falls on to early May. The flood lasts on average - 160 days. Duration of flooding is caused by prolonged melting of snow in the mountains. Peak rivers floods in cross-sections of bridges, in average, fall on mid-April. At the end of spring flow autumn low water comes. During low water on the rivers short-term rises in water level caused by rainfall may occur. The amplitude of the fluctuations in the level of this period is small and usually does not exceed 0.2m.

87. Only large streams crossed by the route of the road, flow regime have been monitored. But flow observation in these rivers was of not high quality - the absence of observations of flood peak or high water, their intermittency, as well as water flows were not counted. The following table shows major rivers in the Project AoI.

Table 5.2 Major Rivers

Sl. No.	**River**	**Period of observation**	**F, km^2**	**Q m^3/s**	**Flow layer, mm**	**Overflow**
1	Zhabaglysu Novo Nikolaevka village	from 1936	172	156*	-	-

2	Aksu, Podgornoe village	from 1926	462	138*	819	0,005
3	Mashat – Antonovka village	from 1920	441	300*	-	-
4	Badam- Kyzyldzharsky gate	from 1953	1970	379	307	0,006

Groundwater reserves

88. Ground water within the piedmont plain occurs very deep, over 0 m, and do not impact the soil formation process. According to the engineering studies, underground water was not shown to the depth of 1-15m. By the chemical composition water is sulphate, slightly aggressive to W4 concrete by water permeability.

5.6 Air Quality

89. In the Project area of influence, there are no major industrial zones or large production facilities that might have significant contribution to air contamination levels. In the project area, air pollution mainly occurs from exhaust gases of motor vehicles and agricultural equipment.

5.7 Noise

90. For the Project area, no measurements of current noise levels were conducted. It is considered that, levels are to be typical for comparable Kazakhstan rural settings, where main source of noise is traffic.

5.8 Flora and Fauna

Flora

91. The project is located in the Asian desert region, the Irano-Turanian sub-region of the West Tien Shan province, in the foothills of the short grass semi-savanna. Vegetation of the undulating plains is represented by short grass ephemeroid-ephemeral semi-savanna consisting of ephemeroids (bulbous bluegrass, sedge carp) of ephemera: cheat grass and Japanese, goat grass, and lentoostnik etc. Forage yield in average is 3-5 kg/ha. To the above-mentioned groups the following is mixed: wheat grass, yarrow, licorice, etc. Arys River and its tributaries are specified by significant diversity of vegetation. Its floodplain is characterized by a dense and rich species composition of stand grass. The most widely spread are bluegrass, brome, white and pink clover. The yield is 10 quintal/ha and more. Willow, goof occurs sometimes in the riverbed of the valleys. The main weed of pastures of rural district is lentoostnik long-haired, covering about 90% of all pastures. Along all the territories non-eatable poisonous weeds are distributed such as brunets and caper, significantly reducing the yield of pastures. Winter cereals (wheat, barley) are grown on the territory as well as alfalfa, sunflower, corn, cotton and melons on irrigated land. The predominant weeds found are bitterling, guma, field bindweed, *cynodondactylon* and cane.

Fauna

92. Rodents throughout the area of the road route such as squirrels, jerboa and field mouse. Representatives of insectivores are hedgehogs, ground-Royko, as reptiles are lizards and snakes.

Domestic animals are sheep and cattle. Dogs and horses are used for various uses by the famers and are common in the area. Places of permanent nesting and habitation of animals are not found in the areas adjacent to the road route. A literature review was carried out of fauna characteristics in Shymkent Oblast. The Fauna throughout Shymkent Oblast is rich and diverse due to the extensive areas of deserts and mountains. However within the area of the alignment the wildlife is less diverse and many of the larger mammals are not generally found.

93. Nevertheless there are significant populations of rodents, badgers, rabbits, gerbils and others. Bird populations in the Oblast are extensive and various eagles, kites, harriers are recorded in the Oblast generally. The Great Bustard, Quail, Gray Crane, Sand Grouse, Jays and Sparrows are to be found. Pheasants are to be found. Since there are no large areas of water within or near to the alignment there are no significant resident populations of ducks, geese, swans etc. Similarly the extensive agricultural land within the alignment reduces the numbers and variety of birds within the area.

94. There is no record of rare, endangered or vulnerable species of animals and birds in the area. There is no record of any populations of Kazakhstan red list animals such as Saiga, Marmot or Gazelle. Here are no large areas of wilderness or natural habitats including forest areas close to the alignment. In the vicinity of the proposed road there are no large areas of water or wetlands. There are no sensitive areas or areas of high landscape value within the immediate vicinity of the road and there are no known proposals to include any part of the area as a legal protected area. Based on the Consultant field work within the alignment and the knowledge and fieldwork of the Design Engineers there is no evidence to show that the alignment has any sensitive fauna or flora.

95. The Aksu Zhabagly Reserve area opened in 1927 as the first protected area in Central Asia. The reserve is rich with flora and fauna and lies in the mountain area approximately 8 km south of the alignment. There are more than 55 species of birds and animals and over 200 plant species in the reserve, many of which are listed in the Red Book. According to experts at the Aksu Zhabagly Reserve documentation prepared 30-40 years ago indicated that there was movement of fauna between the Aksu reserve and mountain area. In recent years however there is no evidence or record to show that there is any migration or general movement of large mammals across the valley between the two mountain areas. It is believed that the increase in traffic and various new developments in the valley have been the major cause of this change in habits. During the Wildlife Survey of the area there were no wildlife sightings of any larger animals.

5.9 Socioeconomic

96. The region features a large variety of agricultural products: cereals, oil, melons and potatoes, grapes and fruits. Food processing plants comprise 40% of the industrial sector. There are two large flour mill complexes belonging to LP “Sana Corporation”. Development of mineral resources and mineral deposits has become another trend in industrial production. The only plant in Kazakhstan for the production of colored cement is located in Tyulkubas region. Tulkubasskiy lime plant has nearly 80-year history.

97. The total amount of product in the region in the first half of 2007 in comparison to the reporting period of 2006 is increased by 107.9% and equals to KZT 4 408 million (the first half of 2006 -

KZT 4 083 million). Industrial products among them are – KZT 1 967 million (44.6%), agricultural products – KZT 2 441 million (55.4%). The region earned established reputation of a region with an excellent yield of agricultural products. Traditional cultivation of different varieties of apples, pears, apricots, grapes were established several decades ago, and juicy and environmentally safe fruits are one advantages of Tyulkubas area

5.10 Archaeology and Cultural Sites

No such sites are available around the Project Area of Influence.

6. ENVIRONMENTAL IMPACTS AND MITIGATION

6.1 Approaches to Screening of Environmental Impacts

98. The approach to screening of environmental impacts for the Project follows the guidance of World Bank (WB) Environmental Assessment Sourcebook, Vol.2, Guideline for Environmental Assessment for Roads and Highways Projects, 1991. Accordingly, potential impacts on various environmental components due to different project activities during preconstruction, construction and O/M stages have been identified. A detailed environmental management and monitoring plan has been prepared for all the identified impacts and is presented in Chapter 8.

6.2 Pre-Construction Stage

99. In Pre-Construction Stage the main activities of the project are:

(i) Study to select best alignment of the road.

(ii) Further investigation on geo-engineering to detailed design the road and bridge.

(iii) Design roads, bridges and other technical facilities.

(iv) Acquire land, relocate houses and infrastructural facilities; remove vegetation covers within the project ROW for construction of road, bridges and other technical facilities.

(v) Implement resettlement action plan (RAP).

6.3 Construction Stage

100. Some of the main environment impacts during construction and operation of roads are:

- pollution by exhaust gases by road transport;
- pollution by road-building machines and mechanisms, used during construction;
- contamination by dust and wearing of road surface and tires when driving motor vehicles, as well as during transportation of road construction materials;
- contamination during extraction of road building materials, excavation, arrangement of roadbed and pavement;
- pollution of surface runoff from the roadway, surface water sources adjacent to the road
- pollution of different types of vegetation;
- disturbance to habitats of animals;
- pollution of roadside by industrial and household wastes;
-

101. The route of the road bypasses such settlements as Kyzylasker, Azattyk Shukyrbulak and Ryskulov district center at a distance of 200m to 500m, so noise and emissions from vehicles will virtually have no harmful effects on population. Nevertheless emission calculations have been made. Based on the projected levels of traffic these emissions are within normal limits.

102. The Project has incorporated the following principles into the design and construction of the road alignment:

- Selection of location of the route to minimize disturbance to occupied land;
- Maximum use of natural landscape, preservation of green space (cutting down trees is only going to be carried out where necessary and replacement planting will be incorporated as a separate contract. ;
- Maintaining of existing irrigation network, arrangement of small artificial structures of concrete pipes of various diameters in agreement with the land user;
- To protect the soil from erosive processes strengthening of drainage ditches as well as reinforcement of man-made structures of bridges;
- Removal and storage of soil and fertile layer with its subsequent use for rehabilitation on temporarily occupied lands. The construction site after construction should be cleared of construction and household debris. All debris shall be removed into the body of mound and household to dump.
- Diversion of water for construction needs is made by specially equipped machine with water intake device, equipped with fish protection grid having mesh size 3x3mm

103. Environmental contamination occurs during the process associated with construction of the road. Although impacts during construction can be significant it should be noted that environmental pollution in construction is of a temporary nature and its cumulative impact is less than during operation of the road.

Road construction can be divided into two main activities:

- Site clearance and removal of vegetation and major cut and fill activities for cuttings and embankments;
- Construction of road base and surface and provision of services and markings.

Each of these processes is different in nature and degree of impact on the environment.

6.4 Air Quality

Emission of pollutants

104. The amount and content of exhaust emissions is determined by design of vehicles, mode of engine operation, technical condition, quality of road surface, type of fuel and weather conditions. The main pollutants are as follows:
Carbon dioxide, CO_2 (carbon dioxide) is the most widespread, greenhouse gas affecting climate change. Emissions of this gas are proportional to the quantity of fuel used and fuel consumption essentially depends on road conditions.

S**ulfur dioxide SO_2** is emitted from diesel engines. Sulphur dioxide is colorless, but has a sharp irritating odor, dissolves in water to form "Acid rain" – solution of sulfuric and sulfurous acid is a characteristic phenomenon for many industrial and construction areas. It potentially damages vegetation far beyond the borders of emission sources.

The largest group of toxic substances composed by **hydrocarbons**, which are formed mainly in terms of lack of oxygen (methane, propane, aldehyde). Aldehydes are referred to highly carcinogenic substances which cause cancer disease.

Carbon monoxide CO violates the oxidative processes in the human body, reacts with hemoglobin in the blood at a rate of 200 times greater than oxygen.

Nitrogen oxides, NOx - oxides formed during high temperature oxidation of atmospheric nitrogen and low temperature oxidation of nitrogen compounds of fuel when released into the atmosphere is transformed into more stable dioxide NO2. This can have significant impact on human health. Emissions from vehicles, tend to create multiple increase in concentration of NO2. The presence of nitrogen in the atmosphere is of one of the main causes of the dangerous phenomenon of photochemical smog.

105. Emissions from vehicles and road equipment also include "solid particles". Their main component is soot, on the surface of its particles different hydrocarbons adsorb, threatening public health. Special consideration is required to be paid to environmental pollution by emissions of

heavy metals, the first place of which is taken by lead. A calculation has been made to determine the mass of harmful substances contained in exhaust gases, taking into account the projected growth of traffic. The traffic projection was based on the Basic Design data of a traffic flow in 25 years of 8714 units/day throughout the eastern part of the alignment.

Proposals to establish maximum permissible emissions, MPE

106. Emissions as well as fuel consumption depend on the mode of operation. Speed significantly affects the volume of emissions. This draft figure was calculated for maximum permissible emissions on a formula taking into account the emissions for each passing car and summing up all of emissions from individual vehicles, taking into account levels and types of transport.

Table 6.1 Presents Calculation of Maximum Permissible Emissions into the Atmosphere During Operation.

Table 6.1 Calculation of Maximum Permissible Emissions

Description	**Cars**	**Buses**	**Trucks**			**Total**
			up to 5t	**5-10t**	**More than 10t**	
Design average daily rate of vehicles per day	6190	1018	110	527	869	**8714**
Number of passages of vehicle per year	2259350	371570	40150	92355	317185	
Mileage million miles a year on 39.433 km of road	89.09	14.65	1.58	7.58	12.51	
Total specific emission of CO, NO_2, CmHn. SO_2, CO_2, Pb g/km	191.6	1069.5	944.6	934.3	1644.4	
Coefficient of influence of factors (traffic and road conditions)	1.1	1.1	1.1	1.1	1.1	
MPE tons/year	**18776**	**17235**	**1642**	**7790**	**22629**	**68072**
including solid particles:			**0.71**	**3.42**	**18.72**	**22.85**

107. Based on calculation results the annual maximum allowable emission of harmful substances of vehicles into the atmosphere (MPE) is calculated using traffic projections for year 25 amounts to 68.072 tons/year. A calculation has also been made for the maximum allowable emissions for the period of construction works. The calculation is based on amount of work on all structural elements of the road, and type of road construction machinery and vehicles used in construction and their performance. Table 6.2 shows specific emissions of harmful substances in the work of construction equipment (Appendix-D, Air Quality Calculations).

Table 6.2 Specific Emissions of Harmful Substances of Construction Equipment
(tons per ton of fuel burned)

No	Description of emissions	Designation	U.O.M	Engine emissions	
				carburetor	Diesel
1.	Carbon oxide	CO	tons	0.42	0.047
2.	Hydrocarbons	CmHn	tons	0.046	0.019
3.	Nitrogen dioxide	NO2	tons	0.027	0.033
4.	Carbon black	C	tons	0.001	0.009
5.	Sulfur anhydride	SO2	tons	0,002	0,010
6.	compounds of lead	Pb	tons	0.00037	-

Dust

108. Another source of air pollution is dust from transportation of construction materials, brake pads, clutch plates of cars as well as products of evaporation from the road surface and lubricants. Dust is formed as a result of wear surfaces under the influence of climatic factors and cars, tire wear, dirt road paving vehicles entering the roadway with dirt roads, vehicular movement on roads with transition-type pavement, transportation, road construction materials.

109. The calculation of dust of the road considered by the "Recommendations on accounting requirements for the protection of the environment when designing roads and bridges", Moscow 1995. The following Table presents calculation of dust.

Table 6.3 Calculation of Dust of the Road

Object	The coating material (rock)	C mpc, mg/m³
Population aggregate	All kinds of non-toxic	0,15
Working area	Quartzite, sandstone	1,0
	Granite, Zion, basalt, gabbro, gneiss, etc.	2,0
	Limestone, marl, dolomite	6,0
	Dust-silicate containing less than 10% free SiO2	4.0
	Clay, mineral, and mixtures containing no free SiO2	6.0
	Cement, clays, other fine fractionation of minerals and mixtures containing no	6,0
Note: In accordance with Standard 12.1. 005-76 attributed to the work area space outside the settlements of up to 2 meters above the ground.		

110. Paving divided into dusty and non-dusty. By non-dusty coverings include asphalt and cement. By dusty - broken stone, gravel, gravel-sand, improved soil, ground. According to the

degree of dust-raising ability of dusty coatings are divided into categories listed in the table 6.5, Table 6.6.

Table 6.4 Degree of Dust-raising Ability of Dusty Coatings are Divided into Categories

Categories ability to dust	Dust emission (mg/m^3)	Priority dust control
Strongly dusty	More than 60	1-st
Average dusty	10-60	2-nd
Slightly dusty	Less than 10	3-d

Table 6.5 Value of the Actual daily Average Dust Concentration

Description of pavement	Cf, mg/m^3
Grit, gravel and other materials treated with binders	1-3
Grit from other species, constructed by the method of wedges	10-20
Gravel	20-40
Grit (limestone), a mixture of selected	40-60
improved ground	60-100
Ground	More than 100

Conclusion: Construction and Operation Periods

111. *Construction:* The detailed calculations for construction and operation periods yield results that are within the limit values prescribed by Kazakh legislation. Also, since the alignment passes through predominantly open rural land with only a few sensitive uses the adverse impact on any communities will be minimal. It will be essential to ensure no depots or worksites are located in these areas. Regular monitoring of air pollution against Kazakh standards (and international, e.g. WHO, for any parameters not covered by local regulations) shall be carried out throughout the construction period. The party responsible for monitoring will be the Contractor, who will be obliged to report to the Engineer as well as local environmental authorities.

112. *Operation:* The results show that the magnitude of the impact of transport on the air quality does not exceed the maximum allowable concentrations to a distance of 20 m from the nearest traffic laneDuring the operation phase concentrations of toxic substances contained in exhaust gases within the areas adjacent to the road are within the allowable MAC, and do not adversely impact on the environment or sensitive uses. However, some mitigation measures are suggested below

Mitigation during Construction Period

113. The concentration of pollutants for each source of contamination when working on the construction of the road shall not exceed the maximum allowable limits set by the Kazakh standard SanPiN RK № 3.03.015-97. Various measures to ensure accordance with this requirement and to reduce the intensity and toxicity of emissions during road construction can be summarized as follows;

- Reducing unnecessary movement of vehicles on unpaved roads and construction sites;
- Ensuring that all construction vehicles and equipment are maintained in accordance with manufacturer's recommendations and that any repairs are carried out immediately in accordance with manufacturers recommendations. ;
- Ensuring the uniform and proper operation of paving machinery, sealing equipment and asphalting machines that will help prevent unacceptable concentrations of pollutants (e.g. aliphatic and aromatic hydrocarbons, including carcinogenic benz-a-pyrene, PAH) the working area and the surrounding areas.
- No mixing of materials (concrete, asphalt), storage of materials or construction camps or depots to be located within 200 meters of any sensitive areas.
- Regular monitoring of air pollution shall be carried out throughout the construction period.

Mitigation during Operation Period

114. **Mitigation during operational period includes following measures.**

- The design of the road will ensure more regular speeds and air pollution will be minimized.
- Improved maintenance of the road to ensure good surface conditions.
- The use of unleaded gasoline is increasing in Kazakhstan and leaded gasoline will be phased out, which will progressively reduce lead emissions into the environment.
- Regular monitoring of air pollution should be carried out throughout the operation period to determine any areas where air pollution exceeds the MAC.
- Mitigation by alignment design: distance of traffic flow to human receptors increased significantly in comparison to baseline situation.

6.5 Noise

Overview

115. During construction, the potential sources of noise are due to operation of construction related vehicular traffic, earth moving equipment, heavy machinery, and pile driving activities can generate high noise and vibration levels. Noise and vibration will have impact on people, fauna, live stock and natural environment. Acoustic enclosures around the pile drivers will reduce the noise levels by 60 decibels and are strongly recommended. Regular maintenance of construction equipment and vehicles in accordance with manufacturers' maintenance procedures will greatly reduce the noise levels. Contractors are recommended to monitor the noise levels regularly at the construction sites and take necessary measures to comply with the national standards. High efficiency mufflers are to be fitted to the noise generating equipment. The construction related

activities will be restricted between 0600 to 2100 hours within 150m of settlements and 500m from sensitive receptors (hospitals and schools).
Noise level is measured in decibels (dB). The extensive exposure to noise can cause irritation, fatigue, increased stress and sleep disturbance.

Exposure to noise during construction

116. Processes in the construction of roads are a source of intense noise, which can affect humans adversely. The intensity of the ambient noise of road machinery depends on the working body, the type of drive, work mode and the distance from the workplace to residential development. Much noise is created by the work of bulldozers, vibrators, compressors, excavators, diesel trucks. The noise produced during construction is temporary and localized. According to GOST 12.1.003-83 "Noise" Noise standards are set maximum permissible level of 70-80 dB with noise level areas above 80 dB must be designated by safety signs.

Vibration

117. Vibration, like noise, leads to annoyance, loss of sleep and in extreme cases sicknesses. Vibrations arise mainly due to rotational or translational motion of the unbalanced mass of motor vehicles and mechanical systems. The main sources of vibration impact on the environment during the works will be the construction machinery, in particular piling machinery and other equipment. Anti-vibration device screens, ie, trenches in the ground filled with discrete materials can reduce vibration. The width of the trench must be at least half the length of the longitudinal wave, or at least 0.5 meters and the depth should be not less than the length of the transverse waves and travel an average of 2 m to 5 m. These anti-vibration screens reduce transmission of vibrations through the ground to about 80%. Anti-vibration screens should be located as close as possible to the source of vibration, which increases their efficiency while reducing the depth of the trench. When placing the anti-vibrating screens on 5 - 6 m from the source of fluctuations in their effectiveness drops sharply.

Conclusion: Construction Period

118. In view of the generally isolated characteristics of the area through which the road passes it is concluded that there will be only limited construction noise impact on any housing or sensitive uses. From experience and engineering judgment it is still predicted From experience and engineering judgment it is still predicted that noise levels will remain below the levels recommended in the regulations referred to above. There will be an increase in construction traffic using the existing main road and the minor roads leading to the road alignment. On the main road it is unlikely that the construction traffic will have a significant impact on traffic flows and noise disturbance to the existing communities but this will need to be reviewed and monitored in detail prior to the commencement of the construction period. For the minor roads that cross the new alignment and for any access routes, construction traffic will significantly increase traffic flows and potential noise disturbance. A traffic count on all possible access roads to road construction site together with a regular monitoring program will be prepared prior to the commencement of the construction period as part of the environmental due diligence and management measures.

Conclusion: Operation Period

119. From experience and engineering judgment it is still predicted that noise levels will remain below the levels recommended in the regulations referred to above.

In conclusion during the operation period the predicted noise impact to any residential or sensitive uses will be minimal, and where required can be further reduced by appropriate engineering measures, such as sound barriers, plantations and landscaping elements. This approach has successfully been implemented in the World Bank financed "South West Roads Project" which has similar objectives, approach, dimensions and issues. During operation regular monitoring of the noise situation and characteristics along the alignment and the access roads will be necessary. If any additional mitigation measures are considered necessary they will be included in the repair and maintenance budget on a running basis and carried out within those activities. No changes to the design of the alignment will be necessary.

Noise Mitigation During Construction

120. Reducing construction noise is achieved through the following activities:

- Impose a speed limit of traffic during construction to 60km/h. This can reduce noise by 7 dB (as compared to 80 km/h);
- Effective soundproofing of all vehicles and equipment by the use of foam, rubber and other soundproofing materials, as well as through the use of hoods with multilayer coatings; ensure that Contractors either have modern equipment that fulfill noise reduction norms, or that equipment is retrofitted to meet the required standards;
- Stationary units (e.g. aggregates or compressors) shall be placed in sound-absorbing areas or tents, which can reduce the noise level by up to 70%.
- The definition of road construction zones with high sound levels above 80 dBA must be designated with safety signs, and workers in this area should be provided with personal protective equipment (ear mufflers of plugs).
- As a means of reducing annoyance to and potential harmful impacts eliminate nighttime construction operation within the vicinity of the sensitive uses. No plants for batching and mixing of materials, for asphalt or concrete production, and no storage sites, lay down areas or construction camps shall be located within 200 meters of these sensitive areas.
- Regular monitoring of noise levels near any sensitive areas (especially zone 2) must be carried out to ensure there is minimal disturbance to residents. If acceptable night time noise levels are exceeded the community must be consulted and additional mitigation methods such as the installation of temporary noise control barriers should be considered.
- Noise Mitigation During Operation
- Normally the provision of a tree screen consisting of 5 m high trees will decrease levels at Kazhymukan to 69.8 dBA. Further consultation with the community and those potentially impacted will be carried out during the construction period to determine whether the use of noise barriers or noise bunds - which would be effective mitigation measures - will be acceptable and desirable to the residents.
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- Generally the extensive tree planting, which will take place throughout the project corridor, will reduce noise levels at all other non critical locations throughout the alignment.

6.6 Hydrology

6.6.1 Contamination of Surface Water Sources

121. Pollution of water bodies caused by road operation activities include emissions from vehicles, products, wear coatings, tires, brake pads, dust and materials used for the icing, construction and agricultural goods, which, when washout by rain and melted snow lead to saturation water runoff by various pollutants. Among the pollutants should be noted are particulate matter (mineral and organic origin, provided Suspension particles of sand, clay, silt, plankton, etc.), petroleum products (gasoline, diesel fuel, oil, fuel oil), lead and chlorides.

Mitigation Measures During Construction

122. The key mitigation measures are, (i) divert the water flow near the bridge piers. In sections streams earths and stones will be stored properly so that they do not block rivers and streams. (ii) open surface will be covered by grasses and creepers to reduce wash-away material; (iii) hydrocarbons will be stored minimum 100 m away from rivers and dry gorges within the bunded areas; (iv) construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and contractors will submit a simple sewage management plan; (v) discharge of sediment-laden construction water directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge; and (vii) drainage system will be periodically cleared so as to ensure adequate storm water flow.

123. Water quality monitoring will be taken up during construction works at all major bridge site quarterly to assess the impact of bridge construction on water quality and implementation of necessary mitigation measures. Stream crossings that are dry during the work period will be kept unobstructed at all times and the channels will not be altered. Bridge construction will be scheduled in dry season to avoid adverse impact on fishery and river water quality.

Mitigation Measures During Operation

124. During operation to prevent contamination, the road will include drainage channels and culverts for removing storm water from the carriageway surface, to collect it and guide it to settlement and evaporation ponds (under the climatic conditions most storm water is expected to evaporate before reaching any natural surface watercourse). Drainage from the roadway and bridges shall be treated in settlement ponds where necessary (especially at Arys bridge), before reaching natural streams and rivers, or canals.

6.7 Borrow pits

125. Possible borrow pits have been defined by the design engineers but these are not part of the approved design since the contractor will make the final decision on the selection of borrow pits. The existing borrow pits have received EIA approval from the Rayon and it thus may be assumed

that they will not be interfering with sensitive aquifers that have any significance as drinking water resource. Moreover, aside from accidental spills (by themselves unlikely) the operation of borrow pits has little contamination potential. The main risk is the failure to properly close and recultivate the pits, which may lead to their conversion into illegal waste deposit sites, which would have a substantial contamination potential. An important part of closure will thus be to dismantle and / or block all access roads.

126. The environmental impacts from river bed extraction are likely to be acceptably low where such operations are carried out under valid licensing and supervision by the authorities. Generally the high dynamics of the rivers in the project area, especially the very high sediment loads due to the proximity of the mountains, and the floods in spring that carry these loads down the river beds, speak for a low environmental sensitivity of these rivers towards gravel extraction.

6.8 Soils

Construction Period

127. Potential impacts on soil during construction period are topsoil damage, soil contamination, soil erosion. During the construction period it is important that the contractor undertakes all activities in accordance with good housekeeping, technical standards and regulations, contract specifications and manages all site activities in an environmentally sustainable manner.

To ensure soil is not polluted it is essential to undertake the following activities:

- Ensure, through proper construction management (especially precision of secure fuel storage and handling facilities, well maintained equipment and vehicles, strict enforcement of traffic safety on construction site), that oil and other spills do not occur, and that if they do immediate action is taken to minimize impacts on the soil.
- Storage of construction materials only takes place in properly prepared locations;
- Immediate sorting and removal of construction debris to an offsite landfill;
- Dismantling after use the base of construction sites and access/haul roads
- Apply topsoil on all vacant sites as soon as practical;
- Operation Period

128. During operational period all liquid wastes of any kind must be taken from the road and disposed of in an approved landfill. It will be the responsibility of the road agency to ensure speedy and full clearance of all waste from the road and from its vicinity.

6.9 Waste Generation

129. Construction waste will include, inert mineral materials such as excavated earth, sand and gravel asphalt and concrete rubble, which can be entirely recycled (categorized regarding geotechnical properties, broken and sorted) and used as construction materials for filling, grading and landscaping. Potentially noxious or hazardous materials will include concrete slurries from washing plants, barrels and containers from fuels, lubricants and construction chemicals, scrap

metal including nails and bolts and steel bars, and spent welding electrodes. Construction waste will also include timber from felled trees and other organic matter from the clearing of the alignment. Waste from the construction camps will include normal domestic waste and toilet effluent.

130. The Contractor shall in accordance with Kazakh specifications ensure that all domestic and other non construction waste is collected and disposed of in a manner that does not cause any potential for contamination of surface and groundwater and contamination of soil. The default disposal pathway will be the deposition of domestic mixed waste on existing authorized waste management facilities.

6.10 Flora and Fauna

131. According to phyto-geographical zoning, the territory of the project is located in the Asian desert region, the Irano-Turanian subregion of the West Tien Shan floristic province. Available species in the territory are: Crocus - Alatau Saffron (iris family). It is incorrectly called a snowdrop, Ranunculaceae eranthis (ephemer), rinopetrium - a poisonous plant (lily family), pedicellate anemone, star of Bethlehem, Severtsev's corydalis, Kolpakovski's iris, Mongolian ephedra, St. John's wort, rabbitberry, mellilot, immortelle, common yarrow, common tansy, blue lucerne, red clover, white clover, meadow peavine, dittany, Central Asian juniper, Semenov's maple, Severtsev's astragalus, clary sage, lacinulated nightshade, Regel's ephemer, Zeravshan flaxseed, Talas aconite, Begger's rose, inula. Forage yield in average is10 centner/ha.

Cultivated plants winter cereals (wheat, barley), alfalfa, safflower. On irrigated lands - corn, cotton and melons. The predominant weeds found are bitterling, guma, field bindweed, cynodon and cane. Lands of the road route at Km 632- 674 are widely used for agriculture. Animals – gothers, jerboas, field-mice. Insectivorous - hedgehog, shrews, reptiles - lizards, serpents. Domestic animals - sheeps and cattle. Rare and legally protected plant species and animals do not exist. There are no places of permanent nesting and habitats of animals.

132. Mitigation of flora impacts include: minimizing damage to topsoil vegetation; limit encroachment and damage to plants beyond project site; suppress dust formation; maintain roadside plantations by watering and fertilizing soil; sore and handle all topsoil in accordance with contract specifications, planting more bushes and trees which will be included in a separate landscaping and planting contract.

6.11 Social Impact and Mitigation

133. Potential negative indirect impact on the local community during the construction period may include: community tension due to unfamiliar people coming to the village; damage to existing roads by road construction equipment and heavy haul trucks; damage to private property and assets; traffic access interruptions; traffic safety on existing roads, etc,.
During survey by "SK Engineering LLP" along the road in Kurlyk village discovered the ancient city of the Kazakh khanate, Khurlug. The road construction will start upon excavations and archiving of all artifacts. Also 17 kilometer from thatplace, they founded burial mounds with kept human remains, ceramics, swards and daggers.

134.Mitigation measures include review the possible installation of temporary noise barriers or other means to reduce construction noise; water spraying and limiting movement speeds of equipment and vehicles near residential areas. Other mitigation includes project information campaigns to support image of contractors and their staff, enforcing contractor employees' discipline; repair and maintain existing roads in satisfactory condition; prevent or compensate incurred losses of any asset owners affected by the contractor; organize proper signing and appoint traffic regulators on access roads and their exits; conduct information campaign to workers on HIV/AIDS, to prevent spreading of such diseases.

6.12 Traffic Safety

135. The new road is likely to be significantly safer than the existing road. However there will be instances where accidents may occur: animals getting on to the carriageway; speeding drivers may lose control of their vehicle; climatic impacts, such as snowstorms, heavy rains, hails, etc. But these are likely to be generally rare and reduced in comparison to the current baseline, i.e. the road will be significantly safer and traffic will be free flowing with more uniform travel speeds.

7. ANALYSIS OF PROJECT ALTERNATIVES

136. The alignment largely follows an existing road that was originally deigned in 1988-90. For the section km 632 to km 674 this was constructed, is now in use and will be improved to Category 1b. The same alignment has been selected except for a short section west of Antonovka village where a new alignment was designed to reduce vertical gradients. For the section km 593 to km 632 the original design was only partially constructed but is not in use. Since the originally adequately designed alignment was selected there were no alternatives analyzed by the design engineers. A do nothing option with no improvements and no new alignments would have the following implications;

Environmental Impact of a Do Nothing Alternative

137. Do nothing would involve no new capital investment in the road and the present road would take all future traffic flows. Since there are few communities along or very close to the alignment there would be some environmental disturbance to these communities. Traffic congestion is likely to increase, particularly at junctions and there would be economic disadvantages. There would be an increase in accidents and danger.

Conclusion

138. The selected alternative which involves a significant portion of green-field alignment avoids all settlements and impacts on local communities will be minimal. There will be some disturbance to agricultural activities during construction and some smaller long term impacts on agriculture. There are no significant impacts on natural habitats associated from this alternative. Overall it is considered that the selected alignment offers the best environmental approach to solving the problems with the present alignment and encouraging greater economic and social links between China and Kazakhstan.

139. The do nothing alternative for the Western Section would have only limited environmental impacts. The impacts are likely to be mainly concerning safety and a potential increase in accidents.

8. ENVIRNMENTAL MANAGEMENT AND MONITORING PLAN

8.1 Environmental Management Plan

140. This Section deals with a set of management and monitoring measures to be taken during the project implementation to: Avoid, Reduce, Mitigate, or Compensate for adverse environmental impacts. Efforts have been made to avoid and reduce adverse environmental impacts in the Project Design and additional recommendations to further avoid or reduce impacts.

141. The EMMP prepared in accordance with the above framework is given in Table 8.1 and Table 8.2 and each of the components is discussed in the following sections. The EMMP will be included in all the bid documents of the Project and become a part of the civil works contract. The strict implementation of the EMMP and project management's strict enforcement of the adequate construction practices and standards will reduce the negative impacts of the Project.

8.2 Mitigation Measures

142. This section includes the principles, procedures and mitigation measures that are necessary for ensuring the most appropriate environmental mitigation and enhancement plans applicable during different stages of project implementation. To avoid and minimize the impacts resulting

from the activities of the project, measures/ management plans are based on appropriate technological design, improvements or adjustments, good site operational practices etc.

143. The mitigation plan has been recommended to highlight the action to avoid/minimize/ control the impacts arising out of different project phases i.e. pre-construction, construction and operation, for each of the anticipated impact as described in EIA Report. Mitigation measures have been identified to avoid or ameliorate potential negative impacts.

8.3 Monitoring Mechanism

144. Monitoring of environmental components and mitigation measures during construction and operation stages is a key component of the EMP to safeguard the protection of environment. The objectives of the monitoring are to (i) monitor changes in the environment during various stages of the project life cycle with respect to baseline conditions; and (ii) manage environmental issues arising from construction works through closely monitoring the environmental compliances. A monitoring mechanism is developed for each identified impact and it includes:

- Location of the monitoring (near the Project activity, sensitive receptors or within the Project influence area)
- Means of monitoring, i.e. parameters of monitoring and methods of monitoring (visual inspection, consultations, interviews, surveys, field measurements, or sampling and analysis)
- Frequency of monitoring (daily. weekly, monthly, seasonally, annually or during implementation of a particular activity)

145. The monitoring program will also include regular monitoring of construction activities for their compliance with the environmental requirements as per relevant standards, specifications and EMP; The purpose of such monitoring is to assess the performance of the undertaken mitigation measures and to immediately formulate additional mitigation measures and/or modify the existing ones aimed at meeting the environmental compliance as appropriate during construction.

146. The environmental parameters that may be qualitatively and quantitatively measured and compared are selected as ‘performance indicators’ and recommended for monitoring during project implementation and O&M stages. These monitoring indicators will be continuously monitored to ensure compliance with the national, WB or other applicable standards and comparison with the baseline conditions established during design stage. The list of indicators and their applicable standards to ensure compliance are given below:

- Air quality (PM), S02, N02, and CO) - Kazakhstan National Standard.
- Noise levels – Kazakhstan National Standards
- Surface Water Quality (TDS, DO, Turbidity, pH) -Standards from the Environmental,

Health, and Safety (EHS) Guidelines of the World Bank Group (April 2007) are used.

- Groundwater Quality (pH, Mg, Na, Coliform) - Standards from the Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group (April 2007) are used.
- Number of identified critical wildlife species and migratory birds - Comparison with Baseline Environment.

147. During the preconstruction period, the monitoring activities will focus on (i) checking the contractor's bidding documents, particularly to ensure that all necessary environmental requirements have been included; and (ii) checking that the contract documents' references to environmental mitigation measures requirements have been incorporated as part of contractor's assignment and making sure that any advance works are carried out in good time.
148. Construction environmental monitoring is a function of supervision, and the essential purpose is to ensure adherence to the EMP. The monitoring is a day to day process, which ensures that departures from the EMP are avoided or quickly rectified, or that any unforeseen impacts are quickly discovered and remedied. Specific actions in the EMP that are to be monitored are included in the Monitoring Plan. During construction, environmental monitoring will ensure the protection of side slopes, and embankment from potential soil erosion, borrow pits restoration, quarry activities, siting of work sites and material storages, siting of batch, concrete and asphalt plants especially close to the nature reserve, preservation of religiously sensitive locations, community relations, and safety provisions.
149. Post monitoring evaluation will be carried to evaluate the impacts of the Project during first 3 years of operation of the Project. Regular monitoring of the condition of the road surface, bridges, culverts, drainage structures and slope protection structures is important from an environmental management point of view, but takes place as part of regular road maintenance. In addition to this activity, information on the locations, type and consequences of traffic or traffic related accidents is required, in co-operation with traffic police. Recommended air, noise and water quality monitoring, greening and landscaping and community feedback are also included in the Monitoring Plan.
150. The monitoring plan during the construction and operation stage is presented in Table 8.2.

Monitoring Schedule and Performance Indicator

151. The monitoring schedule has been developed based on the possible occurrence of adverse impacts and required mitigation actions. However, this schedule is subject to change depending on the analysis results obtained. The performance indicators and protocol for changing the monitoring schedule is given below.

- Soil Erosion and Drainage Congestion

152. No significant soil erosion problem is anticipated due to the project either in the construction phase or in the operation phase. However, in the construction phase, some localized soil erosion may be noticed owing to construction activities. However, if soil erosion is noticed during construction and operation phase, the corrective action shall be initiated and frequency of check be increased to assess the tendency of occurrence.

153. The cross drainage structure shall be free from siltation. Visual check shall be made

periodically to identify any drainage congestion or water logging along the road. Appropriate corrective action shall be taken to clear the congestion and prevent reoccurrence.

- Air and Noise Quality

154. Due to the variability of the construction activities, namely changes in batch composition, type of construction activity and other anthropogenic influences, the ambient air quality of the project area may change. If the air quality with respect to any parameter exceeds of its last monitored value, the monitoring frequency shall be increased and cause of the increase investigated.

- Water Quality

155. No significant change in water quality is perceived due to the project in the operation phase. However, in the construction phase, the monitored values for pH, BOD, COD, TDS, DO and Oil & Grease might change owing to construction activities. Hence, it is suggested that if the monitored value for any water quality parameter exceeds of its last monitored status the monitoring frequency shall be increased (Appendix-C, Environmental Monitoring).

8.4 Institutional Framework for Implementation of EMP

156. Institutions responsible for executing and monitoring the environmental aspects of this Project are:

> CR is responsible for planning, construction, operation and maintenance of national and regional infrastructures in Kazakhstan and Regional Committee for Roads is responsible for overall implementation and management of roads.

> The supervision consultants under CR are responsible for environmental monitoring and management of project implementation and to help ensure the implementation of environmental management practices at each stage of the construction.

> MoEP will be consulted if complicated issues arise during construction and operation stages.

157. Contractor is responsible for implementation of EMP during construction works and Construction Supervision Consultant (CSC) is primarily responsible for supervision of monitoring of the implementation of the EMP. CR will hire 'external monitoring consultant' to monitor implementation and supervision of EMMP. Each Contractor procured under this Project will be recommended to be a compliant of ISO 14001, 2004 Environmental Management System (EMS) certification. Each contractor will be recommended to have one Environmental Specialist and one Occupational, Health and Safety (OHS) Specialist, who will be working in close coordination with the environmental staff of CSC and CR.

158. CSC will be responsible to monitor all activities of all contractors procured under the Project. As several contractors will be working simultaneously for timely and speedy implementation of

the project, it is important that CSC has an environmental unit to effectively supervise and monitor the environmental activities being implemented in the field. The CSC is also responsible to update or make necessary changes to the EMMP if required based on the revised designs and locations.

8.5 Management of Project related Impacts

159. An EMP has been prepared for each identified impact and presented in Table 8.1. This EMP is divided into three sections, pre-construction, construction, and O&M. Again each section is further divided into Project activity to address activity wise impacts (Table 8.1).

Table 8.1 Environmental Management Plan

Project Activity	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibility	
			Implementation	Supervision
B. Design Phase/ Preconstruction				
Detail Design	Potential impacts caused by drilling wells for geotechnical investigation	Properly cover and seal drilled wells after completion of investigation	Design Consultant	CR
Hydrology	Project road crosses rivers and streams, and will affect the natural hydrological and flood water flow.	Hydrological analysis was carried out for all the rivers and streams in the Project area	Design Consultant	CR
Severance	Severance of communities and villages	The project road is designed as access restricted highway (freeway) and overpasses are recommended for all local roads with interchanges with all major regional roads. Hence the project road will not interference with the local traffic	Design Consultant	CR
B. Construction Phase				
Clearing of sites	Striping of top soils (20 cm depth) Excess soil, rock	Collect/strip top soil before earth filling and store and reuse it for final surfacing of road embankment and free plantation	Contractor	CSC, CR Monitor
Establishment of camps	Lack of proper services in camps such as safe drinking water and sanitation	Provision of necessary facilities in construction camps	Contractor	CSC, CR (Regional)
Maintenance of camps	Contamination from solid waste	Implement waste management Activities; All construction materials will be reused, recycled and properly disposed off; All worn out parts, equipment and empty	Contractor	CSC, CR (Regional), Municipality Monitor

		containers must be removed from the site to a proper storage location designated by CR & Municipality (*Akimat*); There will be no site specific landfills established by the contractors.		
STI and HIV trainings		Conduct for all construction workers induction training on STI and HIV issues as well as basic sanitation and health issues	Contractor	CSC, CR Monitor
Large quantities of material import	Exploration of illegal source	Environmental permits of suppliers from relevant authority	Contractor	CR
Mobilization of equipment and materials through road	Road safety and Traffic Management	Implement Road Transport and Road safety Management	Contractor	CSC, CR Government, Police
Operations at Construction Yards and Construction Sites	Air, noise pollution from material storage sites and mixing sites	Implement Air Quality Management Standard; Implement National Standard on Nose and Vibration Management	Contractor	CSC, CR
	Solid Waste, excess materials	Implement Procedure on 'Waste Management'; Develop appropriate construction waste management strategy.	Contractor	CSC, CR
Operation and Maintenance Phase				
Vehicular movement	Increase noise level because enhanced traffic volume	Put signage for noise regulations at sensitive locations (school, hospitals, health care units) with clear instructions of not using horns and running vehicles with limited/allowable speeds	CR	MoEP
	Drainage leading to	Connect water pockets to the nearest	CR	MoEP

	water logging and impacting on surrounding lands	drainage structures/canals by constructing roadside drainage canal		
Landscape and Erosion Protection	Long term degradation of natural landscape at land strips and slopes; Visual impacts Change of drainage patterns, erosion, degradation of	Restoration of the landscape to the natural shape (at the sites not occupied permanently by the carriageways and road facilities, and where reinstatement is possible).	Provincial/Rayon CR in long term perspective through Contractors	CR, MoEP
Protection of Flora and Fauna Protection of Flora and Fauna	Mortality of animals during road crossing	Flora and fauna monitoring will be carried out during first 3 years of operation including monitoring of mortality of fauna due to project roads	Provincial/Rayon CR in long term perspective through Contractor	CR, MoEP

Note: *CR- Committee for Roads, CSC-Construction Supervision Consultants, MEP- Ministry of Environmental Protection*

Table 8-2: Environmental Monitoring Plan during Construction and Operation

Parameter	Monitoring	Means of Monitoring	Frequency	Responsible Agency	
				Implemented by	Supervised by
During Construction					
Operation of borrow and quarry sites	Quarry sites	Visual inspection of quarry sites	Monthly	Contractor	CSC, CR
Top soil	Construction corridor	Top soil of 0.15m depth should be excavated and stored properly	Beginning of earth works	Contractor	CSC, CR
Erosion	Side slopes of the embankment and material storage sites	Visual inspection of erosion prevention measures and occurrence of erosion	At the end of filling activity	Contractor	CSC, CR
Landslide/Rock fall control	Active rock fall sections and steep mountainous slopes	Visual Inspection, monitoring the construction of rock fence	Monthly	Contractor	CSC, RD
Hydrocarbon and chemical storage	Construction camps	Visual Inspection of storage facilities	Monthly	Contractor	CSC
Air Quality (dust, smoke)	Construction sites	Visual inspection to ensure good standard equipment is in use and dust suppression measures (spraying of waters) are in place.	Weekly	Contractor	CSC
	Asphalt Plant	Visual inspection to ensure asphalt plant is located >500 m from residential areas	Monthly	Contractor	CSC
	Material storage sites	Visual inspection to ensure dust suppression work plan is being implemented	Monthly	Contractor	CSC
Air Quality (PM, NO_2, SO_2, CO)	Near the sensitive sites and settlements (as directed by CSC)	Air quality monitoring	Quarterly	Contractor through a nationally recognized laboratory	CSC

Noise	Construction sites	Visual inspection to ensure good standard equipment are in use	Weekly	Contractor	CSC
	Construction sites	Ensure work restriction between 21:00-06:00 close to the sensitive locations/settlements	Weekly	Contractor	CSC
Surface water quality	At all streams near the bridge construction sites near down stream	Sampling and analysis of surface water quality (TDS, DO, Turbidity, pH)	Weekly	Contractor through a nationally recognized laboratory	CSC
Waste Management	Construction camps and construction sites	Visual inspection that solid waste is disposed at designated site	Monthly	Contractor	CSC, CR
Drinking water and sanitation	In construction sites and construction camps	Ensure the construction workers are provided with safe water and sanitation	Weekly	Contractor	CSC, CR
Floral and faunal Monitoring	Project area	Survey and comparison with baseline environment	Yearly	CR through nationally recognized institute	CSC
Safety of workers	At work sites	Usage of Personal Protective equipment Monitoring and reporting accidents	Monthly	Contractor	CSC, CR
Reinstatement of Work Sites	All Work Sites	Visual Inspection	After completion of all works	Contractor	CSC, RD
During Operation and Maintenance					
Air quality	At the Baseline Monitoring Sites	24 hours air quality monitoring of PM, S02, N02 and CO	Yearly	CR through nationally recognized laboratory	External Monitor
Floral and faunal Monitoring	In the Project area	Detailed monitoring plan developed on species assessment.	Yearly	Contractor and CR	External Monitor

8.6 Institutional Strengthening and Capacity Building

160. It is recommended that CR should hire all the positions before starting the Project. To further strengthen the monitoring and compliance to environmental issues recommended in the EMMP, the following specialists are recommended for Contractors and CSC to be hired under the Project.

- Construction Supervision Consultant:
  - Environmental Specialist-International
  - Environmental Specialist-National
  - Social and Resettlement Specialist-International
  - Social and Resettlement Specialist-National

- Contractor:
  - Environmental Specialist
  - Occupational Health and Safety Specialist

- External Monitoring Consultants:
  - Environmental Specialist
  - Social and Resettlement Specialist

161. A series of capacity building programs are proposed for both the environmental and social section/division through continuous and oriented trainings on:

- Environmental & Social safeguards, their importance and benefits
- Preparation of EIA such as screening and/or scoping and adequacy of impact assessment, EMP provisions, Costing etc.
- Preparation of LARP.
- Disciplines like Environmental Management, Sustainable development, Environment Economics, Environment Auditing etc.
- Some of the senior representatives should receive environmental and social safeguard training under a recognized program (national and/or overseas).

9. PUBLIC CONSULTATION

162. Stakeholder consultations were conducted to discuss the environmental issues related to the project intervention. Hearings were carried out pursuant to order of the RoK Minister of Environmental Protection as of 7 May 2007 No.135-p. During the consultations, the purpose and components of the project were presented along with the benefits and potential impacts during project implementation. In addition, several settlement sites along the project AoI were visited and some of the residents were informed about the proposed interventions and their perceptions about the Project were gathered. The participants were informed of the immediate effects of construction activities related to localized air and noise pollution, waste disposal from construction camps etc.

163. The project received unanimous support and consent from all local people. Environmental awareness and concern were found low. They realize that, the project should be implemented urgently with assistance from the RK and IBRD.
Participants of public hearings were:

- The interested public
- Public and non-governmental organizations and associations
- Local executive and representative authorities, state authorities competent to make decisions reviewed
- Mass media.

164. Results of public hearings were recorded in minutes and signed by the chairman and secretary. Prior to consultation meeting, the announcement of public hearings was advertised on web-site mtk.gov.kz on 12.04.2011 and published in the district newspaper of Tyulkubas and Sairam districts.

165. The meeting was attended by Local representatives of executive authorities (Tyulkubas and Sairam districts); SKR representative from the Road Committee; Representative of LLP ”SK Engineering” and local villagers of Tyulkubas and Sairam districts.

10. CONCLUSIONS AND RECOMMENDATIONS

166. The EIA for Shymkent to Zhambyl Oblast Border Road has been prepared to ensure that the Project is environmentally sound and sustainable as well as in compliance with the safeguard requirements of the WB and Republic of Kazakhstan. This EIA will be submitted to the Committee for Roads (CR) and Ministry of Environment Protection (MEP) to obtain Environmental Impact Permit.

167. The major positive impact of the Project will be less air pollution and dust, less congestion, and improved traffic safety in the new road, and better accessibility. Additional positive impacts are the increased growth in the economy of the region, substantial income and employment opportunities, improved living conditions, reduced poverty, and better access to village produce.
Potential negative impacts are clearing areas for future road, changes in land use and resulting damage potential of geo-hazards, borrow pits and quarry sites. Construction related activities will have impact on the natural drainages, generation of excess materials, noise and air pollution and road safety.

168. Road safety will be improved by installing road safety barriers including proper traffic engineering signs and display boards. Quarries and borrow materials will be collected from the pre-approved sites and will be properly restored after the extraction of materials. Regular monitoring and reporting on the status of EMP implementation shall be undertaken to ensure that mitigation measures are implemented as required and to allow for formulation and implementation of corrective actions, as necessary.

169. Environmental Consultants of Construction Supervision Consultants (CSC) are responsible for monitoring of implementation of EMP and ensure compliance. Environmental personnel of CR is also responsible for supervision of construction works and compliance to EMP in coordination with supervision consultants.

170. The Project will have overall beneficial impact as well as some negative impacts that will be carefully monitored and adequately mitigated. Therefore, the completion of this EIA fully meets the CR and WB requirements and submitted to MEP to obtain Environmental Clearance.

References

- Design Manual for Roads and Bridges, Environmental Assessment, UK, June 1993.
- "Environmental Code of RK", 2007
- Environmental Protection, SK-ENGINEERING" LLP, "Reconstruction of the highway A-2 " Khorgos - Almaty - Shymkent - border of the Republic of Uzbekistan" km 593-km 806 (593 km – 632 km section)"
- "Environmental & Social Impact Assessment of the South West Highway, GEODATA PLUS, 2008
- General Requirements for Land Reclamation. GOST 17.5.3.04-83
- "Instructions on conducting the environmental impact assessment for planned and other activity, while preparing preplanned, pre-design, and design documentation", Astana, 2005.
- The Concept of Ecological Security of the Republic of Kazakhstan, Astana, 2003.
- The Soils of the Kazakh SSR.
- World Bank Environmental Assessment Sourcebook, Updated, 1996

Appendices

(Section-1 and Section-2)

Appendix-A: Maps and Diagrams

Appendix -B: Environmental Regulations of Republic of Kazakhstan

Appendix -C: Environmental Monitoring of Selected Parameters, Location and Budget (Sec-1)

Appendix -D: Air and Noise Levels

Appendix-A: Maps and Diagrams

Appendix-A1: Project Location, 593-674km, South Kazakhstan Oblast

Appendix-A2: Location of Road Section of Highway A2 "Khorgos-Almati-Shymkent Border of of Republic of Uzbekistan" 593-674km (Section-593-632km; Section-632-674km)

Appendix-A3: Outline of Places for Sample Selection of Soil, Wate, Air for Road Section km 593-632 of Highway A2 "Khorgos-Almati-Shymkeny"

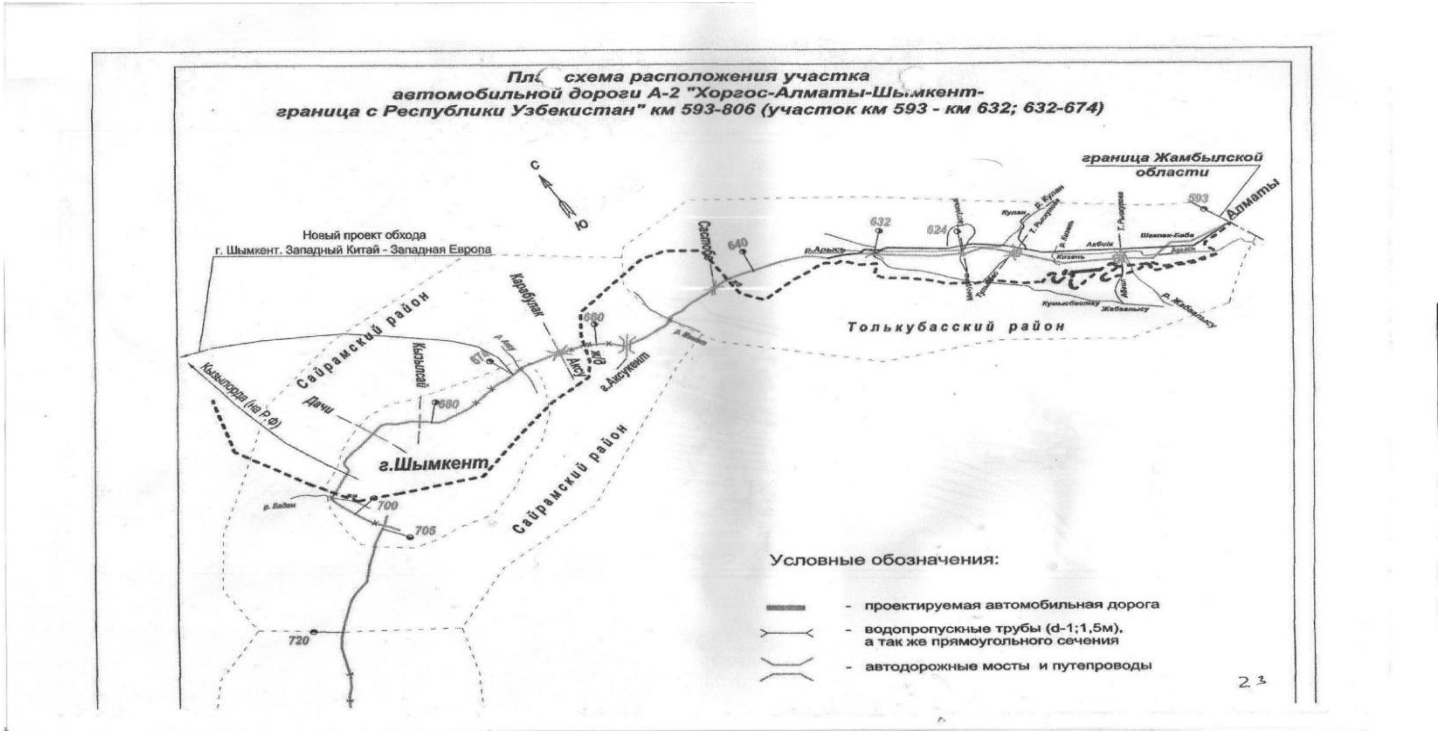
Appendix-A4: Location of Archaeological Objects

Appendix-A5: Scheme of Highway

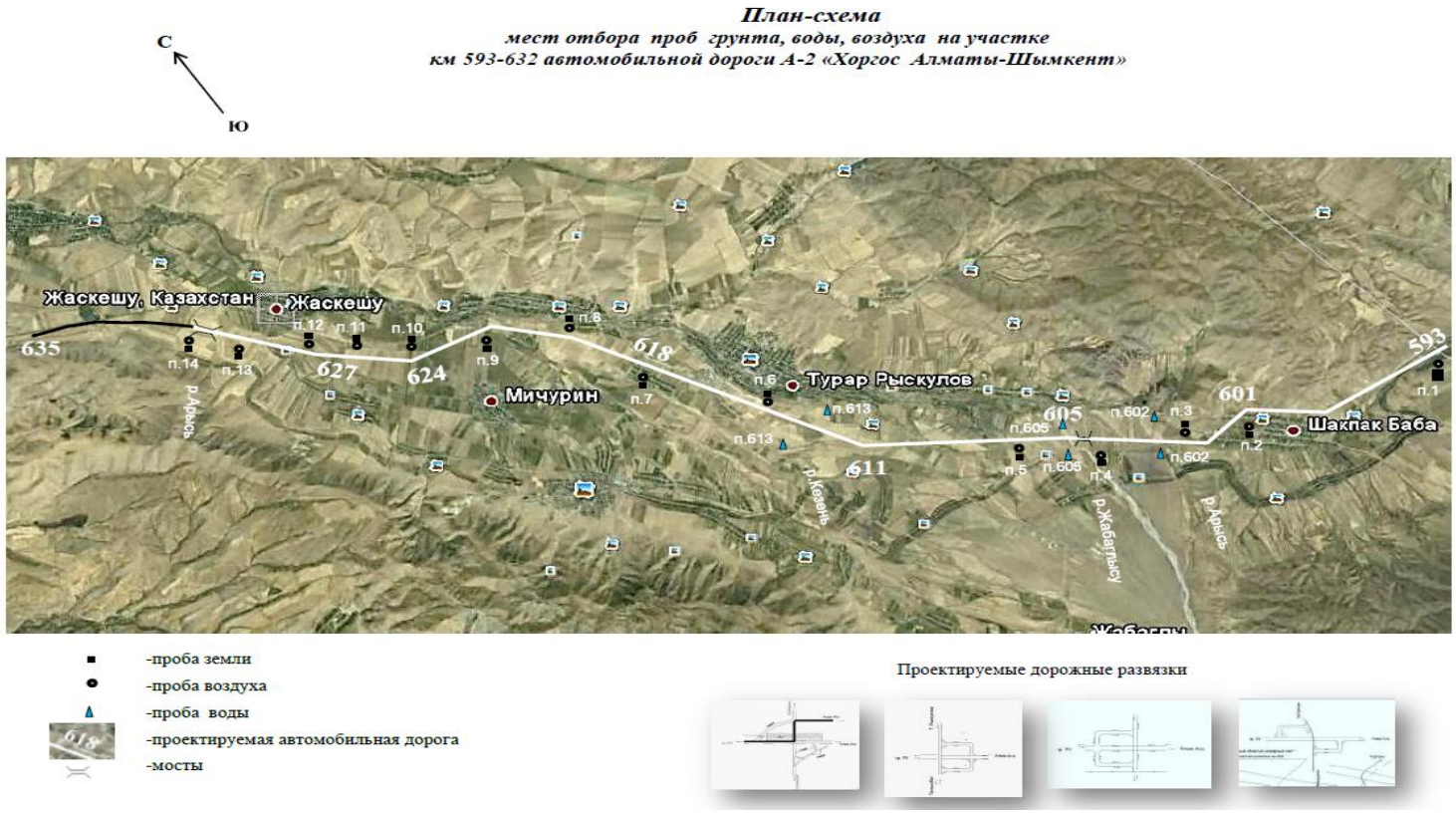
Appendix A-6: Diagram of the highway, Section-1: (593-632 km)

Appendix-A7: Map of Section -2: (632-674 km)

Appendix-A1: Project Location, 593-674km, South Kazakhstan Oblast



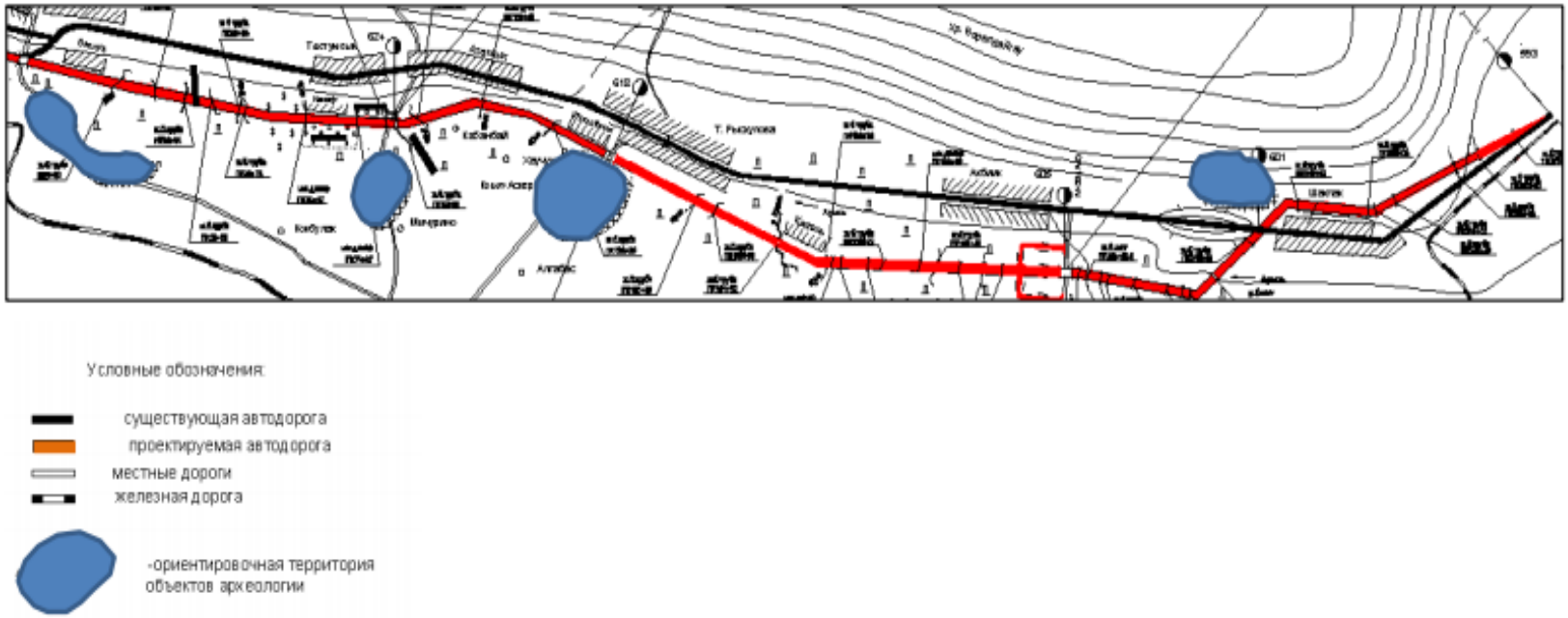
Appendix-A2: Outline Location of Road Section of Highway A2"Khorgos-Almati-Shymkent-Border of Republic of Uzbekistan" 693-674km



Appendix-A3: Outline of Places for Sample Selection of Soil, Water, Air for Section 593-632

Appendix-A4: Approximate Location of Archaeological Objects for Section-1 (in Blue Color)

Ориентировочная территория объектов археологии 1 участка трассы (*выделено синим цветом*)

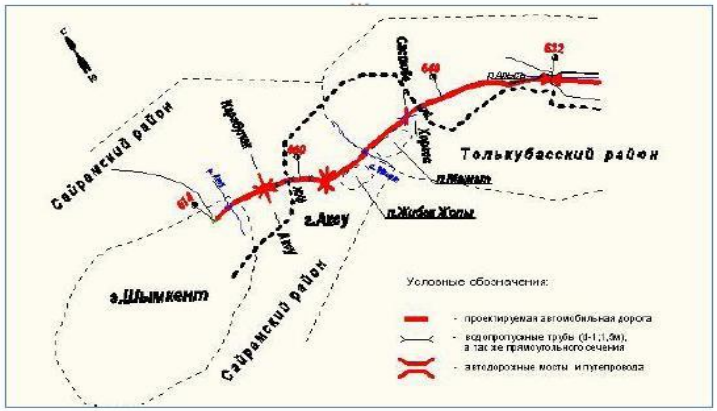


План-схема

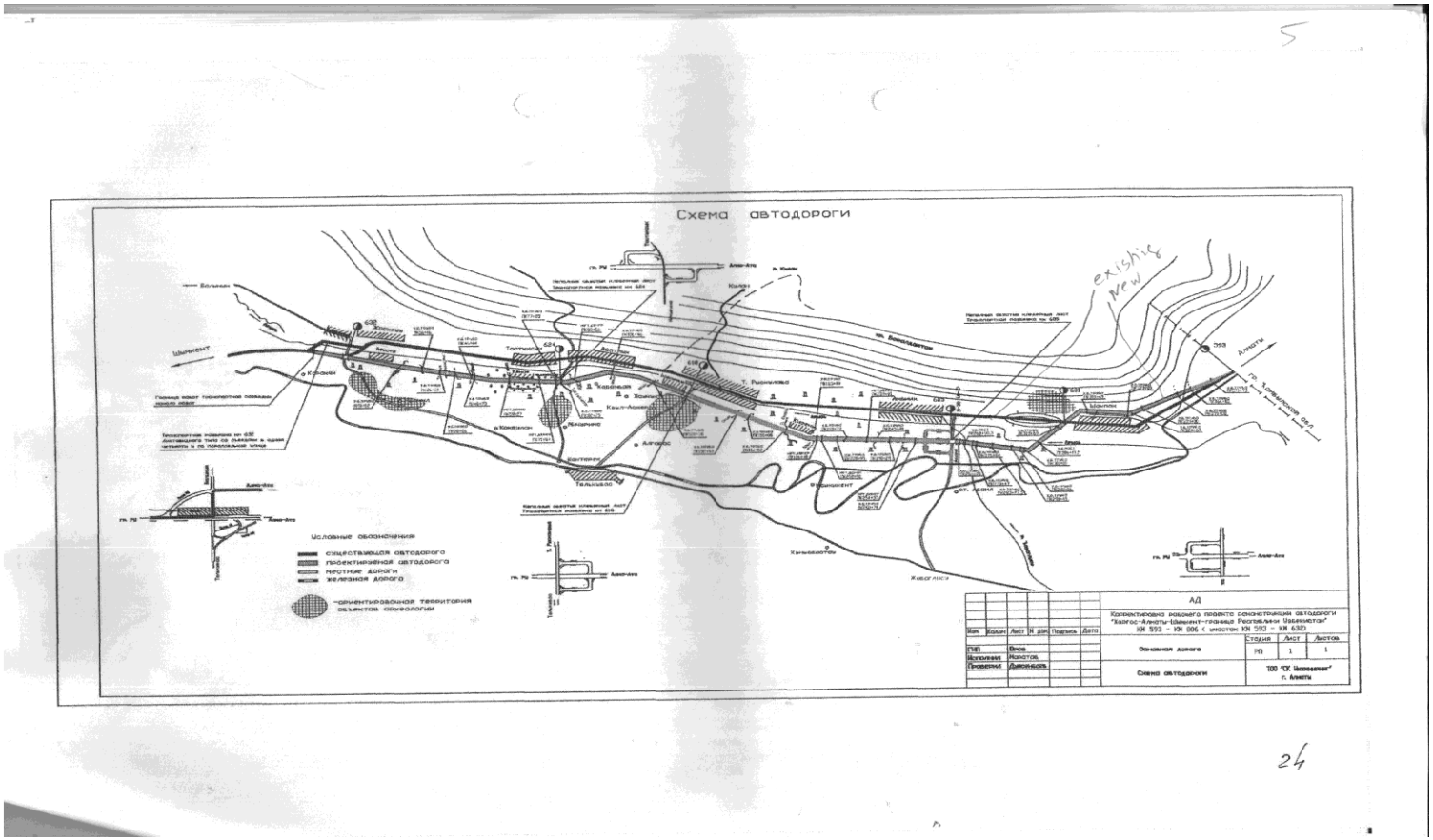
мест отбора проб грунта, воды, воздуха на участке км 632 -674

автомобильной дороги А-2 «Хоргос Алматы-Шымкент»

Тюлькубасский и Сайрамский районы



Appendix-A5: Scheme of Highway



Appendix-A6: Diagram of the Highway (593-632km)

Annex-B: Legal framework of Republic of Kazakhstan

A.1 OVERALL LEGAL FRAMEWORK

Environmental protection is administered in Kazakhstan by the Ministry of Environmental Protection (MEP). The Environmental Code was adopted in January 9, 2007 and is the basic legislative framework for environmental protection activity. Three main laws (the *Law on Environmental Protection*, the *Law on Ecological Expertise* and the *Law on Air Protection*) were abrogated subsequent to their integration into the Environmental Code. Moreover, some 80 normative legal acts were abrogated after the adoption of the Environmental Code.

A.2 ENVIRONMENTAL IMPACT ASSESSMENT

All EIA requirements are included in the Environmental Code. The basis of EIA development is "Instruction on conducting environmental impact assessment of planned economic activity when developing pre-planning, planning, initial project and project documentation, approved by the Order of the Minister of MEP, 28 June 2007, No.207-p".
According to the instruction there are four stages:

1) Review of Environmental Conditions;
2) Preliminary EIA;
3) EIA;
4) Section "Environmental Protection"

The first stage of the EIA "Review of Environmental Conditions" includes general characteristics of natural and socio-economic environment of the area of planned activity, analysis of main trends of practical use of the territory and defining of principal positions of EIA. This stage of the EIA is based on the conceptual design, available materials, other special literature, project description etc. The purpose of this stage is to evaluate the environmental conditions, identify key environmental issues, choose the best option available for siting of the development, and to define scope of work for the second stage.

The Second stage of EIA "Preliminary EIA" – potential possible changes of components of natural and socio-economic environment and its impacts are defined. The purpose of this stage is to assess baseline environmental conditions, identify potential impacts, and design mitigation measures to offset such impacts, which is then included as a chapter into feasibility study of the project. All materials supporting decision-making on regulatory requirements (EIA study and statement, minutes of public hearings, permit applications and other supporting documents) must be reviewed by competent environmental authorities within a procedure known as "ecological expertise". Ecological expertise (EE) is conducted by The Department of Natural Resources and Environmental Management staff for category I enterprises, by TEPOs for categories II and III, and –since 2007- by local administration (Territorial Department of Environment) for category IV enterprises. Recourse to external experts can be made but they

only have a consultative role. Services provided by these experts are paid by project developers; the so-called public expertise may be conducted by independent experts. However, the final documents (expert opinions and permits) are not available to the general public and, sometimes, not even to field inspectors.

According to Article 36 of the Environmental Code "Development of Environmental Impact, assessment is obligatory for all types of activities that can have a direct or indirect impact on the environment or health of the people". The procedure on public hearings is regulated by the 2007 ministerial order on Rules for carrying out of public hearings. EIA and SEE are two interconnected procedures. The developer has to conduct an EIA, which is carried out by accredited private companies, and is in charge of preparing the EIA documentation. The EIA procedure is a two-phase process: the proper EIA and then the SEE. Once the EIA is approved, the developer should apply to the SEE. The competent authority checks the documents` quality prepares its own evaluation and returns both to the developer. The evaluation takes into account the opinions and views expressed by the public and other authorities which have participated in the process. The EIA procedure is performed before the permitting procedure and the developer has to attach the EIA report and the competent authority`s statement together with the permit application. EIA procedure lasts about two months and SEE up to three months. A post-project analysis by the authorities is mandatory and carried out after one year. Experience in other IFI-financed projects in the country shows that the authorities are proactive and compliant with regulations in their oversight of projects with potential significant environmental dimensions.

It is forbidden to implement projects for economic and activities or to finance it by banks and other financial institutions without a positive resolution of the state ecological examination. The positive conclusion of state ecological expertise that is given to the project is generally valid for five years from the date of its issuance.

In the case of green-field projects (i.e. new facilities), environmental authorities must be consulted on land allocation despite the fact that allocation as such is done by *akimats* (sub national administration). At this stage, project developers are obliged to assess baseline environmental conditions and to present this study, together with the Declaration of Intent, for ecological expertise. The Declaration should be discussed with the general public in hearings organized to this purpose. If environmental expert evaluation is positive, land may be allocated to the project developer.

A "preliminary" EIA is required at the feasibility study stage, when technological solutions are assessed. For a large-scale project, field prospecting should be conducted at this stage. Impacts should be estimated but precise emission calculations are not expected. The feasibility study, including all environmental related documentation, is then presented for EE. This EE is carried out by MEP staff at the national or local level, depending on the importance of the project.

An approved "preliminary" EIA is a prerequisite to receive a budget for implementing the project. and as such, it may trigger a "yes or no" decision on the project feasibility. The next stage implies a "full-fledged" EIA. At this stage, very detailed information is required, including calculations of emission limit values (ELVs), an emergency preparedness plan, monitoring programs for all media, etc. Again, this documentation must be presented for review by authorities. If design documentation undergoes any changes at a later stage (e.g. adjustment in the technology), the developer is required to adjust the EIA materials accordingly. Such adjustments require review by authorities as well.

Finally, a "post-construction" EIA must be carried out for large projects with capital investments of over $50 million one year after the activity starts. This is done to confirm the environmental safety of the economic activity and to correct the plan of environmental protection measures during operation.

Public hearings are required at all stages of EIA. In 2006, the total number of such hearings reached 95,073 cases (more than 50% of all EIA material) as compared to just 3,683 hearings in 2000. Minutes from these hearings are part of the EIA documentation. Although the public hearings` conduct and quality may not yet correspond to good international practice as promoted by international protocol (e.g. Aarhus convention) their wide application helps to advance the principle of public participation in Kazakhstan and to take root not only in procedural guidance but in real practice.

Table A-1 Legislation and Regulations Governing the EIA Process

Name of Legislation	**Date and number of registration**
Methodology for Determining Emissions Standards to the Environment	Approved by the Order of the Minister of MEP, 21 May 2007, No. 158-p.
"Instruction on Conducting Environmental Impact Assessment of Planned Economic Activity when Developing Pre-planning, Planning, Initial project documentation,	Approved by the Order of the Minister MEP, 28 June 2007, No. 204-p"
The Amendments to the Order of the Minister of Environment Protection of Republic of Kazakhstan on Approval of "Instruction on Conducting Environmental Impact Assessment of Planned Economic Activity when Developing Pre-planning, Planning, Initial project and Project documentation"	Approved by the Order of the Minister of MEP, 20 March 2008, No.62-p".

Regulations on Conducting State Ecological Expertise.	Approved by the Order of the Minister of MEP, 28 June 2007, No.207-p".
The Amendments to the Order of the Minister of Environment Protection of Republic of Kazakhstan on Approval of Regulations on Conducting State Ecological Expertise	Approved by the Order of the Minister of MEP, 9 October 2007, No.296-p".
Rules for Conducting Public Hearings	Approved by the Order of the Minister of MEP, 7 May 2007, No.135-p".
Instructions for Qualifying Requirements to Licensed Activity on Environmental Design, Regulation and Development of Environmental Impact Assessment	Approved by the Order of the Minister of MEP, 21 October 2003, No.239-p".
Methodological Guidelines to the Licensed Activity on Environmental Design, Regulation and Development of Environmental Impact Assessment	Approved by the Order of the Minister of MEP, 10 February 2005, No.51-p".
Final Environmental Supervision Experts Opinion on Definite Types of Licensed Works and Services	Approved by the Order of the Minister of MEP, 1 July 2004, No.192-p".
The Rules for Licensing and Qualification Requirements to Work Implementation and Delivery of Services in the Field of Environmental Protection	Approved by the Order of the Government of Republic of Kazakhstan, 5 June 2007, No.457-p".
Environmental Code of the Republic of Kazakhstan	9 January 2007, No.212-p".
Law of the Republic of Kazakhstan "On Amendments and Additions to Some Legislative Acts of Kazakhstan on Environmental Issues"	9 January 2007, No.213-p".
Law of the Republic of Kazakhstan "On Ratification of the Stockholm Convention on Persistent Organic Pollutants"	7 June 2007, No. 259-p".

The Concept of Transition to Sustainable Development for 2007-2009 (Action Plan)	The Order of the President of RK, 14 November 2006, No. 216-p".
The Concept of Environmental Security of the Republic of Kazakhstan for 2004-2015	The Order of the President of RK, 3 December 2003, No. 1241

A.3 TRANSPORT LAW

The Law of Republic of Kazakhstan 'On the road' dated 17 July 2001 laid out the basic legal, economic and organizational principles of governance roads in the Republic of Kazakhstan. The Road Law covers all aspects of the development and use of roads including design, engineering, traffic requirements, dimensions and providing land.

The size of the right of way for projected roads for common use is set depending on the category under the rules of allotment of land for roads of public use, namely: for road of I technical categories – 35 meters from the roads axis, for roads of II technical categories – 20 meters, for roads of III technical categories – 15 meters, for roads of IV technical categories – 13 meters, for roads of V technical categories – 12 meters. Road right of way lands are in the possession and use of road authorities or concessionaries, and are intended only for the development, improvement of roads and location of road services.

A.4 AIR QUALITY STANDARDS

The standards for air quality establish the permissible limit of the content of harmful substances both in industrial areas and residential areas. The main terms and definitions related with the atmospheric air contamination, monitoring programs, behavior of pollutants in the atmospheric air determined by the GOST 17.2.1.03-84; Environmental Protection, Atmospheric Air' Terms and Definitions for Contamination Control.
The regulatory document containing information on harmful substances in the atmospheric air is the "Sanitary and Epidemiological requirements for the Atmospheric Air Quality" approved by the Order of the Ministry of Health of the RoK № 629 dd 18.08.2004.

The emission of hazardous substances (pollutants) in the atmospheric air by the stationary source is allowed only on the basis of the permit issued by the authorized state body in the field of atmospheric air protection or its territorial subdivisions in the manner established by the Government of the Republic of Kazakhstan. The permit is based on total emission amounts supplied by the applicant (the developer) and does not show emissions from individual vehicles. The procedure of issue of the atmospheric air pollution permits during operation of the motor vehicles or other transport facilities is defined by the Government of the Republic of Kazakhstan.

All motor vehicles of any type (including buses and trucks) are required to pass an annual roadworthy test which includes emission testing which must be in accordance with the regulations referred to below.

The various legislative, regulatory and procedural documents covering atmospheric air protection are listed below:

Table A-2 Air Quality Legislation

Instruction on Agreement and Approval of the Design of the Maximum Permissible Emission (MPE) and Maximum Permissible Discharges (MPD).	The Order of the Ministry for Environmental Protection of the RoK № 61-n dd 24.02.2004.
Collected Book of Methods for Calculation of the Atmospheric Air Pollution by Different Types of Production.	The Order of the Ministry of Ecology and Bioresources 01.12.96. *Included in the list of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection № 324-n dd October 27, 2006.*
The inventory Rules for Emissions of the Hazardous Substances (Pollutants), harmful Physical Effects on the Atmospheric Air and Their Sources.	The Order of the Ministry for Environmental Protection of the RoK № 217-n dd August 4, 2005.
The procedure of Calculation of the Hazardous Substances Concentrations Containing in the Atmospheric Discharges of the Enterprises. Guiding normative document 211. 2. 01.01-97	The Order of the Ministry of Ecology and Bioresources dd 01.08.1997. *Included the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection № 324-n dd October 27, 2006.*
The procedure of Calculation of the Hazardous Substances Concentrations Containing in the Atmospheric Discharges of the Enterprises.	Approved by the Order of Minister of Environmental Protection № 100-n dd April 18, 2008 (Attachment 18)
Recommendations on Execution and Content of the Design Standards of the Maximum Permissible Emissions (MPE) in the Atmospheric Air made by the Enterprises of the Republic of Kazakhstan.	The Orders of the Minister of Ecology and Bioresources of the Rodd August 1, 1997 and Order of the Ministry of natural resources and environmental protection of the RoK № 156 dd 06.07.2001. *Included the List of the current regulatory legal*

Guiding normative document 211. 02. 02-97	*acts in the field of the environmental protection,* *the Order of the Ministry for Environmental Protection № 324-n dd October 27, 2006.*
Instruction on the Normalization of the Emission of Contaminants in to the Atmosphere of the Republic of Kazakhstan	The Order of the Ministry of natural resources and environmental protection of the RoK № 516-n dd 21.12.00. *Included the List of the current regulatory legal* *acts in the field of the environmental protection,* *the Order of the Ministry for Environmental Protection № 324-n dd October 27, 2006.*
The Calculation Procedure of Motor Vehicles Emissions for Carrying Out of the Summary Calculations of Atmospheric Pollution Guiding normative document 211.2.02.11-2004	The Order of the Ministry for Environmental Protection of the RoK #328-n dd December 20, 2004 *Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006*
The Calculation Procedures of the Specific Emissions of the Atmospheric Pollutants and Damage Depending on the Type of Fuel Used in the Republic of Kazakhstan Guiding normative document 211.3.02.01-97	The Order of the Ministry of Ecological and Bioresources of the Rodd 09.07.97 *Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006*
The procedure of Calculation of Discharge (Emissions) of Contaminants into the Atmosphere Caused by the Motor Transport Enterprises	Approved by the Order of the Minister of Environmental Protection #100-n dd April 18, 2008 (Attachment 3)
The Rules of Governmental Accounting of the Sources of Greenhouse Gases Emission into Atmosphere and Consumption of Ozone-destroying Substances.	The Governmental Decree N 124 dd February 8, 2008

The Rules of Restriction, Stoppage or Decrease of the Greenhouse Gases Emissions into Atmosphere	The Governmental Decree N 128 dd February 11, 2008

A.5 WATER QUALITY LEGISLATION AND STANDARDS

The main legislative act in the area of water resources protection and use is the Water Code of the Republic of Kazakhstan #481 dated July 09, 2003. According to the definition provided in this document "protection of water bodies" is an activity aimed at preservation, rehabilitation and reproduction of water bodies as well as prevention of water from detrimental effect.

I. According to Article 112 the water bodies shall be protected from:

1) natural and industrial pollution by hazardous chemical and toxic substances and their compounds, as well as thermal, bacterial, radiation and other types of pollution;
2) infestation (blockage) with hard, non-soluble subjects, production and household and other wastes;
3) defecation .

II. Water bodies shall be protected to prevent:
   1) disturbance of the environmental stability of the natural systems;
   2) causing harm to the lives and health of population;
   3) reduction of fishery resources and other water fauna;
   4) deterioration of the water supply conditions;
   5) weakening of the natural self-reproduction and cleansing functions of the water bodies;
   6) other unfavorable conditions that negatively affect physical, chemical and biological qualities of water bodies.

III. Protection of water bodies is carried out through:
   1) Taking into consideration competing or conflicting demands related to the protection of water bodies to all water users who use water for any purpose;
   2) improving and applying water protective activities/ measures with the help of new equipment and environmentally and epidemiologically safe technologies;
   3) establishment of water conservation zones and sanitary protection zones for protection of public (drinking) water supply sources;
   4) execution of public (state) and other forms of control over the use and protection of the water bodies;
   5) applying sanctions for non-observance of the water protection requirements.

IV. Central and local execution authorities of the Oblasts (cities of republican significance, capitals), in line with the legislation of Republic of Kazakhstan, take measures in compliance with the principles of sustainable development towards water resources conversation, prevention of pollution and blockage.

V. Physical and legal entities, activities of which affect the water bodies, are obliged to carry out managerial, technological, forestry, ameliorative, land treatment, hydro technical, sanitary-epidemiological and other activities, which ensure protection of water bodies from pollution, blockage and depletion.

Article 116 of the Law regulates issues related to the water protection zones: to maintain water bodies and water facilities in the condition required by the hygiene and sanitary and ecological norms; to prevent contamination, blockage and depletion of the surface water; to preserve flora and fauna water protection zones and belts are required.
While developing any project, which may have any impact on the water system/ resources, the project designs should be agreed with the local executive entity for water resources protection.
A Water Code, adopted on March 31, 1993, is in force in the Republic of Kazakhstan. The Government has approved the *Conception for the development of the water sector of the economy and water policy until 2010 and has approved the sectoral program for Drinking Water.*
In developing the Water Code, the Government of the Republic of Kazakhstan has adopted normative acts concerning the procedure for allowing water reservoirs for special use, a procedure for agreeing to end issuing permits for the special use of water, a procedure for using water for fire fighting needs, classifying water ways as navigable routes, and for using reservoirs for air transport needs. The Government has approved lists of reservoirs (underground waters) that have health significance of the Republic and reservoirs that have special state significance or special scientific value, the granting of which for use is restricted or entirely forbidden.
As for the atmospheric air so for the water such standards are the maximum allowable concentrations (MAC). The MACwrf (water reservoirs for fishing) are stricter than MACwrdw (water reservoirs for drinking water) as rule. It is necessary to emphasize that this refers primarily to the fish industry as such and protection of the human needs though some principles of water ecosystem protection, to all probability, were also taken into account during determination of the standards. As in the case of atmospheric air there are the various indices used for comparative assessment of the water contamination which enable the consideration of the presence of several pollutants. The most widely used index is the integrated hydro chemical water impurity index (WII). The basic document regulating the condition of the surface waters and content of the hazardous substances in them is the sanitary and epidemiological norms and regulations "Sanitary and Epidemiological Requirements for the Surface Waters Protection Against the Pollution" #3.dd 02.03.04 approved by the Order of the Ministry of Health of the RoK #506 dd 28.06.2004.

The legislative and regulatory and procedural documents in the field of the water environment protection are listed below:
Table A-3 Water Quality Legislation

Recommendations on Execution and Content of the Design Standards of the Maximum Permissible Discharge (MPD) in the Water Bodies for the Enterprises of the Republic of Kazakhstan.	The Order of the Ministry of Ecology and Bioresources of the RoK 1992. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
Instruction on the Normalization of the Discharge of Contaminants into the Water Bodies of the Republic of Kazakhstan	The Order of the Ministry of Natural Resources and Environmental Protection of the RoK#516-n dd 21.12.00.

Guiding normative document 211.2.03.01-97	Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Calculation Procedure for Standards of Discharged Waters with Pollutants (MPD) into the Water Bodies, Disposal Fields and Relief of Land	Approved by the Order of the Minister of Environmental Protection #100-n dd April 18, 2008 (Attachment 19)
The Procedure of Establishment of the Maximum Permissible Discharge (MPD) of the Pollutants onto the Disposal Fields and Natural Depressions of the Land. Guiding normative document 211.3.03.03-2000	The Ministry of Environmental Protection of the RoK #156-n dd 06.07.2001 Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Recommendations on Control over the Operation of the Treatment Facilities and Discharge of the Wastewaters.	The Order of the Ministry of Ecology and Bioresources of the RoKdd 21.05.94. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Rules of Surface Waters Protection in the RoK Guiding normative document 01.01.03-94	The Order of the Ministry of Ecology and Bioresources of the RoKdd 27.06.94. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Guidelines on Application of the Rules of Surface Waters Protection in the RoK	The Order of the Ministry of Ecology and Bioresources of the RoKdd 12.02.97. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Procedural Definitions of Norms and Standards of Water Resources Use in the Various Natural Climatic Zones of the Republic of Kazakhstan During Carrying out of the Ecological Zoning.	Approved by the Order of the Minister of Ecology and Bioresources of the RoKdd 1997

A.6 SOIL STANDARDS

New sanitary rules introduced in Kazakhstan following the long-term scientific studies-SanPiN (Sanitary Rules and Norms) 2.1.7.1287-03 Sanitary and Epodemiological Requirements for Quality of Soil and Subsoil which establish the specifications for soils quality in the inhabited localities and agricultural lands and control the observance of the sanitary-hygienic standards during engineering, construction, renewal (technical upgrading and operation of the facilities of different purposes, including those which may cause the adverse effect on the soils status.
The main terms related to the chemical contamination of soils are defined by the GOST 27593-88. Soils. Terms and Definitions. The basic regulatory documents for control of the soil pollution content is "Standards of the Maximum Allowable Concentrations of the Hazardous Substances, Harmful Microorganisms and Other Biological Materials Being the Soil Pollutants" approved by the Order of the Ministry of Health of the RoK #99 dd 30.01.2004 and Order of the Ministry for Environmental Protection of the RoK #21П dd 27.01.2004.
The maximum allowable concentrations (MAC) or allowable permissible concentrations (APC) of the chemical substances in soil are the principal criterion of the sanitary assessment of the soil contamination by the chemical agents.
This requirement applies to all land uses and does not differentiate between various land uses.
The verification of the MAC of the chemical substances in the soil is based on 4 main nuisance values identified

A.7 NOISE STANDARDS

The level of the road traffic noise is determined according to the norms of the SNiP (construction norms and rules) 11-12-77 «Noise Protection». The limit of noise exposure generated by the motor vehicles in the distance of two meters from the buildings facing to the noise sources in compliance with the SNiP 11-12-77 (tab.1.2) is 70 dBA.
The maximum allowable noise level is assumed for areas neighboring on the residential houses, rest areas of the micro-districts and residential groupings, school areas, playgrounds of the preschool after adjustment as follows:

- for noise made by the motor vehicles - 10 dBA
- for existing residential construction - 5 dBA
- for daylight time from 7 hour till 23 hour - 10 dBA.

A.8 HEALTH AND SAFETY DURING CONSTRUCTION AND OPERATION

It is required to follow the requirements of the SNiP 3.06.04-91 «Construction Safety» during the execution of works. There are the «Safety Regulations for Construction, Repair and Maintenance of the Automobile Roads», «Regulations for Safety and Production Sanitary During the Building of the Bridges and Pipes» are applied in the road construction. At performance of the road construction works it is necessary to use the «Safety Instructions» for each construction machine.

The personal protective equipment shall comply with the applicable GOSTs (apron under the GOST 12.4.029, rubber gloves under the GOST 20010, respirator "The Petal" under the GOST 12.4.028, gloves under the GOST 12.4.010, goggles under the GOST 12.4.013 and breathing mask of B type or B with filter, helmets).The site shall be kept in a safe, clean and good sanitary state. The "Contractor" shall bear the responsibility for cleanup of the site from garbage, construction waste and household rubbish and their removal to the municipal solid waste landfill (MSW). The "Contractor" shall be guided by the SanPiN №3.01.016.97 in that regard.

In addition, it is necessary to carry out routine inspection of the machinery and equipment and observance of the repair, training and instruction of the workers engaged in maintenance of the machinery, tools and equipment on safe methods and techniques of work. The protective measures with respect to the equipment are also important for prevention of injuries and accidents. Such equipment includes the following:

- motor vehicles;
- pumps, compressors;
- generators, crushing equipment;
- lifting equipment (cranes, hoists, wire ropes, loaders);
- electrical equipment.

For provision of the sanitary and living conditions for the workers it is required to establish a field camp; changing rooms, drying premises, wash rooms, shower rooms, warming premise for workers, dining facility with three meals daily, toilet facility, field office, rest room, machinery parking facility and household waste storage area. There shall be the information on safety, occupational health, production and household sanitary in the rest room. There shall be medicine boxes, first-aid outfit, drinking water and service water kept in the separate containers provided on the construction sites and field camps. The drinking water shall be located at the distance of maximum 75 m from the working area. The water permit shall be obtained in the sanitary supervision and disease control authorities and comply with the requirements of the SanPiN of the RoK № 3.05.017.97.

It is required to perform works during the hours of darkness provided that artificial lighting in accordance with the standards of the electric lighting for the installation and construction works. Irrespective of the lighting of the sites and working areas the machinery shall be equipped with the independent (built-in) lighting of the working elements and control devices.

The storage of all types of fuel and chemicals shall be in the special location with the mandatory barbed wire fence. The storage area shall not be located near the water source and depressions. The filling and unloading of materials shall be strictly controlled and performed in accordance with the established procedure. All valves and plugs shall be protected against the undesirable interference and vandalism and shall be turned off and opened easily when used. The inner surface of the tanks shall be clean. The measurement shall be carried out so that the impact of moisture and water was not taken into account.

A.9 ARCHAEOLOGY AND CULTURAL HERITAGE

The main legislation comprises:

- The Law of the Republic of Kazakhstan "About Culture", dated 15.12.2006

- The Law of the Republic of Kazakhstan "On Protection and Use of the Historical Cultural Heritage", dated 2.07.1992
- The Land Code of the RoK, dated 20.06.2003

For the purpose of recording and protection of the historical and cultural monuments they are divided into the following categories:

- historical and cultural monuments of international status representing the historical, scientific, architectural, artistic and memorial objects included in the UNESCO World Heritage List;
- historical and cultural monuments of national status representing the historical, scientific, architectural, artistic and memorial objects, having the special significance for the history and culture of the whole country;
- historical and cultural monuments of local significance representing the historical, scientific, architectural, artistic and memorial objects, having the special significance for the history and culture of the oblasts (city of republican status, capital), regions (cities of oblast sub ordinance).

According to Article 39 of The Law of the Republic of Kazakhstan "On Protection and Use of the Historical Cultural Heritage", development and use of any allocated lands shall be made only after archaeological research. Any works that may endanger the existence of monuments are prohibited. Businesses, organizations, institutions, public associations and citizens in case of detection of archaeological and other sites of historic, scientific, artistic, and other cultural value, are obliged to inform the authorized body for the protection and use of historical and cultural heritage, and to suspend continuing such works.

Appendix-C: Environmental Monitoring of Selected Parameters, Sites and Budget

Sampling Sites	Sampling points	Sampling frequency	Parameter	Number of samples	Cost of one sample, KZT	Total cost, KZT
1	2	3	4	5	6	7
Atmospheric air						
Construction site, including living containers	1 point at a distance of 100 m towards the nearest aul	1 time a quarter	Nitrogen dioxide	4x1x7=28	500	14000
			Soot		500	14000
			Carbon oxide		500	14000
			Hydrocarbons		400	11200
			Suspended substances		1500	42000
			Sulphur dioxide		500	14000
			Benz/a/pyrene		5000	140000
Settlements: Azattyk, Kyzylasker, Kizen, Akbiik, Shukyrbulak, Ryskulov, Shokpak-Baba village	Border of residential zones within 50 m towards the road	4 times a quarter	Nitrogen dioxide	7x4x4=112	500	56000
			Soot		500	56000
			Carbon oxide		500	56000
			Suspended substances		400	44800
			Hydrocarbons		1500	168000
			Sulphur dioxide		500	56000
			Benz/a/pyrene		5000	560000
A. Sub Total: Atmospheric air						1,246,000
Surface water						
Arys River at PK11+48.74	below and above the beam within 500 m	1 time a quarter during construction of	Dry residue	2x3 =6	1000	6000
			Suspended substances		300	1800

Sampling Sites	Sampling points	Sampling frequency	Parameter	Number of samples	Cost of one sample, KZT	Total cost, KZT
1	2	3	4	5	6	7
		road section at this beam	Oil products		2000	12 000
			BOD		3700	22 200
			COD		2000	12 000
			pH		200	1200
			Nitrate		900	5400
			Nitrite		900	5400
			Iron		500	3000
			Lead		1000	6000
Arys River at PK306+13.5	Below and above the beam within 500 m	1 time a quarter during construction of road section at this beam	Dry residue	2x3=6	1000	6000
			Suspended substances		300	1800
			Oil products		2000	12 000
			BOD		3700	22 200
			COD		2000	12 000
			pH		200	1200
			Nitrate		900	5400
			Nitrite		900	5400
			Iron		500	3000
			Lead		1000	6000
Zhabaglysu River (below and above the beam within 500 m)			Dry residue	2x3=6	1000	6000
			Suspended substances		300	1800
			Oil products		2000	12 000
			BOD		3700	22 200
			COD		2000	12 000

Sampling Sites	Sampling points	Sampling frequency	Parameter	Number of samples	Cost of one sample, KZT	Total cost, KZT
1	2	3	4	5	6	7
			pH		200	1200
			Nitrate		900	5400
			Nitrite		900	5400
			Iron		500	3000
			Lead		1000	6000
River Kezen	Below and above the beam within 500 m	1 time a quarter during construction of road section at this beam	Dry residue	2x3=6	1000	6000
			Suspended substances		300	1800
			Oil products		2000	12 000
			BOD		3700	22 200
			COD		2000	12 000
			pH		200	1200
			Nitrate		900	5400
			Nitrite		900	5400
			Iron		500	3000
			Lead		1000	6000
B. Sub Total: Surface water						332,400
Soil cover						
Points at border of residential zones of auls of Azattyk, Kyzylasker, Kizen, Akbiik, Shukyrbulak, Ryskulov, Shokpak-	At border of residential zones	1 time a quarter during construction operations	Iron	7 x1x4=28	1000	28000
			Lead		1000	28000
			Oil products		1000	28000
			Suspended substances		1000	28000

Sampling Sites	Sampling points	Sampling frequency	Parameter	Number of samples	Cost of one sample, KZT	Total cost, KZT
1	2	3	4	5	6	7
Baba village						
Construction site, including living containers	1 point at a distance of 100 m towards auls auls of Azattyk, Kyzylasker, Kizen, Akbiik, Shukyrbulak, Ryskulov district center, Shokpak-Baba village	1 time a quarter	Iron	7 x 1x4=28	1000	28000
			Lead		1000	28000
			Oil products		1000	28000
			Suspended substances		1000	28000
C. Sub Total: Soil cover						224,000
Noise						
Section of construction operations at each kilometer	measurements at site and both sides of the road at a distance of 20meter from the road edge	twice a year		39x 2x2=156	700	109200
SettlementsAzattyk, Kyzylasker, Kizen, Akbiik, Shukyrbulak, Ryskulov district center, Shokpak-Baba village	At border of residential zones	1 time a month during construction operations		7 x1x12=84	700	58800

Sampling Sites	Sampling points	Sampling frequency	Parameter	Number of samples	Cost of one sample, KZT	Total cost, KZT
1	2	3	4	5	6	7
D. Sub Total: Noise						168,000
Vibration						
Section of construction operations at each kilometer	measurements at site and both sides of the road at a distance of 20meter from the road edge	twice a year		39x 2x2=156	700	109200
Settlements: Azattyk, Kyzylasker, Kizen, Akbiik, Shukyrbulak, Ryskulov district center, Shokpak-Baba village	At border of residential zones	1 time a quarter during construction operations		7 x1x4=28	700	19600
E. Sub Total: Vibration					128,800	
Radiation and chemical safety						
Section of construction operations at each kilometer	measurements at sites	twice a year		39x 2x2=156	500	78000
Settlements Azattyk, Kyzylasker, Kizen, Akbiik, Shukyrbulak, Ryskulov district	At border of residential zones	twice a year during construction operations		7 x1x2=14	500	7000

Sampling Sites	Sampling points	Sampling frequency	Parameter	Number of samples	Cost of one sample, KZT	Total cost, KZT
1	2	3	4	5	6	7
center, Shokpak-Baba village						
F. Sub Total: Radiation and chemical safety						85,000
Total:						2,184,200
Forest restoration						
Hardwood trees (poplar, ash, maple, osier, birch, acacia, catalpa, plane, elm-tree, honey locust, English elm, Haskberry, nut, oak, teil, chinquapin tree, thuja) - 16 046 plants						
Reclamation of 102.4075-ha lands						

Annex-D: Air Quality Calculations

1.0 Emissions of pollutants

Economic activities to construct and further operate the road A-2 Khorgos - Almaty - Shymkent - border of the Republic of Uzbekistan" KM 593-KM674 will be accompanied by pollutants' emissions into the atmosphere with further propagation in the atmosphere's near-ground layer in operation of construction facilities (emissions from construction operations and from engines of machinery and mechanisms) during the construction period, and emissions from engines of vehicles moving on the road. Table-1.1 gives the list of types of works, description and characteristics of sources of emissions into the atmosphere during construction and operation of the highway.

Table-1.1: Characteristics of sources of emissions into the atmosphere

Types of works	Description and characteristics of sources of emissions	Description of possible emissions into atmosphere
1	2	3
Road construction	Dusting soil and construction materials in operation of machinery and mechanisms	Inorganic dust
	Fuel combustion products from engines of machinery and mechanisms	Nitrogen dioxide, soot, carbon oxide, benz(a) pyrene, hydrocarbons
	Welding works	Iron oxide, manganese and its compounds, hydrogen fluoride
	Painting works	White spirit, xylol
Road operation	Fuel combustion products from engines of vehicles	Nitrogen dioxide, soot, sulphur dioxide, carbon oxide, hydrocarbons C12-C19, lead compounds

Gases exhausted by engines of vehicles include a number of components with significant amounts of toxic gases: carbon oxide, hydrocarbons, nitrogen dioxide, lead compounds, sulphur dioxide and solid substances (soot). The level of the air pollution with specified exhaust gases should be assessed on the basis of forecasts in accordance with the calculations. The list and amounts of pollutants emitted into the atmosphere during the construction and operation period are given in table 5.2. Values of maximum permissible concentrations (MPC) pollutants correspond to the sanitary-epidemiological rules and standards "Sanitary- epidemiological requirements to the atmospheric air" No. 629 as of 18 August 2004. Data shown in the table were obtained by summation of emissions of harmful substances per each ingredient, using the methods approved by the Ministry of Environmental Protection of the Republic of Kazakhstan.

Table-1.2: List of pollutants emitted into the atmosphere

Code of pollutants	Description of pollutants	MPC mot mg/m3	MPC da mg/m3	SRLI mg/m3	Class of hazard	Emissions of pollutants, t
1	2	3	4	5	6	
Total emissions of pollutants during the construction period						
0123	Iron oxide	-	0.04	-	3	0.0072
0143	Manganese oxide	0.01	0.001	-	2	0.00078
0203	Crome (VI) oxide	-	0.0015	-	1	0.001115
0301	Nitrogen (IV) oxide	0.085	0.04		2	186.22664
0304	Nitrogen (II) oxide	0.4	0.15	-	2	28.85255
0328	Soot	0.15	0.05	-	3	82.798178
0330	Sulphur dioxide	0.5	0.05	-	3	107.2029
0337	Carbon oxide	5.0	3.0	-	4	734.1415
0342	Fluoride	0.020	0.005	-	2	0.00000078
0616	Xylol	0.2	-	-	3	0.1553
0621	Toluene	0.6	-	-	3	0.06346
0703	Benz(a)pyrene	-	$1*10^{-5}$	-	1	0.0008395
1042	Butane 1-ol	0.1	-	-	3	0.00414
1061	Ethanol	5.0	-	-	4	0.00207
1210	Butyl acetate	0.1	-	-	4	0.17002
1325	Formaldehyde	0.035	0.003	-	2	0.03207
1401	Acetone	0.35	-	-	4	0.21133
2704	Benzene	5	1.5	-	4	22.4599
2732	Kerosene	-	-	1.2	-	78.4
2754	Alkane C12-19					82.64288
2907	Inorganic dust (SiO_2) over 70%					11.411
2908	Inorganic dust (SiO_2) 20- 70%	0.3	0.1	-	3	79.792
2909	Inorganic dust (SiO_2) less than 20%	0.5	0.15	-	3	8.06
Total emissions of pollutants during the operation period						
0328	Solid particles (soot)	0.15	0.05	-	3	
0337	Carbon oxide	5.0	3.0	-	4	
0301	Nitrogen (IV)	0.085	0.04		2	

Code of pollutants	Description of pollutants	MPC mot mg/m3	MPC da mg/m3	SRLI mg/m3	Class of hazard	Emissions of pollutants, t
1	2	3	4	5	6	
	oxide					
0330	Dioxide sulphur	0.5	0.05	-	3	
0401	Hydrocarbons	1	-	-	4	
0184	Lead	0.001	0.0003	-	1	
0703	Benz(a)pyrene	-	$1*10^{-5}$	-	1	

Impact on the atmosphere is deemed permissible, if the content of harmful impurities in the atmospheric air within populated places does not exceed maximum permissible concentrations specidied in SanPiN"Sanitary-epidemiological requirements to the atmospheric air" as of 18 August 2004 N 629.

The inventory process for the construction period identified a large number of fugitive emission sources of pollutants. There are no organized sources of air pollution during construction of roads. The atmospheric air pollution is made by 24 ingredients. Substances that have the adverse impact summation effect during construction period are presented in four groups. All emissions are associated with construction operations - excavation, asphalt laying and handling works.

Maximum permissible emissions of harmful substances into the atmosphere were calculated with the consideration of an increase in the traffic volume due to increased cargo transportation operations, and in view that construction mechanisms will operated in the course of the road rehabilitation.

The total expected emissions of harmful substances for the entire period of road construction will be: 1422.6371783 tons/year (64.69923294 g/s);

Including: solid 182.07237957 tons/year; (13.77958238 g/s);
gaseous 1240.5647988 tons / year (50.91965056 g / s);

Sanitary waste gases treatment during the construction period is provided only for cement silos of the batch plant. Given the great stretch of the construction object (39.433 km) and uneven impact in terms of both the time and number of operating facilities, ground level concentrations (dispersal) of harmful substances in the atmospheric air were not calculated.

Amounts of expected gross emissions were calculated on the basis of the production program and simultaneous operation of all available equipment.

Concentrations of toxic substances contained in exhaust gases within the 30m reserve-process zone adjacent to the road do not exceed permissible MPC, and will not negatively impact the environment.

Calculations of money compensation for the atmosphere pollution with vehicles and mechanisms during construction were not made as the Contractor compensates for nature management at the place of each vehicle's registration subject to amounts of fuel burnt.

In calculating proposed MPE for the operation period, amounts of specific emissions of harmful substances by separate vehicles were taken in accordance with the data from *International Academy of Discourse Researches (IADR*) as shown in Table- 1.3.

Table-1.3: Specific emissions of toxic substances by separate vehicles

Emissions	**Types of vehicles**				
	VAZ g/km	**GAZ-53 g/km**	**Ikarus g/km**	**KamAZ g/km**	**Haulers c/w semitrailers, 30 tons, g/km**
Solid particles	-	-	0.41	0.41	1.36
CO_2	164.4	850.3	1012.7	913.7	1608.3
CO	23.0	68.47	30.25	3.73	5.89
NO_X	3.1	21.28	22.0	12.42	20.56
SO_2	0.12	0.51	0.73	2.09	5.53
CmHn	1.63	3.97	3.3	1.96	2.75
Pb	1.0	0.085	0.121	0	0
TOTAL:	191.6	944.6	1069.5	934.3	1644.4

Specific emissions listed in the table are calculated for vehicle's engines operating in optimum conditions. Compliance of conditions of vehicles' movement with the optimum operation of an engine is determined by a technical level and transport-operational conditions of roads. Therefore, measures to reduce emissions of toxic substances are based on improving of a design of highways. Reduction of longitudinal slopes, provision of visibility of horizontal and vertical curves, increase of their radius ensure the desired speed, decrease of "acceleration – deceleration" modes and reduction of toxic emissions.

Results of MPE calculations are given in Table 1.4.

Table-1.4: Calculation of maximum permissible emissions into the atmosphere

Description	**Passenger cars**	**Buses**	**Trucks**			**Total**
			up to 5t	**5-10t**	**More than 10t**	
Design daily average rate	6190	1018	110	527	869	**8714**
Number of passages of vehicles per year	2259350	371570	40150	92355	317185	
Mileage in million km a year on 39.433 km of the road	89.09	14.65	1.58	7.58	12.51	
Total specific emission of CO, NO_2, CmHn. SO_2, CO_2, Pb g/km	191.6	1069.5	944.6	934.3	1644.4	
Coefficient of influence of factors (traffic and road conditions)	1.1	1.1	1.1	1.1	1.1	
MPE tons/year	**18776**	**17235**	**1642**	**7790**	**22629**	**68072**
including solid particles:			**0.71**	**3.42**	**18.72**	**22.85**

Based on calculations results the annual maximum permissible emission of harmful substances of transit vehicles into the atmosphere (MPE) is determined considering the increase of traffic intensity for 25-year period, which amounts to 68.072 tons/year.

Forecast of greenhouse gases formation in operation of the reconstructed road.

The need for state control and regulation of greenhouse gas emissions is determined by the participation of the Republic of Kazakhstan to the UN Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol. Based on the need to develop and implement policies and measures aimed at reducing GHG emissions, Kazakhstan conducts an inventory of GHG emissions at the level of enterprises. Calculations were made while using the methods effective in the Republic of Kazakhstan.

In developing this section, we used the following regulatory documents and links:

1. PPRK "On approval of the rules on state registration of sources of greenhouse gases and ozone-depleting substances" as of 8 February 2008 No. 124;

2. PPRK "On approval of the rules on restriction, suspension or reduction of greenhouse gases in the atmosphere" as of 11 February 2008 No. 128;

3. Order of the Minister "On approval of the rules on inventory of greenhouse gases and ozone-depleting substances" as of 13 December 2007 No. 348-p;

4. Order of the Minister "On approval of the rules on developing and approving standards for maximum permissible emissions of ozone-depleting substances" as of 13 December 2007. No. 350-p.

The calculation of greenhouse gas emissions within the projected area of the road was made subject to road transport driven.

Road transport produces a significant amount of GHG emissions such as carbon dioxide (CO_2), methane (CH_4) and nitrogen oxide (N_2O). According to the methodology of the IPCC, road transport as a source of GHG emissions included into the module "Energy activities" as GHG emissions from vehicles are associated with the burning of fuel. In assessing the GHG emissions there can be used either national emission factors or factors of GHG emissions suggested in the Guidebook of the IPCC.
The expected amount of greenhouse gases as per 7000 vehicles a day will be 42855.1606 tons / year.

Dust formation calculations

Dust is formed as a result of wear surfaces under the influence of climatic factors and cars, tire wear, contamination of the pavement by vehicles coming from dirt roads, vehicular movement on roads with the transition-type pavement and transportation of road construction materials.

The intensity of dust is affected by the physical and mechanical properties of materials and the pavement condition, speeds of vehicles, weight, size and type of moving vehicles on the road, weather and climatic conditions in the location of the object.

The basic criterion of the air quality in dust release on f highways is the dust content factor.

"Recommendations on requirements to the environmental protection in designing roads and bridges", Moscow 1995, were considered to calculate the dust content factor.

The dust content factor is defined by the formula:

Kpl = Cf: Cmpc

where: C mpc - maximum permissible concentration of dust, mg/m³ ;
Cf - the actual daily average dust concentration, mg/m3

The values of maximum permissible concentrations of dust and the actual values of daily average dust concentrations, depending on the coating of the pavement are taken from tables.

Table-1.5: The valuesof maximum permissible concentrations of dust, Cmpc

Object	Coating material (rock)	C mpc, mg/m³
Settlement	All non-toxic types	0.15
Working area	Quartzite, sandstone	1.0
	Granite, zionite, basalt, gabbro, gneiss, etc.	2.0
	Limestone, marl, dolomite	6.0
	Silicate dust containing less than 10% of free SiO2	4.0
	Mineral clay and mixtures containing no free SiO2	6.0
	Cement, clays of other fine-fraction minerals and mixtures containing no free SiO	6.0
Note: In accordance with GOST 12.1. 005-76, the working area covers a space outside the settlements of up to 2 meters above the ground.		

There are dusting and non-dusting road pavements. Non-dusting pavements include asphalt and cement, dusting - broken stone, gravel, gravel-sand, improved ground and ground.