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

(DRAFT)
TEMIRLAN BY-PASS ROAD PROJECT
SOUTH-KAZAKHSTAN OBLAST

FINANCED BY INTERNATIONAL 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 *in association with* KazdorNII, Kazakhstan
International

SNC-LAVALIN International Inc.
2275 Upper Middle Road East
Oakville, Ontario, Canada, Tel : (905) 829-8808
10 Syganak , 3rd floor, Astana City
Republic of Kazakhstan, Tel: +7(7172) 661-406

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Abbreviations

AoI	-Area of Influence
CAREC	-Central Asia Regional Economic Cooperation
CR	-Committee for Roads
EIA	-Environmental Impact Assessment
IEE	-Initial Environmental Examination
MoTC	-Ministry of Transport and Communications
KZT	-Kazakhstan Tenge
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
RK	-Republic of Kazakhstan
RoW	-Right of Way
SPZ	-Sanitary protection zone
SPG	-Sanitary protection gap (linear SPZ)
USD	-United States Dollar
WB	-World Bank
SC	- Supervision Consultant
STI	-Sexually Transmitted Disease

Units of Measurements

°C	-degree Celsius
Km	-kilometre
Km^2	-square kilometre
m	-metre
m^3	-cubic metre
1US$	-147,00 Tenge (December 2011)

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.
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.
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
MAC	Maximum Allowable Concentration of a harmful substance in air, soil or water

	water
Tenge	Currency of Kazakhstan
SNiP	Construction norms and rules
FIDIC	Internationally accepted construction contract template

1. INTRODUCTION

1.1 Background

The Republic of Kazakhstan (RK) signed a loan agreement of USD 2.125 billion with the World Bank (WB) to help finance the reconstruction of various road sections in South-Kazakhstan and Kyzylorda Oblasts with a total length of 1,062 km as part of the South West Roads Project: Western Europe –Western China International Transit Corridor (Loan No. 7681, CAREC 1b) in April, 2009. The Committee for Roads (CR) under the Ministry of Transport and Communications (MoTC) is the project-executing agency. The objective of the South-West Roads Project is to develop an efficient, safe, affordable, and environmentally sustainable road transport system that forms a part of the South-West corridor in Kazakhstan traversing Aktobe, Kyzylorda, South-Kazakhstan, Zhambyl, and Almaty Oblasts from Western Europe to Western China. The World Bank financed road reconstruction projects have already commenced in Kyzylorda Oblast in March 2010, and in South-Kazakhstan Oblast (SKO) in February 2011.

Initially during the design stage, in 2008, the road section at Temirlan village of Ordabasy district in SKO was designed as an elevated 2.3 km road overpass through the central street of the village (above the existing alignment). However, in January 2009, public consultations and social surveys showed great opposition to such a design from residents of the village and the Rayon administration. As a result, an entirely new 15 km by-pass road of Temirlan with a bridge over the Arys river has been designed that will pass to the east of the village. Based on this latest design, the present Environmental Impact Assessment (EIA) report has been prepared for the bypass section.

The principle aim of the present EIA report is to address the possible short and long term environmental impacts of the road and bridge construction works to be undertaken near the Temirlan village. The objective of the study is to help the Government prepare and implement an efficient, safe and sustainable international transit network, in accordance with international environmental safeguards.

South-Kazakhstan is the most densely populated Oblast of Kazakhstan with approximately 2,4 million people (2010 estimate). Shymkent, the administrative center of the Oblast, is the second largest city of Kazakhstan with population of 635 thousand people (2011 estimate). The city is linked by road to Taraz city in the south-east and Kzylorda city in the north-west. Temirlan village is the administrative center of Ordabasy Rayon of SKO with population of

about 10,000 people, located 30 km north-west from Shymkent on the road to Kyzylorda city. The road corridor will provide an improved route for goods and passengers. The project is a priority for the Government of Kazakhstan and is in accordance with the approved Road Development Plan. It is consistent with the WB's Country Partnership Strategy for 2009-2013, which identifies the construction and rehabilitation of national roads as a priority. It is also consistent with the CAREC Transport and Trade Facilitation Strategy.

It also should be pointed out that along a 1,000 km section of M32 large scale construction works for the rehabilitation, reconstruction and the construction of new bypass sections has been ongoing for 2 years (currently >15 lots are under construction). The works are being implemented under supervision of a Project Management Consultant (PMC) who has a team of environmental and social specialists in the country that closely monitor and supervise the implementation of environmental due diligence on the construction sites. While some environmental issues remain to be improved in the ongoing construction, environmental compliance is generally satisfactory, as has been determined by several performance assessment missions carried out by the World Bank team. The same structure and approach will be used for the Temirlan bypass.

1.2 Scope of Work

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 15 km by-pass road at Temirlan village from km 2216 to km 2231 of the M-32 highway (from Samara to Russian Federation border to Shymkent in South Kazakhstan). 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.

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.

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

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 impacts during construction and operation of the by-pass, and proposes mitigation measures;
- Chapter 7 reviews alternatives to the project, including “without project” option;
- Chapter 8 provides environmental management and monitoring plans;
- Chapter 9 outlines public consultations conducted for the project.

2.0 METHODOLOGY

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 "GradStroyEkoProekt" in 2010, (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.

This report covers the description of existing environmental conditions, assessment of environmental impacts of the by-pass 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 by-pass development project. The methodology compares the present situation to that in the future both with and without the proposed interventions.

2.1 Data Collection

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 August 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.

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

- Engineering
- Hydrology
- Geology
- Land Acquisition and Resettlement

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

Scope

The Scope of the EIA covers the natural and human environment, their interaction and any direct or induced changes brought about by the proposed by-pass road and a bridge construction near Temirlan village. The methodology compares the present situation to that in the future both with and without the proposed intervention.

Staff Resources

Initially, an EIA report in accordance with Kazakhstan regulations was prepared by a national consulting firm "GradStroyEkoProekt Ltd" in 2010. 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

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.

Chronology of the project design

The following table summarizes the chronology of project design stages.

Table 2.1 Chronology of project design preparation

Date	Event	Note
2008	Project design for section km 2135-2231 was developed.	2.3 km long elevated overpass through Temirlan village central street.
16.12.08	EIA report for section km 2135-2231 prepared	
15.01.09	Public consultations with Temirlan residents (83 people attended meeting) with World Bank representatives in attendance	Elevated overpass over Temirlan village was strongly criticized. A by-pass road was proposed.
12.04.10	CR gives TOR on by-pass project design to consultant designer "Dongsung Engineering Ltd".	No mention in TOR of compliance to WB EIA requirements.
13.05.10	Public consultations.	2 alternatives of the by-pass were discussed. Alternative 1 (East of village) was supported by everyone and project designers proceeded with alternative 1.
29.07.10	Public consultations.	On the newly developed project design, land acquisition and resettlement.
23.09.10	EIA report for Temirlan by-pass was prepared.	Local NGOs strongly criticized the quality of the report.
13.10.10	New project design finalized.	Accepted by CR SKO Department.
27.10.10	Public consultations	Discussion of EIA results.
01.11.10	World Bank rejected EIA report.	Report was a compilation of other reports for sections in SKO, with no specific field data provided.
20.11.10	Meeting of CR, designer and SNC Lavalin (Project Management Consultant).	CR gave the task to improve and update the EIA report with assistance from SNC Lavalin.

		The report was amended slightly.
07.12.10	The EIA report passed to State Ecological Expertise and World Bank.	WB rejected report.
01.04.11	First draft given to CR and WB.	Improved version of the previous EIA. Draft was rejected.
23.07.11	Second draft given to CR and WB.	Improved version of the previous EIA. Draft was rejected.
25.07.11	International specialist has been incorporated into SNC Lavalin team to finalize the EIA report.	Complete rewriting of report started. Several site visits and surveys conducted.
01.08.11	Experienced firm GeoDataPlus invited to assist SNC Lavalin in finalization of the report.	GeoDataPlus conducted pollutants monitoring and gathered missing data at requests from SNC Lavalin.
01.09.11	Compilation and finalization of the present report.	

3.0 REGULATORY FRAMEWORK

In accordance with World Bank's Guidelines and Policies an Environmental Impact Assessment (EIA) has been prepared to meet the requirements of both the Republic of Kazakhstan and the World Bank.

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

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

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).

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.

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.

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.

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.

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

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 .

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.

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 MEP; 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

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 dd 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 dd 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 dd 30.01.2004 and Order of the Ministry for Environmental Protection of the RoK No. 21P dd 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.

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.

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

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. 33. 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

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.

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 Regulatory Framework Analysis

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:

1. 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 ESIAs 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.
2. 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.
3. 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.
4. 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.

4.0 PROJECT DESCRIPTION

4.1 Overview

The Project involves the construction of a four-lane carriageway on a new alignment crossing over the river Arys and bypassing Temirlan village. It forms part of the Western Europe – Western China international transit corridor and links directly with the rest of the South West Road Project: M-32 project to the north and south.

4.2 Project Components, Type and Category of the Project

The project includes the construction of a 15 km new four-lane asphalt or concrete paved by-pass road from km 2216 to 2231 of the M-32 highway (Samara-Russian Federation border-Shymkent). The project will be prepared and contracted to meet internationally accepted (FIDIC; SNiP) design and construction norms and rules within a newly developed embankment.

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.

However, significant potential issues could result from the project, such as erosion, vegetation cutting, impact biodiversity and on Arys river habitat, and other project associated ecologically significant, as this would be a "greenfield" project covering a relatively large and environmentally diverse area. For reasons of scale and nature of potential impacts the overall roads project (1,061 km) was classified as safeguards category A, and the Temirlan bypass has (and would have as stand-alone project) also be classified as "A". Hence this sections requires the preparation of a full EIA.

4.3 Need for the Project

The Temirlan village by-pass 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 by-pass link from km 2216 to km 2231 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. The project has been under construction for two years and construction has already started and substantially progressed at a number of locations / lots between the border with Aktobe Oblast and Shymkent city.

4.4 Project Benefits and Environmental Consideration

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 Temirlan By-pass Project will (i) improve transport infrastructure of the region, (ii) open a vital north-south 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.

The by-pass road construction will further promote traffic safety. It will remove transit traffic from Temirlan village 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 village. Overall the quality of life in the village is expected to increase significantly.

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

The road alignment is located between 42°38'34" N ; 69°14'23" E and 42°32'55" N; 69°19'23" E. Total length is 14,843 m, width of embankment 27.5 m. Average elevation of the project site is 310 m above the sea level. The Project lies within the eastern part of Temirlan Village in Ordabasy Rayon of South-Kazakhstan Oblast.

Figure 4.1 Project location.

The Government of Kazakhstan has no regulations on how to define the area of influence 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.

Figure 4.1 shows the Project Location and Figure 4.2 provides the layout plan of the new road alignment.

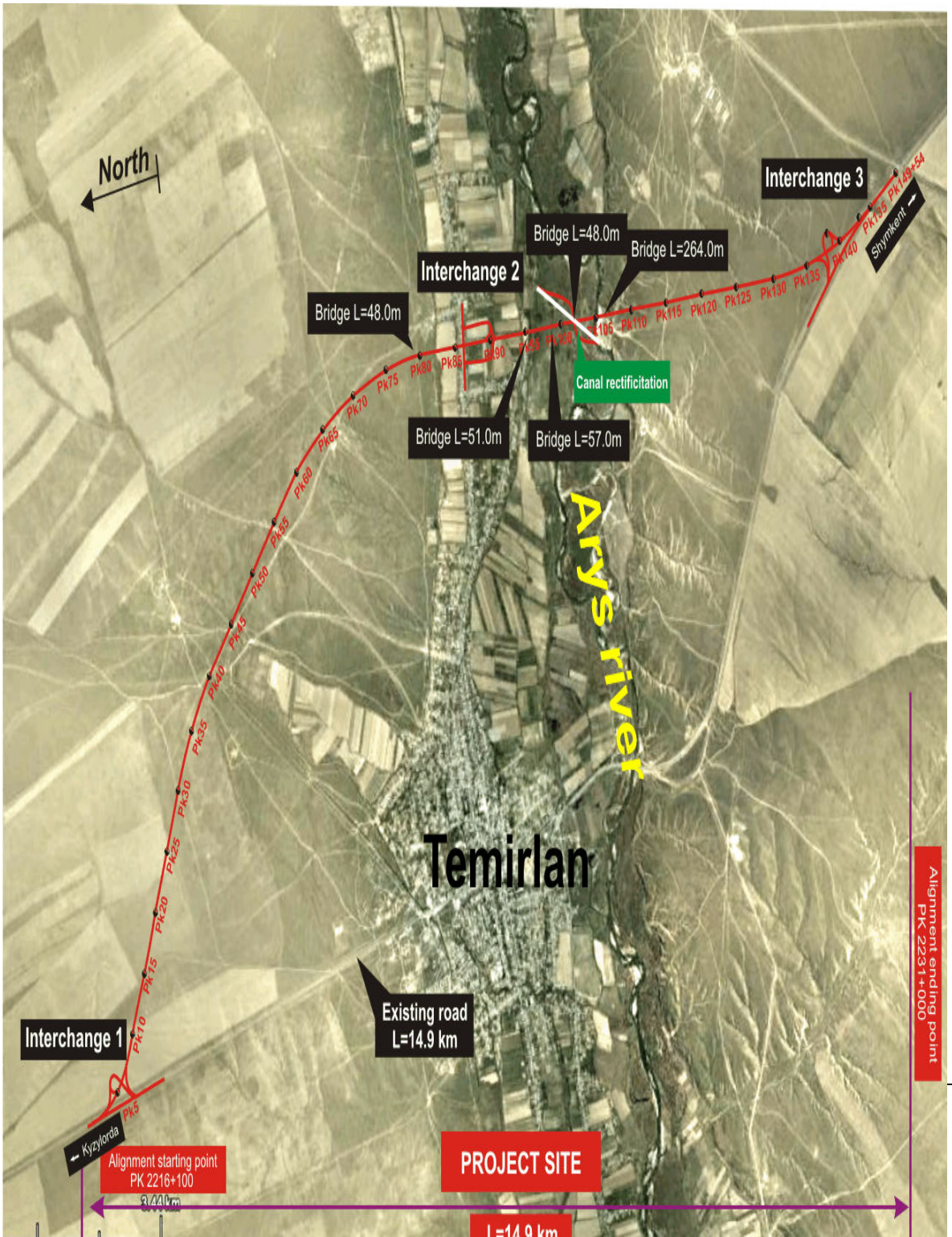
North
Interchange 3
Bridge L=48.0m
Bridge L=264.0m
Interchange 2
Bridge L=48.0m
Canal rectificitation
Bridge L=51.0m
Bridge L=57.0m
Arys river
Temirlan
Existing road
L=14.9 km
Interchange 1
Kyzylorda
Alignment starting point
PK 2216+100
PROJECT SITE
Alignment ending point
PK 2231+000
L=14.9 km

Figure 4.2. Road alignment layout map.

4.6 Project Features and Characteristics

Length:	**14,843 m**
Road category:	**1b**
Embankment width:	**27.5 m**
Number of lanes:	**4 lanes**
Lane width:	**3.75 m**
Carriageway width:	**15 m**
Dividing strip:	**5 m**
Road shoulders:	**3.75 m**
Maximum embankment height:	**8,67 m**
Road surfacing:	**Advanced, cement concrete (main road), asphalt concrete (interchanges, approaches to the bridges and overpasses)**
Culverts:	**19**
Interchanges:	**3**
Small bridges:	**4 (max. 57 m length)**
Bridge over Arys river:	**1 (264 m length)**
Cattle-passes (box culverts):	**3**
Lighting:	**On interchanges and Arys bridge**

The potential disturbance footprint covers an area of 20 meters setback along both sides of the route that has a total area of 296,860m^2 (approximately 30 ha)

4.7 Proposed Schedule for Implementation

The Project is scheduled to commence in the first quarter of 2012 and is to be implemented over 23 months, with 20 months for Arys river bridge construction. The Guarantee test of the facilities will be successfully completed within 24 months from the date of completion of construction.

5.0 BASELINE DATA

5.1 Climate

The climate in the project area is semi-arid with distinct continental features. The winter is mild with frequent thaws; the snow cover is thin and short-lived; during 50% of the winter there is no snowfall; the summer is hot, prolonged and exceptionally dry. Average temperature in January is -2 C^0; in July +26.3 C^0. Average annual temperature is +12.2 C^0. In some days during the summer the temperature may increase up to 45-47 C^0.

Annual precipitation does not exceed 576 mm, most of which falls in the spring and fall seasons. Table 5.1 presents quantity of days in the year with unusual weather events.

Table 5.1 Quantity of days with unfavourable weather in a year

Weather	Meteorological station "Shymkent"
Ice	2
Hail	1
Snow storm	2
Wind over >15 m/s	47

Source: Meteorological Station "Shymkent", 2005-2010

Northern, northeastern and eastern winds predominate in the region. Average annual wind speed is 1.5-2.8 m/s. The following table give the information on wind direction and speed from the meteorological station "Shymkent":

Table: 5.2 Wind Direction and Speed

Wind Directions (numerator), %								
Average Wind Speed (denominator), m/s								
	N	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**

January	4/1,7	8/1,9	32/2,6	24/2,9	6/4,8	11/4,2	8/2,6	7/1,9
July	9/3,6	22/6,5	25/3,0	12/2,8	3/3,2	6/3,5	8/3,4	15/3,2

Source: Meteorological Station "Shymkent", 2005-2010

5.2 Air quality

There are no major industrial zones or large production facilities that might have significant contribution to air contamination levels. In Temirlan and Kazhymukan (east) settlements, air pollution mainly occurs from exhaust gases of motor vehicles and agricultural equipment.

Air monitoring

For identifying quality of air and establishing baseline parameters for further monitoring and comparing changes during the construction period, the design consultants engaged a certified laboratory from Kazakhstan Scientific-Research Institute "Iziskatel". The sampling was done at 4 points along the alignment on September 9, 2011 (time 10.00-13.45). Monitoring point 1 refers to start of alignment at PK0; point 2 is in the settlement of Kazhymukan; point 3 located near Arys river; and point 4 was in southern steppe near the end of the alignment. The pollutants include Inorganic dust (SiO_2 20-70%), followed by Carbon monoxide and Nitrogen (IV) oxide. The results of the monitoring are presented in Annex 7.

Based on the data in Annex 7 the health consequences of air pollution are minimal and do not contribute significantly to respiratory disease in children or old aged persons. Furthermore, no toxic air pollutants including mercury, benzene, dioxin, and asbestos, among others which pose health risks are identified in the project area including its hinterland. During windy days, the particulate matter, or PM, is found in the air, including dust, dirt, soot, smoke, and liquid droplets. Particles can be suspended in the air for long periods of time and can be carried over long distances by wind and then settle on ground or water.

5.3 Noise

No measurements of current noise levels were conducted for the Project area. Levels are expected to be typical for comparable Kazakhstan rural settings, where main source of noise is traffic.

5.4 Surface and ground waters

The source of South Kazakhstan rivers and ground water, are snow melt waters and rains, volumes of which are determined by annual precipitation. Due to use of river waters for irrigational and other needs, the hydrological regime has been anthropologically altered and thus lacks regularity in the project area. All watercourses in the project area, except the Arys river, are not perennial and fall dry over the major part of the annual cycle.

5.4.1 Surface water

The Arys river is a right hand tributary of Syrdarya river, running for 378 km from east to west. The river basin area totals at 14,900 km². The river originates in Talass Alatau mountain ridge in the east. Its right hand tributaries, largest of which is Boralday, flow from Karatau mountain ridge. The flow is mountainous in upper reaches, which converts to steady pattern downstream. Most runoff occurs in April, least in August. Water is used for irrigation of rice paddy fields downstream of Arys river. For this reason little part of the initial water flow in Arys river reaches the Syrdarya river. Other watercourses that cross the alignment are periodical: irrigation canals and ditches, which have water only during vegetation growing period, and dry ravines during snowmelt and rainfalls.

List of watercourses and canals crossing the alignment is presented in Table 5.3, and Figure 5.1 is the watercourses map within the project site.

Table: 5.3 List of watercourses crossing Temirlan by-pass road alignment

No.	Name of the watercourse	Location PK	Estimated flow m^3/sec	Recommended structure	Note
1	Dry ravine	29+55(80)	3.26	Round culvert d=1.5 m	
2	Dry ravine	42+50	21.8	Culvert 2(4*2.5m)	
3	Dry ravine	49+80	1.57	Round culvert d=1.5 m	
4	Dry ravine	77+85	1.8	Round culvert d=1.5 m	

5	"Naiman" canal	83+30		Culvert 2(4*2.5m)	Existing: small bridge L=9m
6	Irrigation canal	84+63		Round culvert d=1.5m	Combine with a bayou
7	"Kaznaaryk" canal	96+00		Culvert 2(4*2.5m)	Existing: small bridge L=9m
8	"Kurtai" canal	97+50		Small bridge	Existing: round culvert 2*1m
9	Emergency discharge canal (from Kurtai)	104+86		Small bridge	Rectify the canal bed
10	Arys river	PK106+24-PK107+10	1100	Bridge	Existing: bridge 8*21m, total length 173.25 m
11	Dry ravine	128+00	1.83	Round culvert d=1.5m	

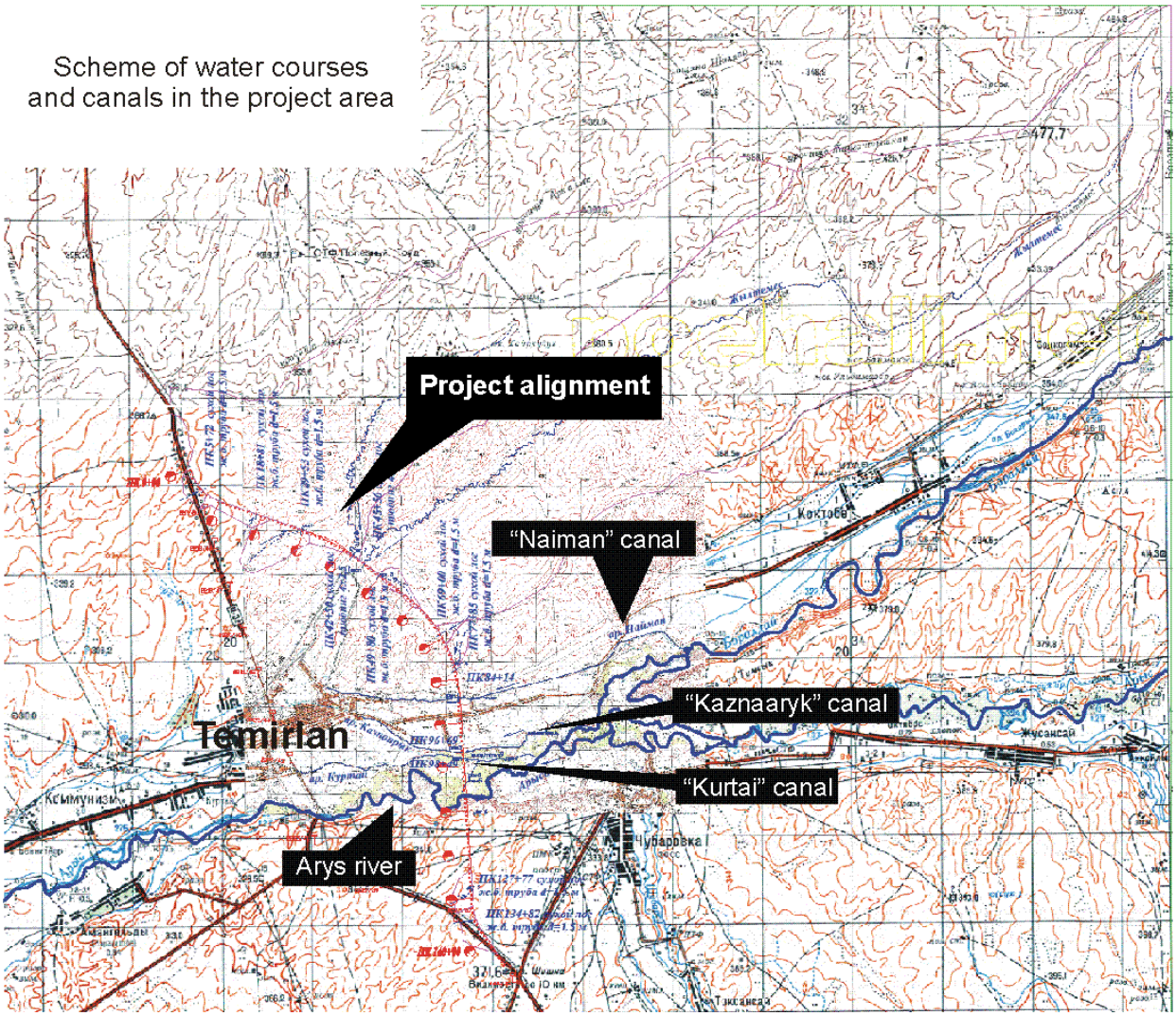

Figure 5.1 Watercourses in the project area.

Figure 5.2. Naiman canal.

The "Naiman" canal starts at the Boralday river, the right hand tributary of the Arys. "Kaznaaryk" and "Kurtai" canals start from Arys river. The emergency discharge canal is used to relieve water from "Kurtai" canal in case of overflowing. All canals are used for irrigation needs.

5.4.2 Groundwater

According to the hydrological survey, ground water throughout the alignment is available at different depths: from 0.3 m (near watercourses and Arys river) down to 7.05 m at elevated sections. Analysis showed mineralization level from 0.5 to 3 g/l, with prevailing content of 1.0 g/l.

As the project area's near-surface geology is dominated by Loess (see section 5.8.2), no aquifers with usable yield are expected close enough to the surface to be influenced by the

roads project. Deeper aquifers are used for irrigation and drinking water, but separated from surface influence by the said Loess barrier.

In the Arys floodplain local groundwater occurrences are expected to occur in the river's sediments. These will have a variable, but generally high rate of replenishment, depending on the water level in Arys. There is no known use of these waters, except for watering cattle where is surfaces in ponds. The groundwater (as well as surface water) is most vulnerable to pollution at the Arys valley crossing, where the protective Loess layer is absent.

5.4.3 Water monitoring

Water pollution monitoring was conducted on September 9, 2011 by a certified laboratory at the left and right banks of the Arys river. The concentration levels of monitored pollutant is found to be within established limits. Monitoring results are presented in Annex 7. The monitoring of water quality is required in order to check any pollution anticipated during construction and operation periods.

5.5 Soil monitoring

As part of the field surveys, a certified laboratory conducted monitoring of soil contamination levels at 4 points along the alignment on September 9, 2011:

1. Sample 1 taken at start of alignment PK km 0.
2. Sample 2 in Kazhymukan settlement PK km 8.5.
3. Sample 3 at left bank of Arys River PK km 10.5.
4. Sample 4 steppe zone to the south of Arys river at PK km 13.8.

The results of the monitoring showed that concentrations of heavy metals in soils along the alignment is within the standard of RK "Norms of maximum permissible concentrations of harmful substances, harmful microorganisms, and other biological substances, which contaminate soil" No. 99 issued 30.01.2004. The summary of monitoring results is presented in the following table:

Table 5.4 Soil monitoring results

Pollutant	Unit	Concentration level				Limit for soils (MAC)	Method of measurement reference number
		Sample No.1	*Sample No.2*	*Sample No.3*	*Sample No.4*		
Mobile heavy metals							
Cupper	mg/kg	0,059	0,052	0,055	0,049	<3,0	MM KZ.07.00.00705-2007
Zinc	mg/kg	0,037	0,033	0,029	0,034	<23,0	MM KZ.07.00.00705-2007
Gross content							
Lead	mg/kg	16,2	16,5	13,3	16,8	<32,0	MM KZ.07.00.00705-2007
Manganese	mg/kg	5,4	5,7	6,0	5,1	<1500	MM KZ.07.00.00705-2007
Arsenic	mg/kg	< 1,0	< 1,0	< 1,0	< 1,0	<2,0	MM KZ.07.00.00705-2007

5.6 Flora and fauna

5.6.1 Flora

The Project area lies in Asian desert region of Iran-Turan sub-region Western-Tyanshan province, in piedmont zone of low grass savanna. The natural vegetation of the foothill-undulating plain in which the project area is located, is presented by low-grass ephemeroid-ephemeral semi-savanna, with ephemeroids (*Poa bulbosa, Sedge carp*) and ephemerals (*Anisantha tectorum, Bromus japonicas, Aegilops, Taeniatherum, Angelica and other*).

The area is and has for centuries been used as pasture and grazing land and thus been altered from its natural state. The main pasture weed of the countryside and steppe is *Taeniatherum crinitum* that occupies 90% of all pastures in the area. Inedible poisonous weeds, such as *Poterium* and *Capparis* that decrease pasture productivity are also widespread throughout the steppe zone along the alignment. Besides grazing, crops are extensively cultivated near the project area are presented by winter cereals (*Wheat, Barley*), *Alfalfa, Safflower*, on irrigated

fields including corn, cotton and melons. Weeds are mostly presented by *Oxtongue, Guma, Convolvulus arvensis, Cynodon, and Reed*.

The Arys river valley, and particularly its right bank is covered with Tugai[1] forests comprised of the following main tree species: *weeping willows, mulberries, elaeagnus,* intertwined with *clematis vine* and the bushes *halimodendrons*, *tamarisks*. These plants along with grasses play an important role in regulating surface water runoff, preventing soil erosion. During warm periods of the year, these forests create a good environment for local peoples recreation. During spring and fall different species of mushrooms grow during rainy days. The Tugai Forest extends along the whole length of the Arys River valley as well as other rivers in the region and is not unique to the Temirlan area.

The Arys valley has already been anthropogenically impacted in the vicinity of Temirlan village. It is approachable by several undulating zigzag mud/gravel roads. There are small ditches scattered within the forests where solid waste is disposed of by the local residents. The forest is used for animal grazing (mainly cattle) and the river water used by the animals for drinking. Tree felling and aggregate extraction are present in small scale, but not pervasive in the area.

[1] Tugai woodlands represent a specific complex of woody-shrubby vegetation and high grasses, occurring only in the floodplains and river valleys of the Amu Darya, Syr Darya, Aral Sea, and other Central Asian rivers. The tugai plant communities are comprised of the poplars (Populus diversifolia, P. pruinosa). The environmental conditions are extreme with the difference in summer and winter temperatures reaching 80º C in some areas. The annual precipitation in the plains does not exceed 300. In 1997 the forest stock of Kazakhstan shows about 68% of the total area (Ref: Forest Registration Data).The Kyzylorda oblast closely connected with the Aral Sea was 807.2 thousand hectares, including the areas covered with the forest 342.6 thousand hectares. 85% of them was saksaul forests, 15% woody - bushed species associated with dense growth of trees entwined in climbing plants, grassy clearings, and sporadic wetlands. They provide a lifeline for resident and migratory wildlife, especially wintering birds from western Siberia. These species safeguard the environment as well, protecting watersheds, providing sand control, ensuring water quality, stabilizing vegetation, and putting a brake on human-caused and natural hazards, such as soil erosion, desertification, landslides, and floods. And they offer marvelous venues for recreation.

Figure 5.3. Tugai forests on right bank of Arys river.

5.6.2 Fauna

The project area is inhabited by rodents: gophers, ground squirrels, jerboa, field mice; insectivores, hedgehogs, shrews; reptiles – lizards, turtles, snakes. Birds are presented by ducks, geese, herons, pheasants, predator birds; mammal predators are represented by jackals, foxes. Domestic stock is presented by sheep and cattle. Some cattle grazing was noted in Arys river valley during field visits.

As the area has been used for agriculture, grazing, hunting and other human activities for a long time most of the present species have adjusted to and live in equilibrium with anthropogenic influence.

Figure 5.4. Animal grazing on right bank of Arys river.

Arys river fish species include barbels, catfishes, and other small fish. Algal flora is represented by 6 species of diatoms; zooplankton of 3 species of animal flagellates, one type of amoebae and ciliates.

Because of the urbanizing influence in the area and significant urban and human disturbance to the local area - agricultural activity animal grazing, gravel extraction etc - the Temirlan area is not characterized by a high diversity of species and sub species. There is no record of rare, endangered or vulnerable species of animals and birds in the project area. There is no record of any populations of Kazakhstan red list animals. There are clearly 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 open water, swamps or wetlands (except Arys). There are no sensitive areas or areas of high landscape value within the rayon and there are no known proposals to include any part of the area as a legal protected area. The cliffs along Arys river are a prominent landscape feature but will be affected only locally by the Arys bridge. Design will ensure that the esthetics of the landscape are preserved to the extent possible.

Based on the Consultant field visits 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.

The part of the alignment that crosses the Arys River and adjacent floodplain includes some dense vegetation of trees and bushes with some open land and marshes and river lagoons. Although there is some human and development impact in the area: grazing, gravel extraction and garbage deposition in the vicinity, it also appears to be a habitat for birds and small mammals.

5.7 Archaeological and cultural heritage

Archaeological surveys conducted in June 2010 revealed 21 mounds (II century BC – II century AD), 16 of which are located directly on ROW of the road alignment in grouped chains on PK67-68, PK72, PK82-83, and PK122-123 (See Annex 3). The mounds are of a value to archeology, and detailed further research will be conducted on site before commencement of any works within 50 m from any of the mounds (protected zone).

5.8 Land

5.8.1 Topography and landscape

The topography of Ordabasy Rayon is part of a piedmont plain of southwestern flanks of the Karatau ridge. Despite the low average altitude of Karatau Mountains, there is a clear contrast in climate due to the barrier created by the mountains that protects the area from cold northern winds. According to government Landscape Zoning Data, Ordabasy Rayon of South-Kazakhstan oblast is situated within mountain-steppe zone with a dry-farming land and irrigated agriculture.

Geomorphologic structure of the project area landscape is presented by an undulating plain with alternating flat ridges and flat plains, with some separate hills of up to 20 m high. The area is drained by the Arys river valley, canals and dry ravines on a narrow and a slightly inclined plain. The general elevation of the road alignment slightly increases from North to South, towards end at PK 149, traversing Arys river valley.

The project site and alignment generally can be divided into 4 distinct zones (Figure 5.6):

Zone 1: Section from PK 0 to PK 85 the alignment crosses agricultural and grazing lands and 2 irrigation canals: "Naiman" canal and one unnamed. Landscape here is undulating plain with several dry ravines, and steppe vegetation (feather grass, sagebrush, and fescue).

Zone 2: Section from PK 85 to PK 95 the alignment crosses Kazhymukan settlement located to the east of Temirlan. The alignment crosses a street in this settlement, with 20 households (houses) being affected and acquired for interchange construction.

Zone 3: Section from PK 95 to PK 107 is a valley of the Arys river. Here the alignment crosses three canals: Kaznaaryk, Kurtay, and an emergency discharge canal (from Kurtay), and the Arys river (1.2 km). The landscape at this section is characterized by a typical riparian habitat, with trees and bushes, gravel, pebble and sandy soils. On the other side of the Arys, the left bank has a steep profile (up to 25 m, Figure 5.5) and sparse vegetation due to high erosion profile of soils. There is evidence of human impact within the river valley; gravel extraction and garbage etc.

Zone 4: Section from PK 107 up to the end at PK 149 the alignment crosses empty land, with sparse vegetation due to water and wind erosion. Here the landscape is semi-arid steppe with a slight elevation towards the end of the alignment.

Figure 5.5. Location of planned bridge over Arys (left). Left bank of Arys river (right).

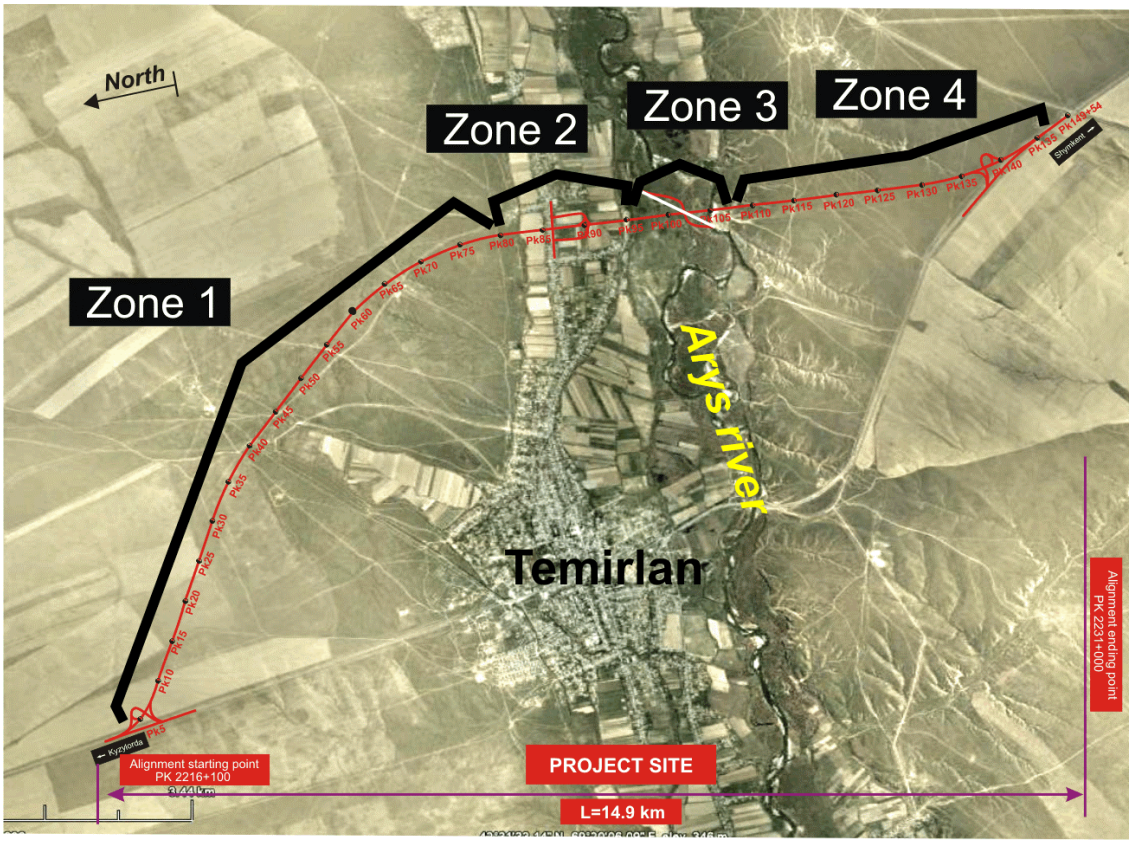

Figure 5.6 Landscape zoning.

5.8.2 Soil and Geological Characteristics

A total of 44 boreholes were drilled of 3.0 to 6.0 m depth along the alignment during geological surveys. The geological structure of the road alignment area revealed alluvial deposits, presented by sandy loam, clay loam, sand, and gravel in different zones. Soil is non-saline, weak, medium or non-aggressive to concrete.

The major part of the project area is covered by Loess, from which other soil types derive depending on location and other factors. Loess is homogenous along the cross-section of the same pale color, porosity, friable structure, high carbonate and fine grade clay mineral content. The loess-like loam is comprised of medium sized composition – particles of less than 0.01 mm comprise 30-45%. The content of carbonates in top horizons is 2.0-0.89%, in lower horizons varies from 2.85 to 12.83%. Analysis of the water extract showed that they contain only minimal saline minerals (< 0.1%).

The dominating soil type of the project area is ordinary gray-brown soil, which is typically formed in piedmont plains, in dry climatic conditions, with scarce, uneven and irregular precipitation. Based on soil research and laboratory analyses, the following types and varieties of soils are identified:

-Ordinary gray-brown loamy soils

-Ordinary gray-brown irrigated loamy soils

-Ordinary gray-brown eroded loamy soils combined with ordinary gray-brownish washed loamy soils 30-50%

Ordinary gray-brown loamy soils comprise most of the alignment area - 90,7%, which were formed on flat areas and on glacis under ephemeral vegetation. Their depth under vegetation topsoil layer of 0.1-0.2 m thickness varies between 2.9-5.9 m.

Gray-brown soils do not normally get frozen in winter but sometimes short shallow freezing is observed. Due to favorable conditions of humidity and heat, the area has rapid vegetation during spring. The soils have a high natural fertility, favorable water regime and physical traits, which make them good quality soils, suitable for arable agriculture.

Ordinary gray-brown loamy washed soils are formed on steep sides of hills and the Arys river bank. They are very prone to water erosion and differ from normal loamy soils by less humus horizon and weak cultivation with earthworms. Mechanical composition of these soils is loamy. Soil quality grade score throughout the alignment is 14.7 units.

5.8.3 Seismology

59. According to the seismicity mapping as per SNiP 3.03-04-2001, the area through which the alignment passes is classified as 7 out of 12 in the Modified Mercalli Intensity Scale: Very Strong.

6.0 ENVIRONMENTAL IMPACTS AND MITIGATION

6.1 Impacts assessment

The environmental impact assessment for the construction period and operation of the road segment has been conducted based on available baseline data, field surveys, project characteristics, emission calculations, and professional judgment of the PMC Environmental Team.

The following key sensitive receptors were identified for Temirlan by-pass project:

1. Temirlan and Kazhymukan settlement residents
2. Residents living close to Interchange 2 (crossing of Kazhymukan)
3. Agriculture workers
4. Local and transit road users
5. Livestock
6. Arys riverbed and aquatic fauna / flora
7. Irrigation canals
8. Tugai forests in Arys river valley
9. Riparian birds and animals

The following identified as a result of scoping and screening exercises are described below.

6.1.1 Quantification of Impacts

In accordance with Kazakhstan requirements, the project owner should prepare calculations of emissions to air and water, estimate noise generation levels for any planned activity based on initial information on production type, process flows, facilities, equipment, methods of works and other. The resulting amounts of estimated air emissions are used to identify the sanitary danger class, and determine the SPZ (sanitary protection zone) distance.

This section defines the projected environmental and social impacts of the construction of the alignment. Calculations and estimations have been made of the air emissions, noise levels, potential water and soil pollution and impacts on flora and fauna, cultural, land, traffic and waste. Mitigation methods to reduce any potential significant impacts are defined and included in this section.

This section should be read in conjunction with Tables 8.1 and 8.2.

6.1.2 Air Quality

Impacts

Air pollution during the construction period will be caused by construction equipment, vehicle emission exhaust gases, and dust generation from construction materials and their transportation. In addition during windy days, dust will be generated from loading and unloading of materials, movement of vehicles on construction sites and access roads, exhaust gases from diesel generators, welding and painting works. During the operation period air pollution will mainly occur from traffic emissions.

Table 6.1 Air pollution sources and main pollutants

Project stage	Name and characteristics of emission source	Pollutant name
1	2	3
Road construction	Dust formation from soil and construction materials during works of road equipment	Inorganic dust
	Emission of exhaust gases from road equipment	Nitrogen dioxide, soot, carbon monoxide, benz(a)pyrene, carbohydrates C12 - C19, lead compounds
	Welding	Ferrous oxide, manganese and its compounds, hydrogen fluoride
	Painting	White spirit, xylol

Road operation	Emission of exhaust gases from traffic	Nitrogen dioxide, soot, sulfur dioxide, carbon monoxide, carbohydrates C12-C19, lead compounds

For air pollutants, based on Maximum Permissible Emissions (MPE) estimated calculation of emission amounts for each pollutant were conducted for the construction period, and separately, for one year of operation in year 2037 with identification of the pollutant dispersion pattern in the air. Traffic intensity was calculated through field surveys. Based on resulting information, traffic for year of 2037 was calculated by formula generally used in motor road design practice: +6% each year. The resulting highest concentration levels were compared to MAC. If the concentration amounts of a pollutant exceeded established MAC limits, further calculations were conducted to identify concentrations on the border of SPG (50m) based on pollutant dispersion patterns (Annex 5). It is concluded that all emissions levels within the 50 meters SPG border are below the MAC and that there will be no adverse impacts.

84. Results of estimated emission calculations are presented in the following tables:

Table 6.2 Air emissions of pollutants for construction period

Code	**Pollutant**	**Emissions**	
		g/s	**t/yr**
0123	Iron oxide (II)	0,0006	0,0049
0143	Manganese and its compounds	0,0001	0,0008
0328	Carbon (Soot)	0,0125734	0,1605471
0330	Sulfur dioxide	0,0792884	0,9431
0337	Carbon monoxide	0,2692222	3,2404
0342	Hydrogen fluoride	0,000026	0,0002
0703	Benz/a/pyrene	0,000000208	0,0000033
1325	Form--aldehyde	0,0019943	0,0235715
2732	Kerosene	0,0481746	0,5782857

2908	Inorganic dust (SiO2) 70- 20%	0,0554	0,9141
2909	Inorganic dust (SiO2) less than 20%	0,0115	0,0034
	Total	**0,478879108**	**5,8693076**

Table 6.3 Air emissions of pollutants for operation period in year 2037

Code	**Pollutant**	**Emissions**	
		g/s	**t/yr**
0337	Carbon monoxide	1,426	44,97
0301	Nitrogen oxide (IV)	0,1056	3,33
0401	Carbohydrates S_{12}-S_{19}	0,28	8,82
0328	Soot	0,05	1,57
0330	Sulfur dioxide	0,07	2,1
0184	Lead	0,0006	0,018
0703	Benz(a)pyrene	0,0000014	0,00005
	Total	**1,9322014**	**60,80805**

Mitigation During Construction Period

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

- 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.

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.

6.1.3 Noise

Construction Noise Impacts

The various mechanical processes during the construction of roads are a source of intense noise, which can adversely affect humans. The intensity of the ambient noise of road machinery depends on the type of machinery and equipment and the distance from the workplace to sensitive and residential development. Especially problematic is the noise created by the work of bulldozers, vibrators, compressors, excavators, and Diesel Trucks. The noise produced during construction is temporary and localized but can still create an annoying impact. According to GOST 12.1.003-83 Section "Noise" standards for noise level have been adopted of 70-80 dBA. Zones with noise level above 80 dBA must be marked with safety signs.

Construction Noise Mitigation

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.

Operation Noise Impacts

Most of the bypass will be sufficiently far removed from human settlements to bring noise below admissible levels. However, noise level estimated calculations were prepared for the road section in Kazhymukan village. The noise levels were 73,8 dBA and 77,8 dBA for construction and operation (for year 2037 with traffic intensity of 21,844 vehicles per day) periods respectively, which exceeds established 70 dBA limit.

Operation Noise Mitigation

As referred to above the calculation of noise during the operation period indicates that traffic noise does not exceed the maximum permissible standards at any location along the alignment except at Kazhymukan village. Normally the provision of a tree screen consisting of 5 m high trees will decrease levels at Kazhymukan to 69.8 dBA. However this may not be sufficient in this case due to the elevated road embankment in this segment. 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.

6.1.4 Surface and ground water

Surface and Groundwater Impacts

Surface waters in project area: The Arys river and irrigation canals may suffer minor impacts during construction of bridges and culverts: there is a small risk that earthworks and concrete works may lead to water contamination with petroleum products; moderate quantities of construction water are presumed to be taken from Arys river; concrete works may contaminate waters with cement, chemical additives, change the pH levels, lead to silting, obstruction of water flow and changing water drainage and regime.

Ground waters may be potentially contaminated by accidental leaks of fuels, oils, and other contaminants, especially during the Arys bridge construction, where ground water level is shallow and surface water exposed.

For the operation period water pollution calculations were prepared for surface runoff water from Arys river bridge. The results showed that pollutant concentrations will increase and exceed established limits of pollutant content (especially particle loads), unless collecting and settling ponds or basins are installed before the discharge point of the bridge's runoff into the surface drainage system. This has been incorporated into project design of the bridge.

Overall the impact on groundwater and surface water is expected to be low. There are no deep cuts or below grade works that could affect groundwater. Any impact on groundwater levels is likely to be minimal and contamination is very unlikely. It is very unlikely that any groundwater resources will be impacted by the construction activities. The crossing of the Arys River will be accomplished by appropriately dimensioned bridges, and the embankments will have sufficient culverts to prevent damming of surface runoff and subsequent water logging (especially during flood events). During road construction in order to prevent pollution watercourses will be constantly monitored, especially in the Arys valley crossing, where other environmental issues are also presnt.

Surface and Groundwater Protection

According to Kazakh regulations water protection zones are established that prohibit the establishment of landfills, industrial waste disposal sites, parking, refueling, cleaning and repair of motor vehicles and road equipment within these zones. The water protection zones are defined as follows: for small rivers the zone is 100 meters, and for large rives it is 500 meters from the banks (average summer water level). Any above mentioned activities must be outside the flooding zone during a maximum probable flood event (MPF). Works within the water protection zone are allowed only by special permission of local water protection authorities, fishery protection and sanitary-epidemiological services. These regulations put specific requirements and constraints on the road construction in the vicinity of Arys River.

Specific Mitigation during Construction:

- Department of Roads, Committee of Water Resources and Rayon in consultation with Contractors will ensure that all water extraction for construction and workers only takes place from sustainable resources such as wells (for construction activities) and from piped supply system (for domestic use in camps etc) or from rivers with sufficient capacity. The contractor shall be responsible for obtaining all permits required for use

of surface and groundwater resources from the Rayon and competent authorities. No water shall be used without those specific permits. Any extraction of water from the Arys river should only be undertaken after express permission from the Rayon and have protective grid to prevent fish and other aquafauna form being sucked into the pump.

- Good management / housekeeping for all areas of the construction site to ensure no short term flooding occurs, and contamination from all construction activities does not occur.
- All surface water courses in all construction are to be protected by siltation barriers, settling ponds and filters from any discharges from the construction site.
- Vehicle and equipment to be maintained and fuelled at protected areas (equipped with surface sealing and oil skimmers).
- All storage areas will be bunded (siltation barriers, ditches, settlements ponds) and properly maintained.
- Waste water from construction camps will be treated on site (settlement ponds, bio-remediation) before discharge into surface drainage network;
- Septic sludge from toilets will be taken to authorized offsite treatment plants.
- Minimal disruption and damage to irrigation infrastructure will be ensured, any daage repaired immediately, and a contact point established for continuous dialogue with farmers.
- The discharge of wastewater to water courses is only allowed with permission of the sanitary-epidemiological service and fisheries. The composition of the wastewater must comply with SanPiN to protect surface waters from pollution № 3.02.002.04.
- For domestic wastewater disposal a pit of precast concrete rings with a diameter of 1.5 meters and a depth of not less than 3 meters should be used. To eliminate the filtration of wastewater into the groundwater the floor of the pit should be concreted.

Operation

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.

6.1.5 Soil Impacts and Mitigation

Major expected and potential impacts on soil during construction period are topsoil damage, soil contamination, soil erosion.

Soil Damage

In the area of immediate footprint of works site clearance, the cut and fill activities, and the construction of the sub grade usually causes the most damage to the soil and the sub soil environment. Some topsoil will be required to be removed for the alignment itself and for borrow pits, construction camps and other construction activities. In these areas there will be potential for contamination, disturbance and damage to the soil cover. In particular soil can become compacted and damaged along temporary access routes and in construction work areas. Disturbance and damage is inevitable but this can be minimized with correct construction procedures.

Soil Contamination

Of equal importance is the potential for pollution and contamination of the soil and sub soil on the alignment itself and sites immediately adjacent. This pollution could potentially have an impact on the surface and groundwater resources in the area and on the agricultural activities in the areas adjacent to the alignment, if contamination were intense and widespread. Some contamination can occur during normal construction activities, but the most serious contamination could occur from accidental fuel spills and storage of materials for long periods of time without any precautions.

During the construction phase the most important potential for contamination will be on the stratum under the top-soil which will be exposed during the construction of the road sub grade. Leaking machinery, spills and materials used in the construction of the sub grade could cause contamination. Such risks are low provided reasonable care is taken during construction, and tested and authorized natural resources (sand and gravel, sand, soil, rubble) are used from local quarries and dealerships for construction.

Contamination may also occur during the operation period. The main criterion for evaluating the risk of soil contamination by chemicals are the maximum permissible concentrations (MPC) - the maximum amount of potential contaminants in mg per kg of oven-dry soil, which guarantees the absence of a negative direct impact on human health. Lead is considered the most frequent and toxic transport pollutant due to its continued presence in fuels in Kazakhstan and is thus used as a general indicator of contamination. The MPC of lead in soil in the Republic of Kazakhstan is calculated according to the "standards of maximum permissible concentrations of harmful substances, harmful microorganisms and other biological contaminants soil", approved by joint order of the Minister of Health from 30.01.2004 № 99 and the Minister Environmental Protection from 27.01.2004 № 21-p, and is set at 32 mg / kg.

De-icing materials, especially salts, are also toxic. Because of the limit of permissible concentration of CL (chlorides) when exposed to anti-icing agents on the ground in the roadside of the zone approved level - 0.04%. With a significant accumulation, they can change the biological composition of roadside soils.

Soil Erosion

Due the flat to softly undulating morphology of the project area through which the alignment passes and the routing of the alignment which generally avoids steep slopes or scarps it is concluded that significant erosion or landslides even in extreme dry or extreme wet conditions will not take place. One exception is the Southern bank of river Arys where the alignment will pass a slope with steep cliffs formed by Loess and oft clay/siltstone. Here design will apply utmost care that slope angles are stable, or that slope stabilization and erosion prevention measures are applied. These may include geo-grids and geotextiles, micro-fences, rock fill drains and surface stabilization by moderate compaction and seeding with endemic vegetation.

Soil Reclamation

The Construction of the road will require the use of land for a temporary period for construction activities and it is a legal requirement that all land used for a temporary period for construction must be reclaimed and returned to the original users and owners in a condition suitable for its original agricultural use. Any use of land that involves the removal of any soil creates instability to the local environment and wider environment and it is essential to preserve the natural topography and existing vegetation.

Guided by the Land Code of the Republic of Kazakhstan from 20.06.2003g. and "Guidelines for the assessment of proposed economic and other activities on the environment in developing preliminary, design and project documentation" Astana 2007. All land temporarily used must be returned in a condition suitable for agriculture.

Biological reclamation allows for the planting of grasses to encourage the restoration of fertility. Land reclamation should be done during or after the completion of the construction activities. It is important to reclaim in all place where soil and sub soil has been disturbed by construction and associated activities.

Activities on the site after construction should include:

- Use of tillage cultivator;
- Mechanized sowing of perennial grasses as follows: alfalfa - 25% of 18 kg / ha 30% perennial ryegrass - 75% of 35 kg / ha of 30%.
- After sowing, rolling the surface by a ring-roller

Immediate and proper reclamation of land reduces the adverse impact of disturbed land on the environment. It will reduce dust and pollution, can have a beneficial impact on human health and eliminates environmental damage.

Soil Contamination

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

During operation it will be important that all pollution is minimized and managed. 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.

6.1.6 Flora and Fauna

Impacts

The majority of the alignment runs through agricultural and grazing land and any damage to biodiversity, habitats or sensitive flora and fauna is likely to be minimal.

Of local importance is the potential impacts on flora and fauna within the Arys valley. The road alignment in the Arys valley crosses some Tugai forest areas. 11,2 ha of this area will be permanently acquired for the project. 5 ha of this area has about 2,065 trees, which will be cut and disposed of (e.g. by sale as timber or firewood). To offset such impact, the equal amount 2,065 trees are programmed for plantation along the alignment during operation period by a

separate maintenance company. Since the Tugai Forest area extends for a considerable distance along the Arys River corridor and there is already some disturbance to the local ecosystem around Temirlan village, the overall Tugai Forest ecosystem along the valley will not be significantly or irreparably impacted. Only an insignificant fraction of already moderately degraded forest will be permanently impacted.

Also important in the Arys valley is the impact on other flora and in particular the fauna. There is already some human and development impact in the area: grazing, gravel extraction and garbage disposal in the vicinity of the alignment. However there appears to be local habitat for some birds and small mammals. Although there are wild boar and smaller deer within the Oblast it is unlikely that there are large numbers living within this confined area close to human habitation. Smaller mammals such as various rodents' ground squirrels, jerboa, field mice hedgehogs and shrews are common in the area and will be found within the area. Some mammals may actually be encouraged to the area by the nearby human habitation, particularly the garbage.

Potential impacts on flora include: destruction of topsoil vegetation by movement of equipment and vehicles and civil works; land encroachment near construction sites; reduction of photosynthesis due to dust and air pollution which can lead to damage to plants in Arys river valley beyond project site. During operation of the road, plants adjacent to road likely will accumulate more pollutants and have reduced metabolism and growth.

Mitigation

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.

Specific Fauna mitigation during Construction:

The Contractor will be required to ensure that no unnecessary disturbance to fauna within or close to the alignment takes place. The Contractor and Supervision Engineers will monitor the incidence of any sightings of any larger or unusual fauna within or close to the alignment

and to notify the Rayon Administration. Any accidental injury or death of larger fauna to be reported to construction management and the Client and the Rayon notified. Hunting, poaching, the collection of edible plants, specimen or firewood by the contractor and workers within the vicinity of the alignment will not be permitted during the period of the contract.

The movement of fauna, particularly any fauna on seasonal migration, and the movement of livestock may be interrupted during the construction period. During the operation period it will be essential to ensure that fauna and livestock can move across the road. Three culverts have been included in the design to ensure that there fauna and livestock can move across the alignment. In practice since this is an agricultural area and close to settlement the number of larger fauna crossing the alignment is likely to be small. Due to the three bridges over Arys the movement of mammals and fish along the valley will only sufer minor restrictions, due to the width of the bridges.

6.1.7 Social Impact

In 2009, Temirlan village residents opposed the proposed elevated road through the village. This alternative solution which passes around the village and does not pass through the village centre has land acquisition and resettlement impacts. The alignment will also create noise and vibration impacts during construction and pile driving works on Interchange 2; dust generation near houses and agricultural plots; damage or interruption of communication, power, gas lines and water supply pipes. However these impacts are likely to be less than impacts associated with an alignment through the village centre.

The outstanding direct impact is acquisition of 61 land plots, 20 of which are houses located on a road section crossing Kazhymukan settlement on PK85 to PK95. Out of 61 land plots 53 are to be acquired through monetary compensation. At present, 52 land plots have already been acquired for an agreed compensation; only one remaining plot is pending for acquisition. More detailed information on Land Acquisition and Resettlement is presented in Resettlement Action Plan of Temirlan by-pass project, developed and prepared by SNC Lavalin (December 2011).

Overall, starting from 2009, four public consultations were conducted in Temirlan village, one of which was attended by the World Bank representatives. In general, local community is very well informed on WB land acquisition and resettlement policy and procedures. The community understands their rights, and feels comfortable in expressing their opinions regarding project decisions. Every concerned AP is familiar with procedures of land

acquisition, valuation of assets, entitlement for additional assistances, compensation payment procedures, and timeframes.

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; spreading of diseases, including STIs.

Mitigation

Mitigation of direct negative impacts on the community during construction period includes: 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. It will also be necessary to prevent accidental damage to communication, power, gas lines, and water pipes by coordinating with responsible authorities and owner companies.

Other mitigation of potential negative indirect impacts during construction period 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, and sexually transmitted diseases in accordance with agreed requirements.

Since the alignment passes through agricultural land it may create a barrier to the free movement of livestock and farm vehicles and equipment. In consultation with the community and local administration in Temirlan, 3 passes (box culverts 4*2.5 m) for livestock and agricultural equipment have been provided on PK45+56, PK69+40, and PK137+00.

6.1.8 Physical Cultural Resources

Archaeological surveys revealed 21 archaeologically valuable mounds, 16 of which overlap with ROW. No works shall be commenced within 50 m distance from any mound until clearance from Committee of Culture and its Departments is received. These mounds shall undergo a complete excavation, archeological study and recording. Items of significance shall be retained for archiving or made available to a museum.

For any PCR that are discovered during the construction works chance find procedures shall apply that are governed by Kazakh legislation and guidelines, specifically by paragraph 2 of Article 39 of the "Law on Protection and Use of Historical and Cultural Heritage in the Republic of Kazakhstan" which stipulates: "*In case of detection of objects of historical, scientific, artistic, and other cultural value, physical and legal persons are obliged to suspend the further conduct of the work and inform the authorized body*. "

6.1.9 Land Resources

Total of 103.762 ha will be permanently acquired for project needs. Most of this land is agricultural or grazing land, and will not be used for this purpose anymore. Compensation will be paid to land owners and to the State Budget as required by Land Code of RK, clause 105 "Compensation of agricultural land losses".

Permanent ROW for the road is 50 m for the whole length from PK0 to PK149. The following summarizes land acquisition for the project needs:

- Permanent land acquisition for motor road is 67.5 ha
- Permanent land acquisition for interchanges is 30.92 ha
- Permanent land acquisition for junctions is 4.9 ha
- Permanent land acquisition for transfer of Power Line PL-35 is 0.058 ha
- Permanent land acquisition for transfer of Power Line PL-10 is 0.035 ha
- Permanent land acquisition for transfer of Power Line PL-0.4 is 0.024 ha
- Permanent land acquisition for transfer of communication lines is 0.2 ha.
- Permanent land acquisition for transfer of water supply pipeline is 0.125 ha
- Temporary rental agreements for construction period will be 26.5 ha

Total area of permanently required land is 103.762 ha.

In addition 61 land plots, 20 of which are houses located on a road section crossing at Kazhymukan settlement are also being acquired.

All land and building are now in the process of acquisition, in accordance with the Resettlement Action Plan and this must be referred to in order to determine mitigation procedures.

During construction there may be damage to land, crops, buildings, drainage and irrigation, and livestock. It is essential that all damage is repaired and losses reimbursed immediately. All incidents to be reported immediately in accordance with complaint and grievance mechanism and coordination takes place between contractor, supervision consultants and PAPs.

The diversion of long distance traffic from the centre of Temirlan and its associated noise, pollution and general disturbance will encourage the growth of the community as a local business and service centre with improved local environmental conditions and better parking facilities. Signs directing drivers to the services available in Temirlan should be installed to the north and south of Temirlan with information concerning the shops and restaurant off the main route.

6.1.10 Traffic safety

Impacts

Traffic safety is one of first priorities in designing roads. Smoother horizontal and vertical alignments, a central reserve strip, proper signposting and road marking will be consistent with general objective of providing safe, comfortable and uninterrupted movement of vehicles.

The design has incorporated these requirements into the alignment geometry, the cross sections, interchanges, intersections, and appropriate signs and marking have been included in accordance with the standards for road category 1b.

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 and no need for risky passing maneuvres.

Mitigation and Enhancement Measures

Mitigation and enhancement measures to support road safety will include a scope of measures, which are foreseen in the current designs: introduce mechanisms to prevent animals from wandering on the road, such as fencing and ditches, install high visibility warning signs where animals frequently cross,; install speed and enforce limits; install warning signs where ice, frost or fog may occur (especially on the Arys bridges), and plant trees to reduce the impacts of cross-winds and snow-drifts. Animal crossings will also be facilitated by channeling the main movements of herds across the alignment through underpasses, which are included in the design. Additional mitigation measures will be added by the road operation and maintenance department of CR if dangers become apparent during operation.

6.1.11 Waste Generation

Construction and other waste

Waste is generated by construction activities and from construction camps and worker's living areas. No specific calculations for construction waste have been made for this section of the alignment, but experience from the ongoing lots shows that waste management is not an issue of significant non-compliance or concern. Construction waste will include the following:

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

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.

A maximum of waste will be recycled or re-used as secondary resource. Contractors must provide containers for all construction waste and shall separate metals, timber, paper, plastics and construction materials. Any waste and scrap that can be recycled or reused must be separated and stored or taken off site as necessary. Waste materials for recycling and reusing within the construction site should be clearly marked and separated. In all cases storage must take place in clearly marked areas and taken off site as soon as practical.

The Waste Management Authority and Rayon Akimat should be consulted in all waste maters. It will be the responsibility of the Contractor to dispose of all waste and to do so in accordance with local and national regulations. Any hazardous waste must be disposed of in accordance with local and national regulations. Disposal of any waste on adjacent sites with or without the landowner's permission, outside the construction site perimeter is not permitted unless the sites are approved waste disposal sites and clearance has been provided by the Rayon Akimat and the Client's Resident Engineer. The burning or incineration of any waste should will not be permitted unless specifically approved by the waste disposal authority and environmental authority (exceptions may e.g. include paper or timber for cooking and heating purposes).

All general waste from the workers camps and office locations will be regularly taken by the Contractor to the nearest approved waste disposal site. Disposal and incineration at the construction site will not be allowed. Temporary collection points will be provided within the site for all general waste and these will be clearly signed and will be collected regularly. Any medical waste will be disposed of separately to approved medical waste sites.

At the completion of the contract all waste types and residual materials and equipment, including all temporary site buildings and installations and all unused materials shall be taken off site by the contractor. No waste shall be left on any part of the construction site.

Operation

Waste generated during operation will mainly be gravel and salt remnants from winter care, sludge / cake from settling ponds for storm-water, and asphalt, concrete and gravel from repair and maintenance works. None of these wastes is hazardous and disposal pathways will either be existing municipal waste management facilities, landfills for mineral materials (gravel, rubble) or recycling facilities (cement kilns or asphalt plants). The annual quantities will fluctuate depending on weather conditions (length and severity of wintery conditions) and volume of maintenance works.

Existing waste management disposal facilities within the area are the responsibility of the Rayon. The operator will agree prior to operation on what waste will be delivered to the publicly operated waste management sites. Other waste disposal (e.g. mixed household waste from service areas / gasoline stations / parking areas) will be agreed with the Rayon prior to any disposal. Only Rayon approved disposal sites will be used. Any hazardous waste that may occur due to unexpected circumstances (e.g. accidents and spill of noxious / hazardous materials) will be disposed of at separate approved disposal sites. The operator will be responsible for all collection within the road and service areas and disposal to the approved and agreed sites. No disposal will take place on the alignment or at the service/rest areas. No incineration will take place on the alignment or service rest areas unless it is in accordance with local and national incineration regulations.

7.0 ANALYSIS OF ALTERNATIVES

The analysis of alternatives is an effective tool to establish the most environmentally favorable alternative which will cause as little loss as possible of valued environmental components, and minimum impacts on habitats, biodiversity and generally to the natural and human environment.

7.1 Original Alignment

As described in section 1.1 of this report the original alignment passed directly through Temirlan village with 2.3 km elevated above the central street of the village. Due to strong community pressure this alignment alternative was dropped. There were significant adverse environmental and social impacts of this alignment and this has been included in the analysis of alternatives.

7.2 Alternatives 1 (selected alignment) and 2.

For this analysis the selected alignment for this project, two alternatives were considered as shown in the figure below.

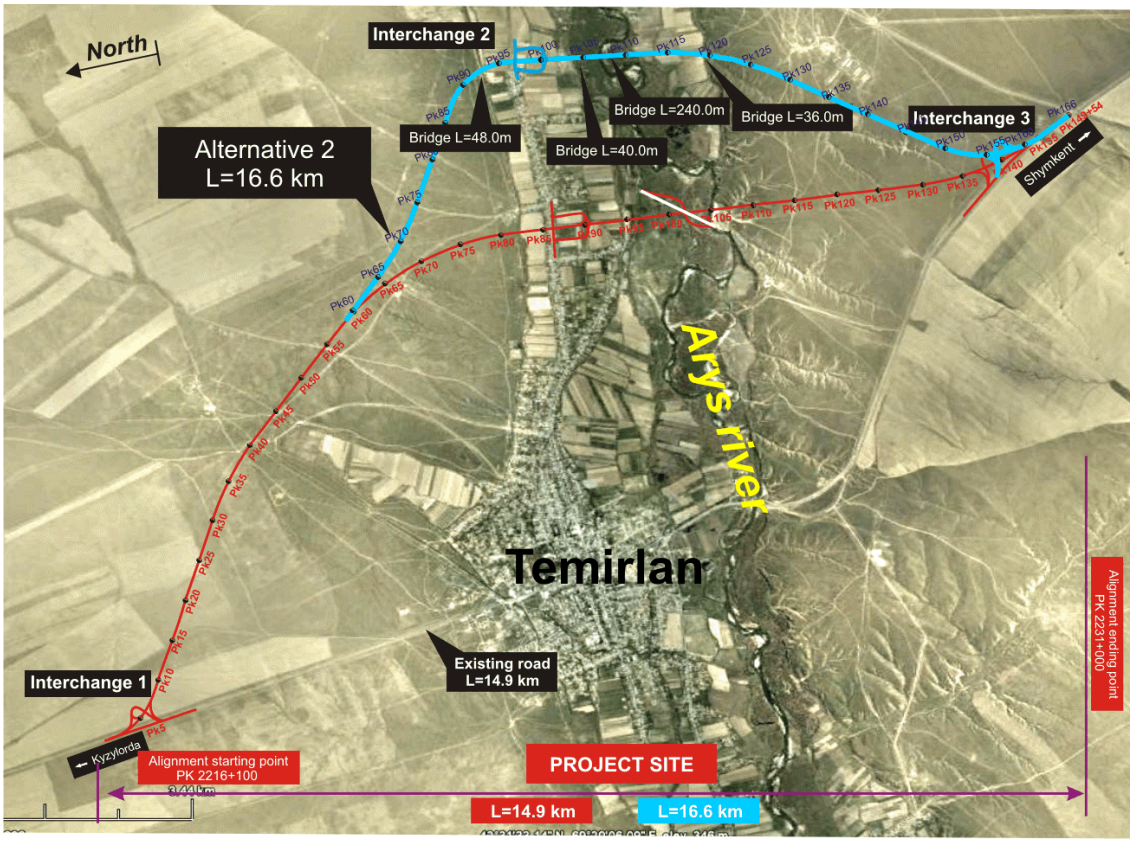

Figure 7.1 Alignment Alternatives.

These two alternatives were presented at public consultations in Temirlan village on May 13, 2010. The alternative 1 was selected by the meeting based on the following advantages and disadvantages

Table 7.1 Comparison of Alternative Alignments

Indicator	Original alignment	Alternative 1 (Selected)	Alternative 2
Land acquisition and resettlement	Some land acquisition for road widening north and south of Temirlan	20 houses and agricultural land	No houses. Agricultural land. More land required since it is a longer alignment
Construction and operation disturbance to community	Significant disturbance to all sensitive uses and other uses along road through Temirlan	Minimal long term disturbance to settlement except in vicinity of Interchange 2.	Negligible long term disturbance to settlement except in vicinity of interchange

Impact on Arys river	Since the alignment uses the existing route across the river valley there is unlikely to be significant additional disturbance to the river and flood plain.	New bridge and alignment across river and flood plain so some impact, but since the area already has some human impact it is unlikely to be significant	New bridge and alignment across river and flood plain. Less existing human impact so could be some adverse impact.
Length	14.9 km	15 km	Longest: 16.7 km
Noise and air pollution	Significant impact to community near existing road	Minimal impact	Negligible impact
Community support	Strongly opposed	Preferred by the community	Not selected by the community

In Environmental and social terms the selected alignment has the least impact on the environment and is supported by the community.

7.2 "Without Project" versus "With Project" analysis

The 'without project' assumes that the present road would continue to be used and that there would be no new capital investment in the present road alignment. The 'with project' alternative assumes that the project (Alternative 1) would be built.

The without project 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 community of Temirlan along the present alignment. There would be increased noise and vibration, air pollution, and significantly danger to local communities and road users, in particular pedestrians. Crossing the road would become more hazardous and the roadside communities would be physically segregated between the different sides of the road. Traffic congestion within Temirlan would increase and the economic disadvantages of this would be significant. Overall the quality of the environment and social conditions within Temirlan would deteriorate. The existing crossing of the Arys River would become more congested and there would be a significant increase in disturbance to the river from air pollution and there would probably be more garbage within the river. Increased congestion would occur in Temirlan so reducing air quality and increasing noise. Economic activities in the community would be adversely impacted and some businesses would be forced to close or would move to other locations outside Temirlan. Sensitive uses would be significantly impacted.

The "With Project" is likely to impact the local flora and fauna more significantly since the selected alignment is though agricultural and grazing land and a new route across the Arys River and flood plain would be required. More removal of vegetation would occur. This would be partially offset by landscaping of the alignment. Also, no sensitive or critical habitats will be affected by the new alignment, which runs mainly through agricultural and grazing land, and only will affect a short section in the Arys valley, which has higher biodiversity but is already affected by human activities from nearby Temirlan. The 'without'

project would have less impact on the local flora and fauna since no new land would be required.

Generally it is concluded that the selected alignment offers the best environmental approach to solving the road transport problems and reducing adverse environmental and social impacts on Temirlan.

7.3 Conclusion

From the above analysis, “With Project” benefits are likely to be more than “Without Project” scenario. Hence, “With Project” scenario is preferred.

8.0 ENVIRONMENTAL MANAGEMENT AND MONITORING

8.1 Environmental Management Plan

The following tables summarize impacts, evaluate their significance, propose mitigation measures and estimate residual impact for construction and operation periods of the project. This plan is to be incorporated into specifications of the project contractual documentation.

Table 8.1: Impacts and mitigation measures during construction

	Aspect	Potential impact and source	Significance (Low, Medium, High) + = positive, 0 = neutral, - = negative	Mitigation	Residual impact/comments
Construction of new 4-lane road					
	Air quality	Emission from construction vehicles and machinery	- medium	All vehicles, equipment and machinery used for construction will be regularly maintained in accordance with manufacturers specifications to ensure that the pollution emission levels conform to the standards prescribed; All equipment and machinery to be operated in accordance with manufactures specifications; Reducing unnecessary movement of construction vehicles on unpaved roads and sites; All construction camps, depots, and storage areas be located at least 200 meters from sensitive areas; Regular monitoring to define areas of significant air pollution.	Negligible.

	Aspect	Potential impact and source	Significance (Low, Medium, High) + = positive, 0 = neutral, - = negative	Mitigation	Residual impact/comments
		Construction related dust, from movement of vehicles at site and to sites from borrow and quarry sites, etc.	- medium	Dust suppression through regular watering and cleaning will be used on unsealed road surfaces, asphalt mixing sites and temporary service areas. Set speed limits on dirt roads.	Negligible.
		Vehicles hauling materials will generate dust nuisance.	- medium	Vehicles delivering material will be covered.	Negligible.
	Noise	High noise levels from construction vehicles and machinery	Medium	Impose speed limits on all construction vehicles; No night time working to reduce potential impact on sensitive uses Sound proofing of all vehicles and equipment; Stationary units to be located in sound absorbing areas; All construction camps, depots, and storage areas be located at least 200 meters from sensitive areas; Regular monitoring to define areas of noise sensitivity	Negligible
		Protection of workers H&S	- high	Noise standards for industrial enterprises will be strictly enforced to protect construction workers from noise impacts, in accordance with international HSE procedures.	
	Surface water	Pollution of Arys river and canals by fuels and oils.	- medium	Fuel storage and refueling sites located away from irrigation canals and Arys river. Extraction of water for construction only to occur with express permission of Rayon and in accordance with regulations	Negligible.
		Arys river and irrigation canals damaged	- medium	Affected irrigation and drainage features will be rehabilitated immediately.	Medium.

	Aspect	Potential impact and source	Significance (Low, Medium, High) + = positive, 0 = neutral, - = negative	Mitigation	Residual impact/comments
		Construction materials blocking drainage and producing contaminated run-off.	- medium	All structures and canals must be kept clear of debris and immediately rebuilt if needed. Drainage from all sites to be channeled to discharge via percolation area and for sensitive sites through a settling pond with an appropriate retention period. Ensure no short term flooding occurs.	Negligible.
	Ground water	Pollution of groundwater by fuels and oils spillage.	- medium	Construction vehicles and equipment will be maintained and refueled at protected refueling stations. All storage areas bunded.	Negligible.
		Exposure and contamination of groundwater during construction; particularly construction of cuttings and at borrow pits	medium		Minor
	Soil	Soil erosion due to inadequate and immediate application of stabilization techniques.	- medium	Re-vegetate barren cuts and work areas as soon after the work has been completed as is practical. Apply topsoil on all vacant sites as soon as practical	Negligible.
		Damage to soil through compaction along temporary work areas such as lay down sites and transport routes.	- medium	Strip off topsoil initially and after works de-compact and reinstate topsoil for effective reinstatement in accordance with national legislation.	Minor.
		Illegal or excessive borrowing of earth for infill damaging natural resources.	- high	No earth borrowed from unauthorized locations.	Medium.
		Contamination of soil from fuel and lubricants.	- high	All fuels and oils stored in accordance with international practice; bunded and impervious flooring.	Negligible.
		Pollution by fuels spillage.	- high	Construction vehicles and equipment will be maintained and refueled at protected refueling stations where practicable.	Negligible.
		Non-productive, barren lands, first choice as approved and licensed	- medium	Restoration of borrow areas wherever practicable.	Negligible.

	Aspect	Potential impact and source	Significance (Low, Medium, High) + = positive, 0 = neutral, - = negative	Mitigation	Residual impact/comments
		borrow areas.			
		Contamination of subsoil by construction of sub grade	-low	Use of natural resources from local sources	Negligible
	Flora	Loss or damage to vegetation	- medium	Plantation of trees and restoration of impacted areas by de-compaction and reinstatement of topsoil.	Negligible.
		Failure to properly manage/store topsoil, leading to degraded and substandard site reclamation and re-vegetation.	- medium	Cleary defined topsoil storage and handling in contract specifications, and follow up with regular inspection, monitoring and reporting.	Negligible.
	Fauna	Loss, damage or disruption to fauna due to unnecessary and un-approved expansion in construction work areas, soil compaction.	- medium	Contractor will be directed not to disrupt or damage the fauna and their habitats.	Negligible.
		Fauna damaged or killed from unauthorized access or hunting.	- medium	Oblast rules for hunting (Wildlife Protection) will be adhered to and rules for bird catching (Wildlife Protection) will be followed. Off-limits fencing and signage where necessary. Contractor to be responsible for implementing 'no hunting' policy.	Minor.
	Social: Community economic activity	Community loses access to resources, affecting income generating activities.	- high	Consult with local officials to establish an adequate detour plan and sufficient access to areas cut off or constrained by the work	Medium and will depend of effectiveness of the plans implemented.
	Social: Construction camps	Community tension and disruption.	- medium	Community and contractors to meet and discuss issues. Evaluate locations for camps based on present EIA report. Develop camp management rules. Develop and implement a Project Induction training course that is mandatory for all workers; this will contain H&S, environmental and social context components.	Minor.

	Aspect	Potential impact and source	Significance (Low, Medium, High) + = positive, 0 = neutral, - = negative	Mitigation	Residual impact/comments
	Physical cultural resources	Loss and damage to cultural resources	- high	No works will be commenced within 50m from the 21 archaeological mounds without permission from Committee of Culture and its Departments. Develop and implement a Late Finds Protocol, including maintaining watching brief during works, with clear procedures for protection and documentation. Archaeological surveys revealed 21 archaeologically valuable mounds, 16 of which overlap with ROW.	Medium.
	Land: Landscape	Landscape impact due to large work areas.	- medium	Implement best practice soil handling techniques to allow for successful reinstatement of affected areas. This to be done through ensuring gradual slopes, planting, stabilizing vegetation, reinforced earth, geotextiles, geogrid etc	Minor.
	Land: Agriculture	Damage to agricultural crops and lands, including drainage and irrigation infrastructure.	- high	Liaise effectively with PAPs before start of construction, maintain dialogue, develop a grievance procedure, strictly control machinery and vehicle access and reinstate all affected areas.	Minor.
	Land: Livestock	Livestock resources damaged by machinery and vehicles.	- medium	Liaise effectively with PAPs before start of construction, maintain dialogue, develop a grievance procedure, strictly control machinery and vehicle access, consider fencing for protection, and discuss livestock crossing points.	Minor.
	Land: Property loss	Properties damaged or requiring to be demolished to facilitate the construction works.	- high	Develop and implement a compensation scheme that is compliant with WB procedures (Resettlement Action Plan). Provide for compensation and emergency management for any accidental damage due to close proximity of works to properties.	Medium or low adverse effect, depending on the success of the compensation arrangements.

	Aspect	Potential impact and source	Significance (Low, Medium, High) + = positive, 0 = neutral, - = negative	Mitigation	Residual impact/comments
	Traffic	Traffic disruption	- high	Develop and implement effective traffic management plans and make them publically available.	
	Traffic: Community safety	Residents injured or disturbed by construction activities in proximity to residences and businesses.	- high	Conduct safety awareness campaigns, focusing on schools and children. Develop an effective method statement for construction, in consultation with the residents.	Residual impacts will depend on effectiveness of the campaigns.
	Traffic management	Both through traffic and local traffic disrupted due to road closures and restrictions during lifting and overhead works	- medium	Develop an effective traffic management plan for through traffic that also minimizes disruption to residents.	Medium or low adverse effect, depending on the success of the traffic arrangements.
	Waste	Contamination of soil or water resources.	- high	The sewage system for labor camps will be properly designed and built so that no water pollution takes place. Such facilities will be decommissioned at end of the construction period. All waste to be disposed off site at approved and managed landfills.	Minor.
		Contamination of soil or water resources.	- high	Contaminated or hazardous waste such as bitumen waste to be disposed in selected areas & approved by MEP/MOTC or its consultants/PMC. All waste disposal to comply with a Waste Management Plan, to be developed at the start of construction.	Minor.
		Pollution of groundwater and soils during demolition of fuel stations.	- high	Develop working method statement to include effective management of fuels.	
		Construction waste not being disposed of appropriately	-medium	Where reuse and recycling not possible all construction waste to be taken off site in accordance with Rayon requirements and	

	Aspect	Potential impact and source	Significance (Low, Medium, High) + = positive, 0 = neutral, - = negative	Mitigation	Residual impact/comments
				national regulations	
	Hazardous material use and storage	Soil and water pollution with fuels and oil.	- high	Construction vehicles and equipment will be maintained and refueled at protected refueling stations. Fuel storage and handling sites located away from irrigation canals and Arys river	Negligible.
		Soil and water pollution with cement and wash-water.	- medium	Develop plans for cement and wash-water management.	Negligible.
	Worker HSE	Workers injured during construction	- high	Implement international HSE standards in all contracts.	Minor.
		Spread of disease, including STIs.	- high	Conduct awareness campaigns for camp workers, and if relevant, nearby communities.	Minor.
	Material resources	Illegal or excessive borrowing may damage archaeological or land resources.	- high	No earth borrowed from unauthorized locations.	Minor.
	Encroachment by contractor	Land resources damaged by contractor using additional land illegally.	- medium	Identify work areas with contractor(s) and describe system of approvals for extensions and fines for violations.	Negligible.
	Temporary roads	Vegetation removed, soil compacted, landscape and vegetation impacted.	- medium	Remove topsoil layer initially and afterwards de-compact routes and reinstate, except where a fire buffer zone is required.	Minor.
	Service and utilities disruption.	Services disrupted by large scale construction works.	- low	Develop an effective method statement for construction, in consultation with the residents, local administration and owner companies.	Negligible.
Arys river bridge	Bridge construction	Damage to riparian habitats.	- medium	Develop working method statements and procedures to include effective fuel, oils and cement management and to limit encroachment.	Minor.
Supervision and management		E&S control during project implementation insufficient to ensure mitigation.	- high	Include effective E&S monitoring and control within supervision consultant's team as part of the construction contract.	Minor.
		E&S auditing during project	- high	Use of supervision consultants to ensure effective delivery of	Minor.

	Aspect	Potential impact and source	Significance (Low, Medium, High) + = positive, 0 = neutral, - = negative	Mitigation	Residual impact/comments
		implementation insufficient to ensure effective mitigation.		safeguards policies.	

Table 8.2: Impacts and mitigation measures during road operation.

	Aspect	Potential impact	Significance (Low, Medium, high) + = positive 0 = neutral - = negative	Mitigation	Residual impact/Note
New 4-lane by-pass					
	Air quality	Some increase in air pollution to locations close to road including Kazhymukan village	- low	Mandatory annual vehicle inspection for heavy vehicles encouraged. Regular maintenance of the road will be done to ensure good surface conditions. New design will encourage regular speeds and no congestion will keep emissions level comparatively low.	Minor, at crossing of Kazhymukan village.
		Significant decrease in air pollution in Temirlan	+high		Positive impact.
	Noise	Increased noise along new alignment	-medium	Consider landscape planting and/or fencing in consultation with PAPs. Regular monitoring to determine any sensitive areas	
		Failure to implement efficient noise abatement measures such as plantings, construction of noise barriers, especially near Kazhymukan village.	-high	Undertake remedial planting and repair. Monitor noise pollution and effectiveness of noise attenuation measures.	
	Surface water	Potential pollution from spillages from accidents and road maintenance particularly in vicinity of Arys River.		Develop system of spillage control and clean-up, and implement in road maintenance organization.	Minor.
	Ground water	Changes to groundwater levels or flows		Monitor groundwater patterns.	
		Unmanaged storm water drainage from road surfaces drained directly into water courses leading to chronic		The drainage system will be monitored periodically cleaned. Water quality will be monitored as the monitoring plan to be developed by road maintenance organization.	

	Aspect	Potential impact	Significance (Low, Medium, high) + = positive 0 = neutral - = negative	Mitigation	Residual impact/Note
		contamination.			
	Soil	Soil Erosion due to inadequate and immediate application of stabilization techniques.	- medium	Re-vegetate barren cuts and work areas as soon after the work has been completed as is practical. Maintain roadside planting.	Minor, depending on effectiveness of restoration works.
	Flora & fauna	Increased road kills of wildlife	- medium	Monitor impacts on fauna: record road kills and report any sightings of large mammals to relevant authorities.	
		Fauna not being able to cross alignment	-low	Three culverts to allow Fauna to cross alignment.	
	Livestock safety	Encroachment into previous agricultural land increasing livestock damage/losses.	- medium	If necessary develop a fencing strategy in consultation with PAPs/farmers.	
		Insufficient consideration for proximity of livestock to roadsides and crossing points (long established trails).	-medium	The design team has coordinated with Akimat officials on locations of livestock crossings, designed cattle-underpasses (box culverts) and provided special signage and warnings to vehicles to slow down. For CR it will be important to enforce its roadside restricted use zone at all time, thus discouraging animal grazing near the road.	
	Traffic & driver safety	Increased accidents due to higher speeds.	- low	Good signage, traffic calming and speed enforcement measures required.	
	Community Safety	Improved safety and access within exiting Temirlan village	+high		Positive changes
		Increased speed and traffic levels pose risk to pedestrians and local users adjacent to new road	- low	Unlikely to be significant pedestrian movement near new road. Review need for traffic calming and other procedures as necessary; consider education of school children on road safety.	- minor
	Waste	Contamination of water courses, groundwater and soils	-low	Regular and immediate collection of all waste and accident waste from carriageway	minor

	Aspect	Potential impact	Significance (Low, Medium, high) + = positive 0 = neutral - = negative	Mitigation	Residual impact/Note
	Landscape	Changes to landscape from agricultural to semi-urban	- low	Conduct roadside planting and landscaping	
Arys river bridge		Highway run-off and spillages affecting Arys river	- high	Conduct maintenance of drainage system as required for incidental spillages.	Medium.

8.2 Environmental Monitoring Plan

The following table presents monitoring of environmental conditions during construction and operation periods. This plan shall be used in preparation of contractual documentation for construction of the road and for maintenance of the road.

Table 8.3: Environmental Monitoring Plan

						Responsibility	
Stage	**What:** *parameter is to be monitored?*	**Where:** *is the parameter to be monitored?*	**How:** *is the parameter to be monitored/type of monitoring equipment?*	**When:** *is the parameter to be monitored – frequency of measurements or continuous?*	**Why:** *is the parameter to be monitored (optional)?*	**Install**	**Operate**

						Responsibility	
Stage	**What:** *parameter is to be monitored?*	**Where:** *is the parameter to be monitored?*	**How:** *is the parameter to be monitored/type of monitoring equipment?*	**When:** *is the parameter to be monitored – frequency of measurements or continuous?*	**Why:** *is the parameter to be monitored (optional)?*	**Install**	**Operate**
Construction	Emissions from construction machinery	Construction sites	Observation, records	Regular site visit	Compliance to EMP commitments	Contractor	Contractor EHS staff
	Dust	At construction sites and haul roads	Visual observation	Regular site visits.	Compliance to RK EHS standards	Contractor EHS staff	Contractor EHS staff
	Noise	Kazhymukan village	Noise meters and observation	Monthly	Compliance to RK standards and EMP	Contractor	Certified laboratory (subcontract)
	Damage to irrigation system	Irrigation canals and agricultural lands	Visual observation, discussion with PAPs	Weekly	Compliance to EMP	Contractor	Contractor EHS staff
	Water quality	Arys river, irrigation canals	Instrumental measurements	Monthly	Compliance to RK EHS standards	Contractor	Certified laboratory (subcontract)
	Waste water from camps and residential areas	At labor camps and residential areas	Monitoring of proper installation and operation of wastewater units, latrines and septic tanks	Regular site visits.	Compliance to RK standards	Contractor	Contractor EHS staff

						Responsibility	
Stage	**What:** *parameter is to be monitored?*	**Where:** *is the parameter to be monitored?*	**How:** *is the parameter to be monitored/type of monitoring equipment?*	**When:** *is the parameter to be monitored – frequency of measurements or continuous?*	**Why:** *is the parameter to be monitored (optional)?*	**Install**	**Operate**
	Topsoil management	At all affected areas	Observation, records	Weekly	Compliance to RK EHS standards and EMP	Contractor	Contractor EHS staff
	Construction material extraction	At borrow pits	Visual and topographical monitoring	Monthly	Compliance to EMP commitments	Contractor	Contractor EHS staff
	Hazardous materials, fuel and oils management	At labor camps and construction sites	Visual monitoring, documentation, audit	Weekly	Compliance to EMP commitments	Contractor	Contractor EHS staff
	Arys river habitat	Arys river bridge construction	Visual monitoring and recording all sightings of larger mammals.	Weekly	Compliance to EMP commitments	Contractor	Contractor EHS staff
	Fauna and Livestock damaged by machinery	Construction sites	Observation, records	Regular site visit	Compliance to EMP commitments	Contractor	Contractor EHS staff
	Community relations	Temirlan and Kazhymukan villages	Observation	Regular site visit	Compliance to EMP commitments	Contractor	Contractor

						Responsibility	
Stage	**What:** *parameter is to be monitored?*	**Where:** *is the parameter to be monitored?*	**How:** *is the parameter to be monitored/type of monitoring equipment?*	**When:** *is the parameter to be monitored – frequency of measurements or continuous?*	**Why:** *is the parameter to be monitored (optional)?*	**Install**	**Operate**
	Spread of diseases, including STIs	Temirlan and Kazhymukan villages	Observation, discussion with residents and administration	Monthly	Compliance to EMP commitments	Contractor	Contractor
	Protection of workers H&S	Construction sites	Observation	Regular site visit	Compliance to EMP commitments	Contractor	Contractor EHS staff
	Residents injured during construction works	Construction sites	Observation, records	Regular site visit	Compliance to EMP commitments	Contractor	Contractor EHS staff
	Physical cultural resources	21 mounds near the alignment	Visual monitoring by experienced and qualified staff	Regular site visit	Compliance to EMP commitments	Contractor	Contractor
	Restoration of temporarily occupied lands	At construction sites	Visual monitoring	Monthly	Compliance to EMP and RK standards	Contractor	Contractor EHS staff
	Traffic disruption	Construction sites, Temirlan and Kazhymukan villages	Visual monitoring of detour roads	Regular site visit	Compliance to EMP commitments	Contractor	Contractor

						Responsibility	
Stage	**What:** *parameter is to be monitored?*	**Where:** *is the parameter to be monitored?*	**How:** *is the parameter to be monitored/type of monitoring equipment?*	**When:** *is the parameter to be monitored – frequency of measurements or continuous?*	**Why:** *is the parameter to be monitored (optional)?*	**Install**	**Operate**
	Solid waste management	At all sites.	Visual monitoring, documentation, audit.	Regular site visit	Compliance to RK EHS standards and EMP	Contractor EHS staff (via Waste Management Plan)	Contractor EHS staff
	Relocation of services	Construction sites	Observation	Regular site visit	Compliance to EMP	Contractor	Contractor EHS staff
Operation							
	Air Quality	At sensitive locations: Kazhymukan village, Arys river valley,	Instrumental measurements	Monthly	Compliance to EIA commitments	CR	CR
	Noise	At sensitive locations: Kazhymukan village, Arys river valley,	Instrumental measurements	Monthly	Compliance to EIA commitments	CR	CR
	Water quality	Arys river and irrigation canals	Instrumental measurements	Quarterly	Compliance to EIA commitments	Road maintenance company	Certified laboratory (subcontract)

						Responsibility	
Stage	**What:** *parameter is to be monitored?*	**Where:** *is the parameter to be monitored?*	**How:** *is the parameter to be monitored/type of monitoring equipment?*	**When:** *is the parameter to be monitored – frequency of measurements or continuous?*	**Why:** *is the parameter to be monitored (optional)?*	**Install**	**Operate**
						company	(subcontract)
	Soil	At five typical locations adjacent to right of way	Instrumental measurements	Monthly	Compliance to EIA commitments	CR	CR
	Animals killed on road	Whole section	Information from local authorities	Annually	Design review	CR	CR
	Traffic safety	Car accident records	Information from SKO Department of CR and SKO Motor Vehicle Department	Annually	Design review	CR	CR

9. PUBLIC CONSULTATIONS

A total of 4 public consultations were carried out in connection with the Temirlan village bypass road project. All minutes except for public consultation on April 2nd 2009 are attached in Annex 1. All public consultations were organized in accordance with World Bank requirements, since at that stage all road sections in Kyzylorda and South-Kazakhstan Oblasts were potentially suitable for World Bank financing, and the Borrower (Committee for Roads) has adopted World Bank procedures for the entire construction site in both Kyzylorda and South Kazakhstan Oblasts. All residents were notified at least 10 days in advance of the consultations advertising in local newspaper, TV, radio, and in posters hung in public places. Public consultations were organized with sufficient place to sit. All attendants were recorded. Public consultations were chaired by local Akimat officials together with SKO Department of CR. All participants were free to ask questions, give comments, express their opinions.

The first public consultations took place on January 15, 2009. Total of 83 local residents participated. World Bank representatives were in attendance. As the result of this consultation, the design of elevated overpass was rejected. CR proceeded to redesigning the section to avoid going through the center of the community.

The second public consultations took place on May 13, 2010 after full redesign of the section. 2 alternatives of the by-pass were presented to the public. Alternative 1 was chosen unanimously.

The third public consultation took place on July 29, 2010. Consultations mainly were about project design decisions (road characteristics, bridges, underpasses for animals and farm traffic, fencing etc), land acquisition, and resettlement procedures. All PAPs were given information on compensation procedures and contact details of local and international resettlement specialists.

The fourth public consultation was held on October 27, 2010. The discussions focused on the EIA report project design decisions, land acquisition and resettlement procedures. Attendance at this consultation was poor.

In September 2010, a local NGO criticized the quality of the EIA report. The same report was rejected by the World Bank. Accordingly the CR requested the design consultant to revise the report to be consistent with World Bank requirements but this was not achieved. Subsequently a complete rewriting of this report was started in July 2011.

10.0 CONCLUSIONS AND RECOMMENDATIONS

This EIA has focused on waste disposal, soil erosion, air, water and noise pollution, and impacts on plants, aquatic resources, and wildlife for a 15 km road section for a bypass of Temirlan village. The ecological environment, natural resources, valued environmental components, physical cultural resources, and road safety were taken into consideration to identify potential significant issues that would need to be mitigated. Based on the results of studies and analyses it was concluded that the project would have some identifiable significant environmental impacts, but can be reduced to acceptable and sustainable levels with appropriate mitigation measures diligently implemented during the construction and operation phases.

Issues of particular attention that were highlighted in the EIA are the following:

- Need for underpasses to allow for safe and easy movement of livestock, farm equipment and fauna; this has been mitigated through the incorporation, after consultation with farmers, of three underpasses (box culverts) that have been provided at the following locations: PK45+56, PK69+40, and PK137+00.

- Need to ensure that the river Arys and its immediate floodplain are not adversely and irreversibly impacted; mitigated through ensuring the footprint of construction activities within the floodplain and river area is minimized and that all activities are carefully supervised by environmental personnel; that any construction waste is immediately cleared from the area; and that no water is extracted from the river area for construction unless from non-sensitive areas with explicit clearance from Client's Resident Engineer and the Kazakh water authorities. During operation it will be important that no storm-water run-off flows directly into the Arys River, but passes settlement / seepage ponds before reaching natural watercourses.

- Need to ensure that the community of Kazhymukan is not adversely impacted by noise and other disturbance during the construction and operation periods. This will be mitigated by ensuring that during construction no night time activity occurs within 500 meters of the nearest house, that no construction camps and depots be located within 200 meters of the nearest house, that machinery used complies with international good practice and specifications regarding emissions (noise, exhaust gases). During the operation period the tree screen may reduce some of the noise but further mitigation may be necessary and consultation will take place during construction with the community to determine the need for additional mitigations.

- Finally Archaeological surveys revealed 21 archaeologically valuable sites, all of them ancient burial mounds, 16 of which are within the ROW. It is essential that no works shall be commenced within 50 m distance from any mound until clearance from

Committee of Culture and its Departments is received. It has been determined that These mounds shall undergo a complete excavation by licensed experts, with subsequent archeological study and recording. Items of significance shall be retained for archiving or made available to a museum.

Although there will be a range of potential adverse impacts to the areas close to the alignment, it should be pointed out that there will be significant benefits to the community within Temirlan. Traffic flows will reduce significantly and noise disturbance will reduce and air quality will improve. There is likely to be significantly less traffic congestion and general disturbance. These benefits will accrue to the majority of the existing Temirlan community.

It also should be pointed out that along a 1,000 km section of M32 large scale construction works for the rehabilitation, reconstruction and the construction of new bypass sections has been ongoing for 2 years (currently >15 lots are under construction). The works are being implemented under supervision of a Project Management Consultant (PMC) who has a team of environmental and social specialists in the country that closely monitor and supervise the implementation of environmental due diligence on the construction sites. While some environmental issues remain to be improved in the ongoing construction, environmental compliance is generally satisfactory, as has been determined by several performance assessment missions carried out by the World Bank team. As the same structure and approach will be used for the Temirlan bypass the risk of environmental non-compliance and resulting environmental damage is deemed low.

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ANNEXES