E2332 v8

World Bank Financed Turfan Prefecture Water Conservation Project Xinjiang

Environmental Management Plan

Project Implementer: Turfan Prefecture Water Bureau PMO, Xinjiang

Assessment Organization: Environmental Expert Group of Turfan Prefecture PMO

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1 Overview

1.1 Brief Description of the Project

Xinjiang Uygur Autonomous Region is located in the northwest part of China, and in the middle of Xinjiang Uygur Autonomous Region by east lies Turfan Prefecture, a basin among mountains at the foot of Tianshan Mountain in its south, 300km long from east to west and 240km from south to north, with a total area of 69,713km^2. Its geographically position is longitude 87°16′-91°55′ east and latitude 41°12′-43°40′ north. Abounding with land and photothermic resources and teeming with melons and grapes, Turfan Prefecture is one of China's famous tourist attractions with its unique natural scenery.

The climate of Turfan Prefecture is typical of continental warm temperate desert zone, full of sunlight, rich in thermal energy but extremely dry with rare rainfall and frequent winds, hence the name "fire continent" and "wind storehouse". Its annual average precipitation being 16.6 mm and annual evaporation 2,845 mm, the prefecture is one of the extremely desert areas in China. Water resources are most scarce in the place, amounting to 535 million m^3 in total. The problems with water resources utilization at the present are, on the one hand, water resources are unevenly distributed among the seasons. There are very few control structures in the mountains, so it is impossible to effect spatial regulation of water. As a result, very little surface water can be diverted and utilized during flood period and water is very short during dry season. On the other hand, deep irrigation, series irrigation and other flood irrigation methods are still being adopted in agriculture in the prefecture, which cause unnecessary waste of water.

At present, industrial and agricultural development in Turfan Prefecture rely mainly on surface water and groundwater. However, in recent years, with rapid economic development water use in various sectors has been constantly increased. Especially in industries much more water has been used, resulting in sharper and sharper conflict between water supply and demand in the region. In order to meet the normal domestic and production needs, people have started exploiting groundwater in enormous quantities and water table has dramatically declined, causing a series of environmental problems: groundwater overexploitation, Kariz systems dry-up, serious conflict between water resources shortage and rapid development, and degradation of the already very fragile environment. Therefore, water saving in a planned manner and agricultural development through water saving have become the only solution to the agricultural and economic development of Turfan.

In order to broaden its financing channels of water saving irrigation in agriculture, speed up its water saving society development and achieve its sustainable development objectives, Turfan Prefecture Water Bureau, Regional NDRC and Regional Finance Department agreed with the World Bank and water bureaus of Turfan City, Shanshan County and Tuoxun County on the plan to use World Bank loan at an amount of $100 million for the water conservation project in the prefecture.

The proposed World Bank Financed Turfan Prefecture Water Conservation Project comprises civil works construction and management system and institutional capacity building. The construction component includes: a) constructing three medium- and small-sized mountain reservoirs; 2) reconstructing 47.5km of lined main and branch canals; b) constructing 161.4 thousand mu of water saving irrigation schemes for agriculture; c) for Kariz system preservation, restoring one selected Kariz system to protect ancient water

delivery system of historical cultural heritage. The management system and institutional capacity building part includes: d) carrying out integrated water and environment management by introducing integrated basin management concept and methodology; e) for institutional capacity building, establishing WUAs, monitoring and evaluation system and management information system. For names and area of the subprojects and EIA report (table) preparation institutions, see Table 1.1-1.

Subprojects, their area and EIA report (table) preparation institutions

Table 1.1-1

City （county）	Serial No.	Code	Name of subproject	EIA preparation institution
Turfan City (4)	1	TLF1	Meiyaogou Reservoir	Xinjiang Institute for Water and Hydropower Survey, Design and Research
	2	TLF2	Turfan City water saving irrigation	
	3	TLF3	Tarlang Branch Canal	
	4	TLF4	Wudaolin Kariz system preservation	
Shanshan County (3)	5	SS1	Ertanggou Reservoir in Shanshan County	Xinjiang Institute for Water and Hydropower Survey, Design and Research
	6	SS2	Water saving irrigation in Shanshan County	
	7	SS3	Ertanggou branch canal lining reconstruction	
Tuoxun County (3)	8	TKX1	Alagou Reservoir in Tuoxun County	Hunan Institute for Water and Hydropower Survey, Design and Research
	9	TKX2	Water saving irrigation in Tuoxun County	Xinjiang Institute for Water and Hydropower Survey, Design and Research
	10	TKX3	Alagou main canal	

Note：Since the seven subprojects of TLF4,SS2,SS3,TKX2 and TKX3 have very little environmental impact due to their small scale, small quantity of work and simple construction. In accordance with relevant domestic regulations on EIA and World Bank safeguard policy requirements, only tabulated EIA reports are prepared.

The goals of this project are to adopt the new concept and methodology of integrated water and environment management and agricultural water saving irrigation with the focus on non-beneficial evapotranspiration (ET) reduction, improve regional on-farm water infrastructure, attach importance to software development, push forward with sustainable water resources utilization and development, and facilitate socioeconomic development in Turfan Prefecture.

The specific objectives of the project are to increase regional flood control capacity so that flood water resources are effectively utilized, increase the number of employed farmer labors, improve canal and irrigation efficiency, reduce non-beneficial ET in the project area, cut down on total ET in the project area, increase agricultural output value in the project area, reduce groundwater drawdown in the project area, protect Kariz system of cultural heritage, and make regional project management in keeping with international practice.

1.2 Objectives of Environmental Management Plan (EMP)

The environmental management plan is prepared for the purpose of formulating a set of detailed environmental measures that are technically feasible and financially sustainable and operable in view of the unavoidable potential adverse impacts of the project on environment to specify that the project contractors, supervisors, operators and environmental management department will implement measures and arrangement for environmental mitigation and management and institutional establishment during project implementation and operation so as to minimize as much as possible or compensate for the adverse environmental and social impact of the project and reduce it to an acceptable level. The specific objectives include:

1) Specifying environmental management obligations of the contractors and operators

Xinjiang Uygur Autonomous Regional Environmental Protection Department, Turfan Prefecture Environmental Protection Bureau, the environmental impact assessment institution and the design institution have carried out detailed field verification and confirmation with regard to environmental protection objectives and come up with effective environmental impact mitigation measures, which are included in the project design as contractual responsibilities of the project construction contractors and operators.

2) Serving as operational guidelines on environmental management

The environmental monitoring plan for construction and operation periods stipulated by the EMP will ensure effective implementation of the environmental impact mitigation measures and will be provided as an environmental protection document to the construction supervisor, environmental supervisor, and other relevant organizations during construction and operation periods to specify the responsibilities and roles of relevant function departments and management organizations and provide for communication channels and methods among various departments.

3) Ensuring funds for environmental management actions

In the EMP, costs of environmental management, environmental supervision and capacity building are estimated and their sources are explained to ensure implementation of the various environmental management actions. The management costs include staff salaries, office expenses and transportation costs.

The EMP serves to avoid and control adverse environmental impact during project implementation and operation, for which purpose it sets out the environmental impact mitigation measures, monitoring measures and legal and regulatory tools to be implemented and measures for ensuring implementation of these measures. At the same time, it is the key link to connect the assessment of EIA with detailed environmental impact mitigation measures and their alternative measures. For each of the environmental management measures the EMP provides for its technical implementation, investment estimates, implementation plan, government agency functions, funding sources and monitoring plan. In order to achieve the mitigation objectives the measures set out by the EIA and EMP must be fulfilled.

1.3 Preparation of the Environmental Management Plan

The EMP of “Turfan Prefecture Water Saving Irrigation Environmental Development Project” comprises the overall EMP and 10 subproject EMPs. The subproject EMPs are prepared by the project owners and their environmental impact assessment institutions with descriptions focused on project budgets and project environmental management plan organization. The overall EMP submitted to the World Bank for review is jointly prepared by Turfan Prefecture Water Bureau PMO and the environmental expert group of Turfan Prefecture Water Bureau PMO. The overall EMP and the subproject EMPs are in consistency and are strictly in accordance with the national level and regional level environmental management regulations. Under the condition of meeting the requirements of Chinese environmental impact assessment, special attention is paid to the requirements of World Bank’s safeguard policies, specifically relevant rules of the operational regulations 4.01.

The information of the overall EMP comes from:

1) Overall EIA

2) Subproject EIAs

3) Subproject EMPs

4) Subproject feasibility study reports

5) Overall feasibility study and assessment report

6) Workshops organized by PMO and attended by subproject environmental impact assessment owners and World Bank representatives

7) Subproject soil and water conservation plan

1.4 Design of EMP

The EMP serves as a guiding document for environmental management during project implementation and its action plans mainly include the following three parts:

Environmental impact and mitigation measures: main project impacts during its construction and operation and engineering and management measures taken to prevent or mitigate adverse impacts created by the project.

Environmental management and supervision plan: environmental supervision actions taken to ensure synchronous implementation of environmental protection measures and project construction.

Environmental monitoring plan: environmental monitoring actions taken to supervise the achievement of environmental standards during construction and operation and ensure safe operation and improvement in environmental conditions in the construction areas.

Capacity building (i.e. personnel training) plan: knowledge and skills trainings provided for managers, environmental supervisors, full-time or part-time environmental managers and so on during project implementation in order to ensure implementation of the environmental management plan.

1.5 Details of Technical Preparation

This EMP is prepared through proper addition, revision and improvement of and based on the “Comprehensive Assessment Report on the World Bank Financed Turfan Prefecture Water Conservation Project, Xinjiang” and the 10 subproject EMPs. As an independent document, it includes all the environmental management actions to be taken during project construction and operation and provides an action guide and framework for the implementation of the adverse impact mitigation measures, environmental supervision, environmental management and environmental monitoring. In addition, the pest management policies of the World Bank under this project are dealt with separately in “Pest Management Plan” and are not concerned in this article.

2 Framework for Policies, Laws and Administration

2.1 Environmental Policies, Regulations and Documents

2.1.1 Summary

Based on comprehensive analysis of the type, scale, site and environmental sensitivity of the project and the features and extent of its potential environmental impact, the EIA of this project is made mainly in accordance with and with regard to the following policies, laws, regulations and standards:

1) Environmental protection laws and regulations;

2) Technical policies on pollution prevention and control;

3) Plans and master plans for socioeconomic development and environmental protection;

4) City master plan;

5) Technical guidelines on environmental impact assessment;

6) Environmental quality standards;

7) Pollutant discharge control standards;

8) World Bank safeguards policies.

The above policies, laws, regulations and standards comprise the policy, legal and regulatory framework for guiding and standardizing the environmental impact assessment of this project. Since the subprojects vary in category and nature, the policies, laws, regulations and standards that apply are also different in each of the cases.

In addition, the EIA of this project also uses the feasibility study report, administrative review and approval documents of government line agencies and other relevant documents that specifically reflect and apply the above-mentioned the policies, laws, regulations and standards as one of the bases for EIA.

2.1.2 Environmental Protection Laws and Regulations

1) Environmental Protection Law of the People's Republic of China (December 26, 1989);

2) Environmental Impact Assessment Law of the People's Republic of China (October 28, 2002);

3) Law of the People's Republic of China on Water Pollution Prevention and Control and its detailed implementation rules (February 28, 2008);

4) Law of the People's Republic of China on Atmospheric Pollution Prevention and Control (April 29, 2000);

5) Law of the People's Republic of China on Prevention and Control of Environmental Noise Pollution (October 29, 1996);

6) Law of the People's Republic of China on Prevention and Control of Environmental Pollution Caused by Solid Waste (April 1, 2005);

7) Water Law of the People's Republic of China (August 29, 2002);

8) Law of the People's Republic of China on Soil and Water Conservation (June 29, 1991);

9) Law of the People's Republic of China on Protection of Wildlife (August 28, 2004);

10) Fishery Law of the People's Republic of China (October 31,2000);

11) Law of the People's Republic of China on Protection of Cultural Relics□December 29, 2007□;

12) Law of the People's Republic of China on Flood Control□August 29, 1997□;

13) Law of the People's Republic of China on Land Administration□August 28, 2004□;

14) Grassland Law of the People's Republic of China □December 28, 2002□;

15) Law of the People's Republic of China on Prevention and Treatment of Infectious Diseases□August 28, 2004□;

16) Law of the People's Republic of China on Prevention and Control of Radioactive Pollution□June 28, 2003□.

2.1.3 Environmental Protection Regulations, Ministry and Commission Regulations and Protection Catalogs

1) Regulations for Implementation of Law of the People's Republic of China on Soil and Water Conservation□August 1, 1993□;

2) Regulations of the People's Republic of China for Protection of Wild Plant□September 30, 1996□;

3) Regulations of the People's Republic of China on Nature Reserves□October 9, 1994□;

4) Regulations of the People's Republic of China for River Administration □June 10, 1988□;

5) Regulations for Environmental Protection Administration of Construction Projects□November 29, 1998□;

6) Outline for National Ecological and Environmental Protection (April 10, 2001);

7) National 11th Five Year Master Plan for Ecological Protection□HuanFa 2006 [No.158]□;

8) Provisions for Administration of Pollution Prevention and Control for Drinking Water Sources Protection Zones□July 10, 1989□;

9) Interim Measures for Public Participation in Environmental Impact Assessment (HuanFa 2006 [No.28]);

10) Circular On Strengthening Environmental Impact Assessment Administration of Construction Projects Financed by International Financial Organization Loans by Four Ministries, HuanJian [1993] No.324.

11) Circular for Strengthening Environmental Protection for Hydropower Construction HuanFa [2005] No.13

12) A Number of Recommendations for Strengthening Environmental Protection Administration of Construction Projects in Western Development (HuanFa [2001] No.4);

13) Recommendations of State Environmental Protection Administration for Strengthening Regulation of Ecological and Environmental Protection in Resources Development (HuanFa [2004] No.24);

14) Circular for Strengthening Ecological and Environmental Administration of Construction Projects for Natural Resources Development (SEPA, December 1994);

15) Letter Concerning Issuance of "Technical Guidelines for Environmental Impact Assessment of Ecological Water Use, Low Temperature Water and Fish Passage Facilities in River Courses for Hydropower and Water Construction Projects (for Trial Implementation)" (HuanPingHan [2006] No.4);

16) Letter Concerning Issuance of Minutes of Workshop on Water Environment and Aquatic Ecology Protection Technology and Policies for Hydropower and Water Construction Projects HuanBanHan [2006] No.11;

17) Circular for Strengthening Environmental Impact Assessment Administration and Avoiding Environmental Risks HuanFa [2005] No.152;

18) List of Classified Environmental Protection Administration of Construction Projects (2008)

19) List of National Nature Reserves of China 2004;

20) List of Key Protected Species of Wildlife Under State Protection (No.7 Decree of State Forest Administration, February 2003)

21) List of Key Protected Wild Plants under State Protection 1st Amendment August 4, 2001

2.1.4 Local Environmental Protection Regulations and Protection Catalogs

1) Regulations of Xinjiang Uygur Autonomous Region for Environmental Protection July, 1996

2) Regulations of Xinjiang Uygur Autonomous Region for Protection of Wildlife September, 2006

3) Regulations of Xinjiang Uygur Autonomous Region for Protection of Wild Plants September, 2006

4) Regulations of Xinjiang Uygur Autonomous Region for Protection of Natural Forest in Plains□December, 2008□□

5) Regulations of Xinjiang Uygur Autonomous Region for Protection of Kariz Systems (September 29, 2006)□

6) Public Notice of the People's Government of Xinjiang Uygur Autonomous Region On Division of Key Soil and Water Loss Prevention and Protection Areas, Key Supervision Areas and Key Treatment Areas in the Region (October, 2000)

7) Circular On Promulgation of the Catalog of Protected Key Wild Aquatic Animals in Xinjiang Uygur Autonomous Region□XinZhengFa [2004] No.67□□

8) Water Environmental Function Zone Division in Xinjiang, China□

9) Ecological Function Zone Division in Xinjiang□

10) Catalog of Nature Reserves in Xinjiang Uygur Autonomous Region□2003□□

11) Catalog of Protected Key Wildlife in Xinjiang Uygur Autonomous Region (XinLinDongZhiZi [2000] No.201)□

12) Catalog of Protected Key Wild Plants in Xinjiang Uygur Autonomous Region (XinZhengBanFa [2007] No.175).

2.1.5 Master Plans for Socioeconomic Development and Environmental Protection

1) 11th Five Year Master Plan of Turfan Prefecture Xinjinag□

2) 11th Five Year Master Plan of Turfan Prefecture for Water Saving Society Development□

3) 11th Five Year Master Plan of Turfan Prefecture for National Economic and Social Development□

4) Master Plan of Turfan Prefecture for Groundwater Utilization□

5) Report on Master Plan for Agricultural High Efficient Water Saving Irrigation in Turfan City, Turfan Prefecture, Xinjiang Uygur Autonomous Region□

6) Report on Master Plan for "Wuhe (Five River)" Basin of Turfan City□

7) Report on 11th Five Year Master Plan for Water Saving Society Development in Shanshan County□

8) Report on Master Plan for "Sanhe (Three River)" Basin of Shanshan County□

9) Report on Master Plan for Water Saving in Tuoxun County, Xinjiang Uygur Autonomous Region□

10) Report on Master Plan for "Lianghe (Two River)" Basin of Tuoxun County□

11) Master Plan for Protection and Utilization of Kariz Systems in Xinjiang.

2.1.6 Technical Guidelines and Standards for Environmental Impact Assessment

1) HJ/T2.1-93 Technical Guidelines on EIA – Outline□

2) HJ/T2.2-2008 Technical Guidelines on EIA – Atmospheric Environment□

3) HJ/T2.3-93 Technical Guidelines on EIA – Surface Water Environment□

4) HJ/T2.4-1995 Technical Guidelines on EIA – Acoustic Environment□

5) HJ/T19-1997 Technical Guidelines on EIA – Non-pollution Impact on Ecology□

6) HJ/T88-2003 Technical Guidelines on EIA – Water and Hydropower Engineering□

7) HJ/T169-2004 Technical Guidelines on Environmental Risk Assessment of Construction Projects□

8) HJ/T192-2006 Technical Standards for Eco-Environmental Assessment (for trial implementation) □

9) GB/T16453.1□6-1996 Technical Standards for Comprehensive Improvement of Soil and Water Conservation□

10) GB/T50433-2008 Technical Standards for Soil and Water Conservation of Development and Construction Projects.

2.1.7 Environmental Quality Standards

1) GB3095-1996 Environmental Quality Standards for Air

2) GB3838-2002 Environmental Quality Standards for Surface Water

3) GB3096-2008 Environmental Quality Standards for Noise

4) GB5084-2005 Water Quality Standards for On-farm Irrigation

For environmental quality standards applied in environmental impact assessment of the subprojects and the assessment parameters, see Table 2.1 – 1.

For relevant environmental quality standards, see Annex 1-1 to 1-4.

2.1.8 Standards for Control of Pollutants Discharge

1) GB16297-1996 Standards for Comprehensive Atmospheric Pollutants Discharge

2) GB8978-1996 Standards for Comprehensive Wastewater Discharge

3) GB12523-90 Noise Limits for Construction Sites

4) GB12348-2008 Emission Standard for Industrial Enterprises Noise at Boundary

For pollutants discharge control standards appliedin environmental impact assessment of the subprojects and the assessment parameters, see Table 2.1 – 2.

For relevant standards for pollutants discharge control, see Annex 1-5 to 1-7.

Environmental Quality Standards Applied in Environmental Impact Assessment of the Subprojects and the Assessment Parameters

Table 2.1-1

SN	Category of project	Name of project	Name of standard	Class	Assessment parameter
1	Reservoir scheme	Meiyaogou Reservoir	(1) GB3838-2002 Environmental Quality Standard for Surface Water (2) GB3095-1996 Environmental Quality Standard for Air (3) GB3096-2008 Environmental Quality Standard for Noise	Class II Class I, Grade 2	PH, CODMn, CODCr, ammonia nitrogen, total phosphorus, mercury, copper, cadmium, iron, lead, zinc, fluoride, arsenic, chrome (hexavalent), cyanide, volatile phenol, anionic surfactant ; TSP ; equivalent sound level ;
		Ertanggou Reservoir	Ditto	ditto	ditto
		Alagou Reservoir	(1) GB3838-2002 Environmental Quality Standard for Surface Water (2) GB3095-1996 Environmental Quality Standard for Air (3) GB3096-2008 Environmental Quality Standard for Noise	Class I Class I, Grade 2	PH, CODMn, CODCr, ammonia nitrogen, total phosphorus, mercury, copper, cadmium, iron, lead, zinc, fluoride, arsenic, chrome (hexavalent), cyanide, volatile phenol, anionic surfactant ; TSP ; equivalent sound level ;
2	Water saving irrigation scheme	Water saving irrigation scheme of Turfan City	(1) GB3838-2002 Environmental Quality Standard for Surface Water (2) GB5084-2005 Water Quality Standard for On-farm Irrigation (3) GB3095-1996 Environmental Quality Standard for Air (4) GB3096-2008Environmental Quality Standard for Noise	Class II Class I, Grade 2	PH, CODMn, CODCr, ammonia nitrogen, total phosphorus, mercury, copper, cadmium, iron, lead, zinc, fluoride, arsenic, chrome (hexavalent), cyanide, volatile phenol, anionic surfactant ; Water temperature, PH, BOD5, COD, SS, anionic surfactant, salt content, chloride, sulphide, total mercury, cadmium, total arsenic, chrome (hexavalent), lead, quantity of fecal coliform bacteria, quantity of ascarid eggs ; TSP ; equivalent sound level ;
		Water saving irrigation scheme of Shanshan County	ditto	ditto	ditto
		Water saving irrigation scheme of Tuoxun County	ditto	ditto	ditto
3	Canal construction (reconstruction) scheme	Canal scheme in Turfan City	(1) GB3838-2002 Environmental Quality Standard for Surface Water (2) GB3095-1996 Environmental Quality Standard for Air (3) GB3096-2008 Environmental Quality Standard for Noise	CLASS II Class I, Grade 2	pH,CODMn ,CODCr,BOD5, ammonia nitrogen, total phosphorus, mercury, copper, cadmium, iron, lead, zinc, fluoride, arsenic, chrome (hexavalent), cyanide, volatile phenol, anionic surfactant, E. coli TSP equivalent sound level

		Canal reconstruction in Shanshan County	ditto	ditto	ditto
		Canal scheme in Tuoxun County	ditto	ditto	ditto
4	Kariz system preservation scheme	Wudaolin Kariz system preservation	ditto	ditto	ditto

Pollutants Discharge Control Standards Applied in Environmental Impact Assessment and the Assessment Parameters

Table 2.1-2

City （county）	SN	Code	Name of subproject	Name of standard	Class (Grade)	Assessment parameter
Turfan City (4)	1	TLF1	Turfan City Meiyaogou Reservoir	GB16297-1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB8978-1996 “Comprehensive Standard for Wastewater Discharge” GB12523-90 Noise Limits for Construction Sites GB12348-2008 Emission Standard for Industrial Enterprises Noise at Boundary	Grade I and II at different construction stage Class I	particulate matter continuous equivalent sound level A continuous equivalent sound level A
	2	TLF2	Turfan City water saving irrigation	GB16297—1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB8978–1996 Standard for Integrated Wastewater Discharge GB12523—90 Noise Limits for Construction Sites	Grade 1 at different construction stage	particulate matter pH, SS ,BOD_5 ,COD_{CR}, petroleum type continuous equivalent sound level A
	3	TLF3	Taerlang Branch Canal	GB16297—1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB8978–1996 Standard for Integrated Wastewater Discharge GB12523—90 Noise Limits for Construction Sites	Grade 1 at different construction stage	particulate matter pH, SS ,BOD_5 ,COD_{CR}, continuous equivalent sound level A
	4	TLF4	Wudaolin Kariz system preservation	GB16297—1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB8978–1996 Standard for Integrated Wastewater Discharge GB12523—90 Noise Limits for Construction Sites	Grade 1 at different construction stage	particulate matter pH, SS ,BOD_5 ,COD_{CR}, petroleum type continuous equivalent sound level A
Shanshan County (3个)	5	SS1	Shanshan County Ertanggou Reservoir	GB16297-1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB8978-1996 “Comprehensive Standard for Wastewater Discharge” GB12523-90 Noise Limits for Construction Sites GB12348-2008 Emission Standard for Industrial Enterprises Noise at Boundary	Grade I and II at different construction stage Class II	particulate matter continuous equivalent sound level A continuous equivalent sound level A

	6	SS2	Water saving irrigation in Shanshan County	GB16297-1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB12523-90 Noise Limits for Construction Sites GB12348-2008 Emission Standard for Industrial Enterprises Noise at Boundary	at different construction stage Class I	TSP continuous equivalent sound level A continuous equivalent sound level A
	7	SS3	Ertang Branch Canal lining reconstruction	GB8978–1996 Standard for Integrated Wastewater Discharge GB16297-1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB12523-90 Noise Limits for Construction Sites GB12348-2008 Emission Standard for Industrial Enterprises Noise at Boundary	Grade 1 at different construction stage Class I	pH , SS , BOD_5, COD_{cr} TSP continuous equivalent sound level A continuous equivalent sound level A
Tuoxun County (3个)	8	TKX1	Tuoxun County Alagou Reservoir	GB8978–1996 Comprehensive Standard for Wastewater Discharge GB8978–1996 Standard for Integrated Wastewater Discharge GB16297-1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB12523-90 Noise Limits for Construction Sites GB12348-2008 Standard for Noise in the Ambient Environment of Industiral Enterprises	Grade 1 and II at different construction stage Class I	pH, COD_{cr}, BOD_5, petroleum type, SS pH, COD_{cr}, BOD_5, petroleum type, SS TSP continuous equivalent sound level A
	9	TKX2	Water saving irrigation in Tuoxun County	GB16297—1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB12523—90 Noise Limits for Construction Sites	at different construction stage	particulate matter continuous equivalent sound level A
	10	TKX3	Alagou Main Canal	GB16297—1996 Standard for Integrate Atmospheric Pollutants Emission (monitoring concentration threshold of fugitive emission) GB12523—90 Noise Limits for Construction Sites	at different construction stage	particulate matter continuous equivalent sound level A

2.1.9 World Bank Safeguard Policy

□1□ OP 4.01 Environmental Assessment

□2□ OP 4.04 Natural Habitats

□3□ OP 4.09 Pest Management

□4□ OP 4.10 Indigenous Peoples

□5□ OP 4.11 Physical Cultural Resources

□6□ OP 4.12 Involuntary Resettlement

□7□ OP 4.36 Forestry

□8□ OP 4.37 Safety of Dams

□9□ OP 7.50 Projects on International Waterways

□10□OP 7.60 Projects on dissentient Region

2.1.10 Relevant Project Documents

□1□ TOC of Environmental Management Plan of the World Bank Financed Turfan Prefecture Water Conservation Project

□2□ Subproject Feasibility Study Report

□3□ Subproject Environmental Impact Assessment Report (table)

□4□ technical assessment comments on Subproject Environmental Impact Assessment Report of the (table)

□5□ Approval Document of Subproject Environmental Impact Assessment Report (table)

□6□ Subproject Soil and Water Conservation Plan

□7□ technical assessment comments on Subproject Soil and Water Conservation Plan Report

□8□ Approval Document of Subproject Soil and Water Conservation Plan Report

2.2 Environmental Administration Organization and its Responsibilities

The Central People's Government of China and the people's governments of the provinces (municipalities directly under the central government or autonomous regions), municipalities (prefectures), and counties (districts) have established their environmental administration agencies in accordance with the law and discharge the corresponding environmental administration responsibilities. Environmental administration agencies related to this project are Environmental Protection Department of Xinjiang Uygur Autonomous Region, Water Resource Department of Xinjiang Uygur Autonomous Region, Environmental Protection

Bureau of Turfan Prefecture, Water Bureau of Turfan Prefecture, environmental protection bureaus of the counties (city), water bureaus of the counties and (city), and so on.

□1□ Environmental Protection Department of Xinjiang Uygur Autonomous Region

The Environmental Protection Department of Xinjiang Uygur Autonomous Region is responsible for environmental protection administration and administrative law enforcement in the whole region. Its main responsibilities include:

A. carrying out national environmental protection policies, guiding principles, laws, regulations, and administrative bylaws and standards, drafting regional level environmental protection regulations, administrative bylaws and supervising their implementation;

B. being entrusted by the Regional People's Government with environmental impact assessment of regional-level major economic and technical policies, development master plans, and major economic development plans;

C. formulating the environmental protection master plan, organizing the development of environmental function zone and area system, basin pollution prevention and control master plans and ecological protection master plans, and supervising their implementation;

D. participating in the formulation of environmental protection industry policies and development master plans;

E. being responsible for protection of natural ecology and environment within its command area and environmental protection supervision and administration of construction projects; organizing the formulation of the plan for pollution source rectification within the prescribed time limits and the supervision of its implementation;

F. formulating the regional-level plan for total load control of pollutants discharge, being responsible for registration of pollutants discharge applications and reports and administration of pollutants discharge permits and organizing the supervision and administration of pollutants discharge fee collection;

G. being responsible for environmental supervision and administrative inspection and investigation for environmental protection;

H. organizing region-wide activities for implementing international treaties on environmental protection;

I. being responsible for international economic and technical cooperation and exchange activities concerning environmental protection;

J. Being entrusted by the Regional People's Government with handling of foreign related environmental protection affairs and so on.

Under the Environmental Protection Department of Xinjiang Uygur Autonomous Region is established the Natural Ecology Division to be especially responsible for administration of environmental impact assessment of non-pollution ecological impact projects.

□2□Water Resource Department of Xinjiang Uygur Autonomous Region

The Water Resource Department of Xinjiang Uygur Autonomous Region is responsible for region-level water administration and administrative law enforcement. Its main responsibilities include:

A. organizing the formulation of regional-level water, hydropower and water industry development strategies, mid- and long-term master plans for water development and mid- and long-term master plans for region-wide and inter-prefecture/city water supply and demand and the construction and production groups water supply and demand;

B. being responsible for organizing the preparation of comprehensive basin master plans and special master plans;

C. organizing the preparation of preliminary plans for proposed key water and hydropower projects and being responsible for organizing the review of proposals, feasibility study reports and preliminary designs of water construction projects within the region;

D. being responsible for supervising and inspecting plans for capital water construction projects and their funding;

E. organizing the review and submission for approval of plans for use of flood control and drought combating funds, water construction funds, and so on;

F. making studies of and coming up with recommendations for adjustment of water prices, taxes, credits, and so on;

G. being responsible for organizing and providing guidance on the protection of water resources and water environment, organizing the monitoring and analysis of water quantity and quality in water bodies and dynamic monitoring of groundwater and so on, organizing the division of water function zones and the control of pollutants discharge in drinking water zones and other zones, examining and verifying the assimilative capacity of water bodies and the set-up of discharge outlets, and setting forth recommendations for limits of total discharge load and supervising their implementation;

H. being responsible for safety supervision and administration of reservoirs, hydropower stations and dams;

I. formulating Xinjiang’s policies and regulations on soil and water conservation, preparing its soil and water conservation master plan and its annual implementation plans and organizing their implementation;

J. organizing and providing guidance on region-level comprehensive improvement of soil and water conservation, being responsible for organizing the preparation and construction administration of comprehensive soil and water conservation watersheds and areas improvement projects;

K. organizing region-wide dynamic monitoring of soil and water losses and publicizing bulletins on a regular basis;

L. organizing the preparation, review and approval, testing, and check and acceptance of soil and water conservation plans of construction projects;

M. Being responsible for law enforcement supervision of Soil and Water Conservation Law and other relevant regulations.

Under the Water Resource Department of Xinjiang Uygur Autonomous Region is established the soil and water conservation division to be especially responsible for guiding and supervising region-wide soil and water conservation work.

□3□Environmental Protection Bureau of Turfan Prefecture

Environmental Protection Bureau of Turfan Prefecture is responsible for environmental protection administration and administrative law enforcement in its prefecture. Its main responsibilities include:

A. carrying out national environmental protection policies, guiding principles, laws, regulations, administrative bylaws and standards;

B. drafting local environmental protection regulations and administrative bylaws and supervising their implementation; being entrusted by the prefecture administrative office with environmental impact assessment of major economic and technical policies, development master plans and major economic development plans of the prefecture;

C. formulating environmental protection master plans, organizing the preparation of master plans for basin pollution prevention and control and master plans for basin ecological protection and supervising their implementation;

D. being responsible for supervision and administration of natural ecological and environmental protection and environmental protection supervision and administration of construction projects within its command area;

E. organizing the formulation of the plan for pollution source rectification within the prescribed time limits and the supervision of its implementation;

F. formulating the local plan for total pollutants discharge load control, being responsible for registration of pollutants discharge applications and administration of pollutants discharge permits, and organizing the regulation of discharge fee collection;

G. being responsible for environmental supervision and administrative inspection and investigation for environmental protection; being responsible for environmental protection related international economic and technical cooperation and exchange activities;

H. Being entrusted by the prefecture administrative office with handling of foreign related environmental protection affairs and so on.

Under the Environmental Protection Bureau of Turfan Prefecture is established the environmental impact assessment administration section (or pollution control section, supervision and administration section, nature and ecology section) to be specially responsible for administration of environmental impact assessment in the prefecture. Its main responsibilities include□being responsible for the implementation of environmental impact assessment and the unified supervision and administration of the “three simultaneous” system within the prefecture; carrying out national and regional laws, regulations, bylaws and policies concerning environmental impact assessment and the “three simultaneous”

system; formulating and carrying out local regulations, bylaws and policies concerning environmental impact assessment, “three simultaneous” system, and so on and supervising their implementation; providing guidance on and supervising the review and approval of environmental impact assessment of construction projects within the prefecture; being responsible for administrative permission of environmental impact assessment documents of construction projects within the limit of the prefecture environmental protection bureau’s authority; being responsible for providing guidance on administrative permission of environmental protection check and acceptance of trial production (operation) of construction projects and completed construction projects, and so on within the command area of the prefecture.

□4□ Water Bureau of Turfan Prefecture

The Water Bureau of Turfan Prefecture is responsible for the prefecture’s water administration and administrative law enforcement. Its main responsibilities include□

A. organizing the formulation of prefecture-level water, hydropower and water industry development strategies, mid- and long-term master plans for water development and mid- and long-term master plans for region-wide and inter-prefecture/city water supply and demand and the construction and production groups water supply and demand;

B. being responsible for organizing the preparation of comprehensive basin master plans and special master plans;

C. being responsible for supervising and inspecting plans for capital water construction projects and their funding within the prefecture;

D. organizing the review and submission for approval of plans for use of flood control and drought combating funds, water construction funds, and so on;

E. being responsible for organizing and providing guidance on the protection of water resources and water environment, organizing the monitoring and analysis of water quantity and quality in water bodies and dynamic monitoring of groundwater and so on, organizing the division of water function zones and the control of pollutants discharge in drinking water zones and other zones, examining and verifying the assimilative capacity of water bodies and the set-up of discharge outlets, and setting forth recommendations for limits of total discharge load and supervising their implementation;

E. being responsible for prefecture-wide safety supervision and administration of reservoirs, hydropower stations and dams;

F. organizing the implementation of soil and water conservation policies and regulations and the preparation of the soil and water conservation master plan and its annual implementation plans.

Under the prefecture water bureau is established the water conservation section, which is mainly responsible for organizing the plan, review and submission of soil and water conservation projects in the prefecture and inspecting and supervising prefecture-wide soil and water conservation work.

□5□ environmental protection bureaus of the counties/city

The environmental protection bureaus of the project counties/city are responsible for the environmental protection administration and administrative law enforcement of the counties/city. Their main responsibilities include□

A. carrying out national environmental protection policies, guiding principles, laws, regulations, administrative bylaws and standards;

B. formulating environmental protection master plans of the counties/city and supervising their implementation;

C. being responsible for supervision and administration of natural ecological and environmental protection within the command areas and environmental protection supervision and administration of construction projects;

D. organizing the formulation of the plan for pollution source rectification within the prescribed time limits and the supervision of its implementation;

E. formulating plans for total pollutants discharge control of the counties/city, being responsible for registration of pollutants discharge applications and administration of discharge permits within the limit of their authority and organizing regulation of discharge fee collection;

F. Being responsible for environmental supervision and administrative inspection and investigation for environmental protection, and so on.

□6□water bureaus of the counties/city

The water bureaus of the project counties/city are responsible for water administration and administrative law enforcement water bureaus of the counties/city. Under the water bureaus of the counties/city are established water conservation organizations. Their main responsibilities include:

A. formulating master plans of the counties/city for soil and water conservation and their annual implementation plans and organizing their implementation;

B. organizing guidance on comprehensive improvement of soil and water conservation work of the counties/city;

C. organizing county/city-wide dynamic monitoring of soil and water losses and publish bulletins on a regular basis;

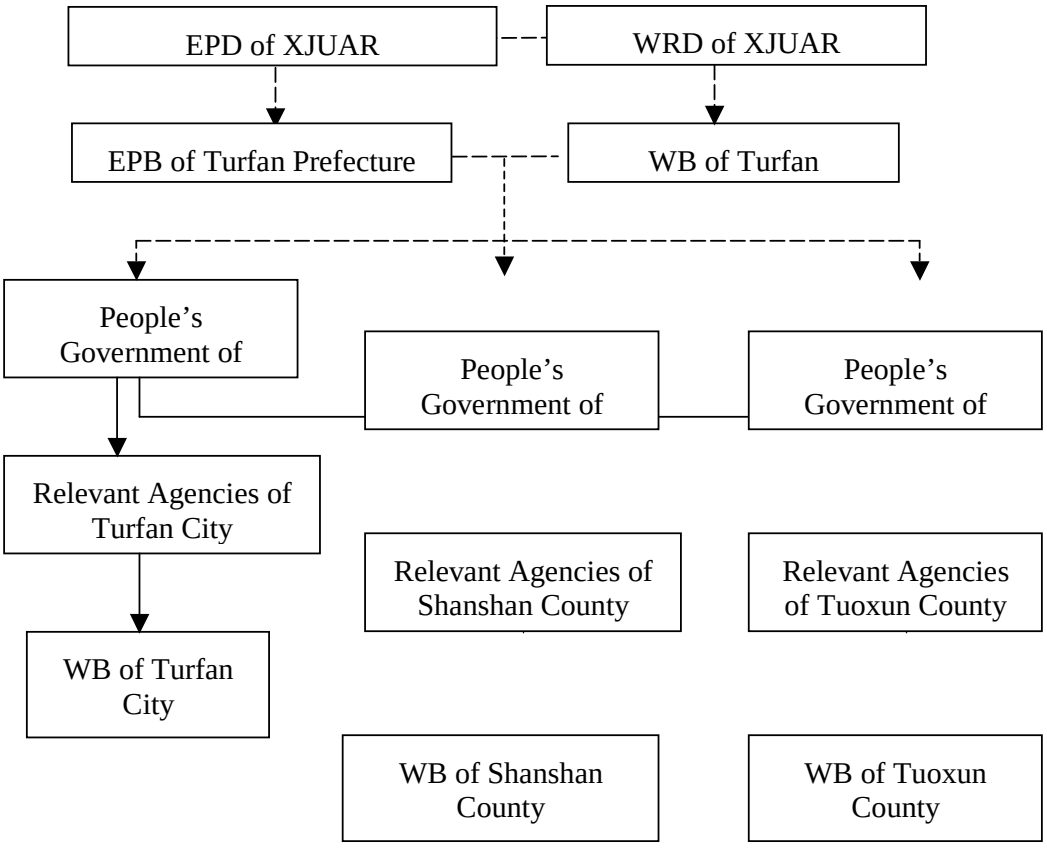
D. organizing preparation and implementation of soil and water conservation plans of the counties/city for construction projects;

E. providing guidance on urban soil and water conservation of the counties/city;

F. monitoring soil and water losses: general survey of soil and water losses, reports on soil and water losses monitoring, providing soil and water loss bulletin data, investigations and analyses of comprehensive soil and water loss control measures and their impacts, and establishment and management of soil and water conservation information system;

G. Disseminating soil and water conservation information and training.

For environmental administration framework in China (the part relevant to the project), see figure 2.2-1.



2.2-1 Environmental Administration Framework in China

3 Description of the Subprojects

3.1 Objectives of the Subprojects

For objectives of the subprojects, see Table 3.1-1.

Table 3.1-1 Objectives of the Subprojects

Project County/city	SN	Code	Name of subproject	Objectives of the subprojects
Turfan City (4)	1	TLF1	Meiyaogou Reservoir	To supply water to Shenhong Chemical Industrial Zone and Meiyaogou Zone I. It is anticipated that for a long term by 2020 the annual water supply to Shenhong Chemical Industrial Zone will reach 14.6 miilion m^3; and the flood control of Meiyaogou Reservoir will enable its downstream flood control standards to upgrade from less than 1 in 3 year frequency to 1 in 20 – 50 year frequency so that the comprehensive flood control capacity of the basin will be improved and flood calamities downstream reduced.
	2	TLF2	Water saving irrigation in Turfan City	To change the past backward irrigation methods, convert middle and low yield farmland into high and stable yield land, increase the farmers' incomes, facilitate agricultural economic development in Turfan City; improve water resource efficiency, reduce groundwater exploitation, enable water tables in irrigation areas to restore gradually and protect the ecological and environmental conditions in the downstream irrigation areas.
	3	TLF3	Taerlang Branch Canal	To ensure agricultural irrigation water use in Zone I of Meiyaogou Irrigation District, reduce groundwater exploitation and increase surface water utilization in Turfan City.
	4	TLF4	Wudaolin Kariz system preservation	To strengthen Wudaolin Kariz system, hollow out, dredge and line the system so as to prevent collapse, siltation and seepage and protect the water source; improve water efficiency, reduce maintenance work load, preserve the Kariz system and improve its use, salvage and maintain this ancient physical cultural heritage.
Shanshan County (3)	5	SS1	Ertanggou reservoir	After the project is built, to supply water of 58.5921 million m^3/a （including 7.9584 million m^3/a of ecological use） to all sectors of Shanshan County, with 39.4751 million m^3/a supplied to irrigation district, 9.9054 million m3/a to Dikan Industrial Zone, 1.2032million m3/a for petroleum and 50 thousand m3/a for fishery; and upgrade the flood control capacity of the current less than 1 in 5 year frequency of the downstream river reach to 1 in 20 year frequency.
	6	SS2	Water saving irrigation in Shanshan County	The implementation of the project will improve the soil conditions for cropping, save irrigation water, increase irrigation probability, and at the same time guarantee water supply for ecological and environmental improvement in the project area and gradually change irrigation methods through reconstruction of existing old irrigation areas and improve local farmers' production and living conditions .
	7	SS3	Ertang Branch Canal lining reconstruction	To ensure partially agricultural irrigation water, improve surface water efficiency, and reduce groundwater exploitation.
Tuoxun County (3)	8	TKX1	Alagou Reservoir	To ensure agricultural irrigation and ecological water use in the basin, reasonably allocate surface water diversion, reduce groundwater exploitation; reduce agricultural groundwater exploitation, ensure industrial groundwater supply for industry in the basin without groundwater overexploitation, improve its water supply guarantee so as to promote industrial development in the basin; at the same time the flood control capacity in the basin will be raised from the current 1 in 20 year frequency to 1 in 50 year frequency.
	9	TKX2	Water saving irrigation in Tuoxun County	To change the backward irrigation methods, save water so as to resolve the increase in industrial and municipal water use due to economic growth and alleviate the bad situation of water resource scarcity in the county. Improve middle and low yield farmland by means of advanced irrigation methods and increase farmers' incomes.
	10	TKX3	Main canal for water diversion in Alagou	To improve Alagou main canal diversion system, reduce canal seepage, increase surface water efficiency, supply water to downstream irrigation areas in a stable way; after construction of the works, irrigation area will be controlled below 122 thousand mu, improve 59.7 thousand mu of middle and low yield farmland, and save 19.0619 million m^3 of water each year.

3.2 Plan for Project Implementation Progress

In the light of the specific conditions, the project period will be 1 – 4 years from its preparation to its completion.

For the plan of implementation progress of the subprojects, see Table 3.2-1.

Table 3.2-1 Plan for Implementation Progress of the Subprojects

Project County/city	SN	Code	Name of subproject	Implementation progress
Turfan City (4)	1	TLF1	Meiyaogou Reservoir	The total construction period of Meiyaogou Reservoir will be 22 months including one and a half months of preparation and 21 months of construction.
	2	TLF2	Water saving irrigation in Turfan City	The total construction period will be 5 months including one month of preparation and 4 months of construction.
	3	TLF3	Taerlang Branch Canal	The total construction period will be 10 months including one month of preparation and 9 months of construction.
	4	TLF4	Wudaolin Kariz system preservation	The total construction period will be 24 months including one month of preparation and 23 months of construction.
Shanshan County (3)	5	SS1	Ertanggou reservoir	6 months of preparation. The total construction period will be 30 months. The scheme will be finished in three years. The construction will start from the beginning of the first year until the end of the third year.
	6	SS2	Water saving irrigation in Shanshan County	The total construction period will be 5 months including one month of preparation and 4 months of construction.
	7	SS3	Ertang Branch Canal lining reconstruction	The total construction period will be 6 months including 2 months of preparation and 4 months of construction.
Tuoxun County (3)	8	TKX1	Alagou Reservoir	The total construction period will be 48 months.
	9	TKX2	Water saving irrigation in Tuoxun County	The total construction period will be 5 months including one month of preparation and 15 months of construction.
	10	TKX3	Main canal for water diversion in Alagou	The total construction period will be 9 months including one month of preparation and 8 months of construction.

3.3 Overview of the Project

For information on subprojects of reservoirs, water saving irrigation and canals, see tables 3.3-1 to 3.3-3.

Table 3.3-1 Reservoirs

Name	Location	Main Structure	Scale	Classification of Construction and Structure	Flood Control Standard
Meiyaogou Reservoir	Middle reach of Meiyaogou River in Qiquanhu Town,Turfan	Dam. The spillway and diversion tunnel serve as flood discharge tunnel. Culvert tunnel serve for industrial water supply and irrigation water delivery; It is	Total storage capacity: 9.80 million m^3, maximum height:	Small-size (1) type scheme; Class □ construction. The main structure is a dam. Flood discharge tunnel and spillway belong to Class 3; the auxiliary structures Class 4 and	The dam and other main structures are designed for 1 in 50 year frequency, with check standard of 1 in 1,000 year frequency;

Name	Location	Main Structure	Scale	Classification of Construction and Structure	Flood Control Standard
	City	a concrete faced sand and gravel dam.	41.0m	temporary structures Class 5.	the temporary structures are designed for 1 in 10 year frequency.
Ertanggou Reservoir	Middle reach of Ertanggou River, Lianmuqin Town, Shanshan County	Dam. Spillway, diversion, flood discharge and flush tunnel and irrigation water delivery. It is a asphalt concrete core dam.	Total storage capacity: 25 million m^3, maximum height: 66m	Medium-size type scheme; Class □ construction. The main structure is a dam. Flood discharge tunnel and spillway belong to Class 3; the auxiliary structures Class 4 and temporary structures Class 5.	The dam and other main structures are designed for 1 in 50 year frequency, with check standard of 1 in 1,000 year frequency; the temporary structures are designed for 1 in 10 year frequency.
Alagou Reservoir	Middle reach of Alagou River, Bostan Town, Tuoxun County	Dam. Spillway, flood discharge and flush tunnel, irrigation water delivery tunnel; It is a asphalt concrete sand and gravel core dam.	Total storage capacity: 45.67 million m^3, maximum height: 66m	Medium-size type scheme; Class III construction. The dam as the main structure belong to Class 2; the flush and flood discharge tunnel, irrigation water delivery tunnel and spillway belong to Class 3; the auxiliary structures Class 4 and temporary structures Class 5.	The dam and other main structures are designed for 1 in 100 year frequency, with check standard of 1 in 2,000 year frequency; the temporary structures are designed for 1 in 10 year frequency. The spillway energy dissipation and scour protection structure is designed for 1 in 30 year frequency.

Table 3.3-2 Water Saving Irrigation

City (county)	Project Area	Area of Water Saving Irrigation (ha)					Total
		Drip irrig. for grapes	Drip irrig. for cotton	Green house	Date tree	Apricot tree	
Turfan City	Yaer Township	333.33		333.33			4016.27
	Aidinghu Township		333.34				
	Qiatekale Township			1000			
	Erbao Township			1004			
	Sanbao Township			1012.27			
	Total	333.33	333.34	3349.6			
Shanshan County	Qiketai Town	210.7	270.0				3338
	Tuyugou Township	180.0	486.7				
	Lukeqin Town	200.0	224.0	133.3			
	Dikan'er Township	331.3	142.5				
	Lianmuqin Town	133.3					
	Dalangkan Township	306.8	264.9				
	Dongbazha Township	13.3					
	Pizhan Township	90.6	302.9				
	Urban	46.7					
	Total	1513	1691	133.3			

Tuoxun County	Guolebuyi Township			689.34	201.6	136.07	3408.7
	Xia Township			348			
	Yilahu Township				355.3		
					684.7		
	Bostan Township				312		
			681.6				
	Total		681.6	1037.34	1553.6	136.07	

Note: the numbers may not add up to the total due to the round-up.

Table 3.3-3 Canals

Name	Location	Nature	Length	Classification of Construction and Structure	Designed flow
Taerlang branch canal	Yaer Township and Putao Township, Turfan City	New construction	22.82 km from Taerlang Main Canal to Renmin Canal	Class □, small-size （1） type	2.0
Ertang Branch Canal lining reconstruction	Shanshan CountyLianmuqin Town	Canal lining reconstruction	18.82km from No.5 Gate of Ertang Main Canal downstream	Class Ⅳ, small-size （1） type	4.0
Alagou main canal	Tuoxun CountyBostan Township	New construction	6.5km from the discharge tunnel of Alagou Reservoir to the headwork of Alagou	Class Ⅳ, small-size （1） type	10

Wudaolin Kariz system is located in Shanghu Brigade of Yaer Township, Turfan City. The coordinates of its head: N42º58.860′， E089º03.978′; The coordinates of its end: N42º58.807′， E089º04.708′. Its construction started 1300 AD, with a history of over 700 years.

Wudaolin Kariz system consists mainly of four parts: open canal, waterlogging dam, closed conduit and vertical shaft. The volume of its waterlogging dam is 1,000m^3, its open canal is 0.118km long, its closed conduit is 2.695km long (the straight length is 2.6km) including a catchment part of 0.15km long, its water conveyance part is 2.45km, and there are altogether 104 vertical shafts along the closed conduit. The annual average flow of Wudaolin Kariz system is 0.014m^3/s, functioning mainly to supply drinking water and irrigation water downstream.

The protection scheme of Wudaolin Kariz system is meant mainly to protect and strengthen the closed conduit, the open canal, downstream waterlogging dam for water storage and the vertical shafts and includes strengthening and lining the 1000m^3 waterlogging dam, strengthening and lining 118m open canal, strengthening 33 vertical shafts with focus, strengthening 0.79km closed conduit with focus, strengthening 51 vertical shafts in an ordinary manner, strengthening 1.905km closed conduit in an ordinary manner, and

strengthening some other vertical shafts selectively depending on their relationship to the main canal and their damages.

4 Summery of Environmental Impacts and Mitigation Measures

4.1 Environmental Impact Assessment

4.1.1 Main Impact Data and Mitigation Measures

In the process of environmental impact assessment, the layout of the subprojects and main environmental protection targets and sensitive points around the construction within the scope of assessment are identified (see Figure 4.1 – 1). The adverse environmental impacts that the project may create are as follows:

4.1.1.1 Impacts of Resettlement, land acquisition and Relocation and Mitigation Measures

The World Bank Financed Turfan Prefecture Water Conservation Project will involve one city and two counties of the Prefecture, i.e. Turfan City, Shanshan County and Tuoxun County. Construction of the 3 reservoirs included in the project will involve land aquisition, resettlement, relocation, and so on. To address the potential environmental impacts of resettlement, relevant social impact assessment has been carried out separately and the resettlement action plan has been prepared.

Cost Estimate of Resettlement

Table 4.1.1 Unit: 10^3 yuan

Subprojects	Local Governments Responsible for Implemenation	Governmental Department Responsible for Supervison	Cost
Meiyaogou Reservoir	Turpan City Government	Resettlement Bureau of Turpan City Government	8464.5
Ertanggou Reservoir	Turpan City Government & Shanshan County	Resettlement Bureaus of Shanshan County and Turpan City Governments	23818.2
Alagou Reservoir	Tuokexun County Government	Resettlement Bureau of Tuokexun County Government	1948.44
Total			51767.1

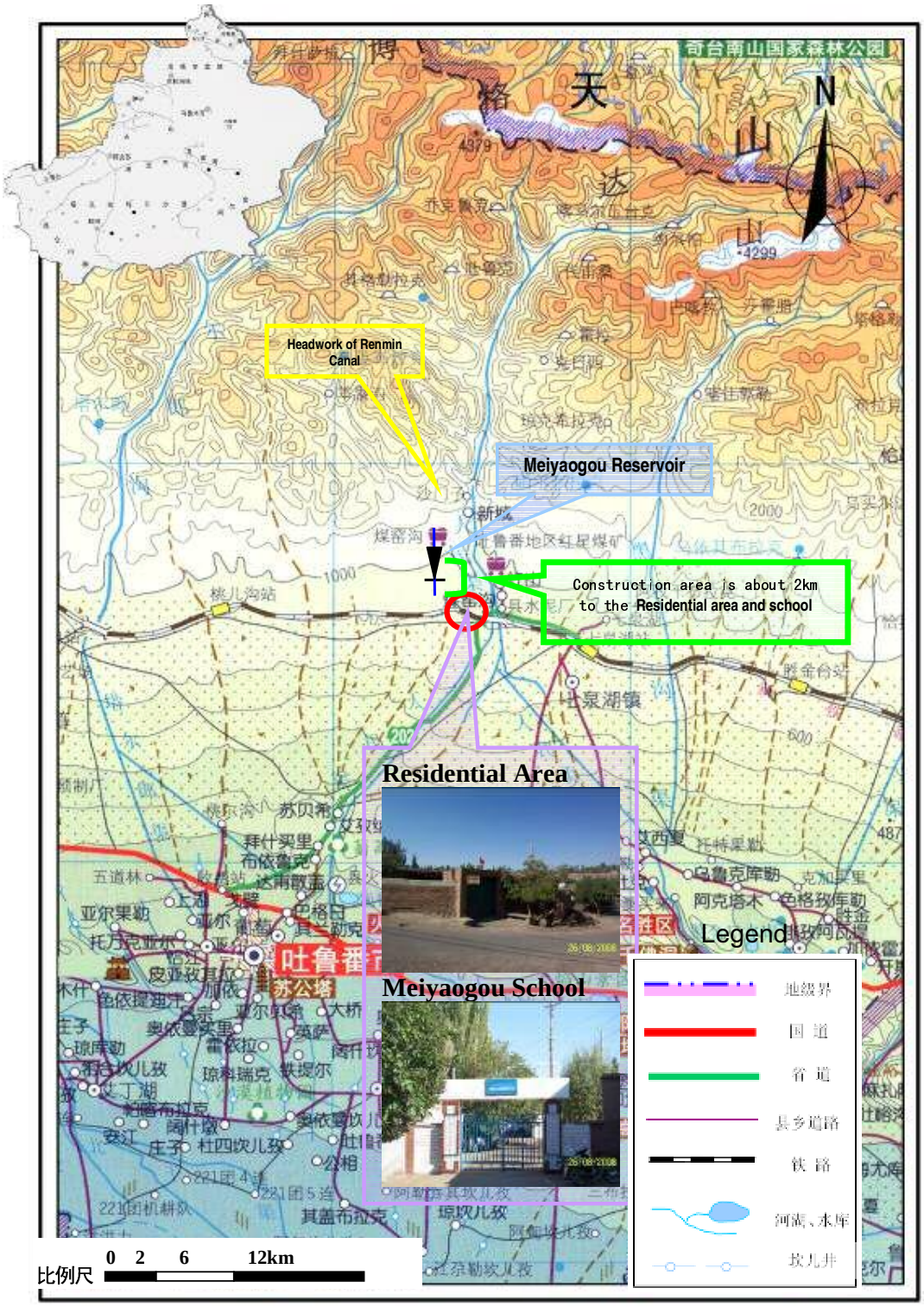


Figure 4.1-1 Locations of Sensitive Targets of Meiyaogou Reservoir Project

4.1.1.2 Impact on Physical Cultural Resources and Mitigation Measures

According to the investigation report on historial relics in the three reservoir areas and cost estimiate for preservation of the historial relics by Xinjiang Archeological Research Institute, in the whole project area, only the Ertanggou and Alagou reservoir areas have historial relics distributed

In the Ertanggou reservoir area, there are 5 ancient graves(totally 20 tombs), 1 ancient residential site covering an area of 300 m^2, and 1 petroglyph; there are no protected relices at national, provincial or county level existing in the inundation area of the reservoir.

In the Alagou reservoir area, there are 33 ancient graves (some individual tombs were robbed), there are no protected relics at national, provincial or county level in the inundation area of the reservoir.

Table 4.1-2 Basic Information of Physical Cultural relics Distributed in the Project Area

Cunty/City	Sub-project Related	Type of Historial Relics	Location	Quantity	Elevation (m)	Distance to Sub-project	Preservation Level	Remarks
Shanshan County	Ertanggou Reservoir	Ancient Graves	Edge of Level-2 Terrace on Eastern Bank of Ertanggou River	2 Stone Ancient Tombs	1474	At about 0.9 km upstream of the dam site	Ordinary Relics	
			Edge of Level-2 Terrace on Western Bank of Ertanggou River	6 Stone Ancient Tombs	1475	At about 1.6 km upstream of the dam site		
			Level-2 Terrace on Western Bank of Ertanggou River	6 Stone Ancient Tombs	1473	At about 0.5 km upstream of the dam site		2 of the tombs were robbed.
			Inner Side of the Level-2 Terrace on Western Bank of Ertanggou River	6 Stone Ancient Tombs	1475	At about 1.7 km upstream of the dam site		
		Ancient Residential Site	Edge of Level-2 Terrace on Western Bank of Ertanggou River	1 Site	1474	At about 1.0 m upstream of the dam site		30 m long from South to North, 10 m wide from East to West, Total area is 300m^2.
		Petroglyph	Edge of Level-2 Terrace on Western Bank of Ertanggou River	1 Site	1474	At about 1.1 m upstream of the dam site		Caved on an isolated Black Pebble Stone and the Stone is 1.5 long, 1m wide and 0.7m high.
Tuokexun County	Alagou Reservoir	Ancient Graves	Concentrated on the Edge of Level-3 Terrace on Northern Bank of Alagou River	33 Stone Ancient Tombs	932	At upstream of the dam site		Some tombs were robbed

Mitigation Measures: According to the document prepared by Xinjiang Archeological Research Institute containing its recommendations on preservation of cultural relics in the reservoir areas, rescue excavation should be conducted in the concerned reservoir areas prior to construction of the reservoirs, and the fund needed for the preservation is estimated at 300×10^3 yuan in total, including about 180×10^3 yuan for excavation of the ancient graves, ancient residential site and petroglyph located in the inundation area of Ertanggou reservoir and 120×10^3 yuan for preservation of cultural relics in the inundation area of Alagou reservoir.

Table 4.1-3 Cost Estimate of Funds for Preservation of Cultural relics

Unit: 10^3 yuan

Sub-projects	Institution Responsible for Implementation	Department Responsible for Supervision	Cost
Ertanggou Reservoir	Xinjiang Archeological Research Institute	Shanshan County Cultural Relics Bureau	180
Alagou Reservoir	Xinjiang Archeological Institute	Tuokexun County Cultural Relics Bureau	120
Total			300

4.1.1.3 Impacts on Natural Habitats

The project construction area doesn't involve any natural reserves at any level. However, construction of the Ertanggou reservoir will impact to some extend on the native fishes in the Ertanggou river system. Native fishes in the river system include four kinds, namely small eyed loach, small strip loach, Triplophysa stoliczkae and Turpan loach. Therefore, construction of the Ertanggou reservoir will trigger the World Bank safeguard policy of "Natural Habitat".

Mitigation measure: Conducting monitoring of aquatic ecosystem and the fishes in the Ertanggou river system during operation period.

4.1.1.4 Analysis of Environmental Risks and the Mitigation Measures

Risks relating to reservoirs' construction and operation are: transportation and storage of explosives and fuel during construction period; river water pollution during construction period; dam failure during operation period and environmental risks of construction material storage space of the Alagou reservoir and radioactive material distribution, etc.

Water saving irrigation sub-projects and new construction/rehabilitation canal sub-projects are typical rural water works in nature. A lot of water works that are similar to the proposed works have been built up in the project area since the past decades. The consequences of those water works and their long-term running prove that those small-size rural water works would not trigger emergent or nonemergent environmental risk basically.

Although protection of Karezes is cultural relic restoration project, it will only concern small working quantities and limited area. The consequences of the similar works that have been

done in the project area and their long-term running prove that the protection work works would not trigger emergent or nonemergent environmental risk basically.

Hence, this chapter gives analysis on the possible environmental risks to be encountered during construction period and operation period of the proposed project and proposes corresponding mitigation measures and contingency plan..

4.1.1.4.1 Evaluation on environmental risk of explosive and oil material

（1）risk identification

The construction and operation of totally 3 (three) reservoirs will not concern with virulent raw material or disproducts; However a certain amount of the explosives and oil material will be needed during construction period. The flammable and explosive material may cause some accidents during their transportation and store or as a result of improper handling.

（2）analysis on damages of environmental risk

All project concerned explosives and oil material will be transported by road. During transportation, possible traffic accidents would be encountered or occurred, which would lead to oil material leakage, combustion or explosion, then contaminate circumferential bio-environmental and environmental quality or cause environmental damage. In accordance with respective construction scheduling of each reservoir, all transportations necessary for the project constructions will be done by special vehicle, driven and escorted by special professional person so as to effectively get rid of traffic accidents; in addition, transportation capacity of oil material per vehicle shall be strictly controlled in accordance with national codes so that to limit the possible environmental damages probably caused by an accident within a controllable range.

(3）preventive measures and mitigation measures

① Preventive measures against damages that endanger people’s life and property in the process of transportation and store of explosives and oil material during constructions

A. Whole transportation shall be in accordance with the rules specified by the Ministry of Public Security of the People’s Republic of China. Before transportation detailed transportation specifications shall be put forward describing transportation line, vehicle, time, escort in transportation, delivery and acceptance, etc.

B. The dangerous goods shall be stored in accordance with current applicable rules. It is required that the Contractor should report daily consumption, and then the Supplier should put forward a daily transportation plan, so that those dangerous goods would not be exposed in the project site for a long period.

C. The application of those dangerous products shall be in accordance with the applicable codes. Only the persons who received related training, got certificate and are satisfied with security administration requirements are allowed.

D. Xinjiang has a very hot summer. The vehicles that do transportation of dangerous goods shall have proper shield against insolation. In addition, appropriate cooling measures shall be taken.

E. Strengthen traffic security administration, upgrade technical capability of drivers and give more training on safe driving and courteously driving.

F. In case of a leakage of dangerous goods into river courses during transportation or an accident of pollution of production water or living water with the river water, an water quality monitoring and inspection shall be done at once with concerned region to figure out pollution source diffusion law and incidence, meanwhile, such accident shall be reported to the local government of the downstream area in a timely manner to prevent people from the endangers to their security, health and crops at the downstream area as a result of leakage of flammable and explosive goods, in addition, the administrative department at the upper level shall be reported.

G. In then event of an oil leakage of explosion, the people in the vicinity of accident site shall be evacuated immediately. A disastrous fire of the flammable products as a result of leakage caused by people shall be strictly prevented. In addition, given a traffic jam or river course block made by an explosion, vehicles leading and river course unblocking shall be carried out, for instance, the vehicles hold in the traffic jam can be led to other paths.

H. After an accident, a professional team shall be assigned to identify the accident nature, assess the consequence, determine the degree of pollution with the water environment and provide decision-making reference for the headquarters and post treatment.

I. High dangerous goods, for instance, explosive, shall be taken care of by specific person, handled by specific person and used by specific person. The scope of 100m around the explosive depot shall be set out as dangerous zone with security belt built up. Before utilization of explosives, all people who have no specific job concerned with the explosion construction shall be got out of the explosion scope and kept 100m away, no entrance may be permitted.

 Preventive measures against the pollution of waste fire-fighting water to the ambient after a fire disaster

A. Strengthen training of fire fighting and security on the administrators and improve their fire awareness.

B. Bring forward necessary safe production and administration system and provide more safe production training for the administrators.

C. Drainage ditches shall be built around perimeter of oil depot. A concrete water tank with a capacity of 1.5 times the maximum waste fire-fighting water shall be built at the end of those drainage ditches to collect all waste fire-fighting water and get rid of arbitrary discharge.

4.1.1.4.2 Evaluation on environmental risk of pollution to river water during construction period

（1）risk identification

The quality of water in the river reaches where the reservoir project will be located is classified at Class II. In accordance with the integrated wastewater discharge standard, GB8978-1996, no pollution discharge into the river basin may be allowed. Hence, all production waste water and living sewage from the construction of reservoir project will be forbidden to be discharged into the river course and river bed.

The construction waste water will be the production waste water and living sewage from construction camp area and construction site. The production waste water will mainly come from machinery cleaning or repairing with the dominant contents of SS and petroleum group. Petroleum group will be heavily harmful to the water quality. Due to the limit of management of construction teams, there would be some treatment of waste water

inconsistent with environmental protection requirements during the construction period, direct discharge of waste water into river course or river bed would occur, river water would therefore risk pollution during construction period.

（2）analysis on damages of environmental risk

All 3 (three) reservoir proposed are key control reservoirs to be located on Meiyaogou River basin, Ertanggou River basin and Alagou River basin respectively. Meiyaogou Reservoir and Ertanggou Reservoir will be arranged on the middle reaches of respective river basin, but Alagou Reservoir on the upstream reaches. In this case, the water quality situation of downstream irrigation use will be directly subject to the quality of reservoir water after project completion, while, the water function of the river basin where a reservoir will be built will be deteriorated.

(3) Preventive measures and mitigation measures

① put in place various environmental protective measures with regard to the treatment of production waste water and living sewage during construction period. Preventive measures against damages that endanger people's life and property in the process of transportation and store of explosives and oil material during constructions;

 Strengthen the training of environmental protection on construction personnel and improve their environmental protection awareness;

 Aperiodically carry out inspections on the site. Strictly forbid direct discharge of production waste water and living sewage into river course or river bed;

 Effectively put in place the water environment monitoring and measurement plan during construction period.

4.1.1.4.3 Risk of dam failure

（1）risk of dam failure of proposed reservoirs

The types of dams to be a part of the proposed reservoirs are that: concrete-faced rockfill dam for Meiyaogou Reservoir, and concrete-faced rockfill dams both for Ertanggou and Alagou Reservoirs. The statistics conducted by the International Committee on Large Dams (ICOLD) throughout 110 countries and regions with regard to the dams indicate that dam failures indicate that dam failures account for 2.3%, of which earthfill dams take a large percent (earthfill dam failures takes 95% out of all dam failures), while concrete-faced rockfill dam and concrete-faced rockfill dam have a quite low failure rate. The research results both abroad and at home in terms of dam safety show that there are a lot of and complicated factors that would lead to a dam damage and failure finally. The analysis on possible reasons is described as follows:

 overtopping flood

The analysis based on the historic dam failure data shows that most dam failures were caused by overtopping floods. The main reasons leading to overtopping flood are improper design standards, inadequate capacity of discharge facilities or inappropriate dispatching behavior. The Chinese national Standard for Flood Control, (GB50201-94) shall be strictly followed in determining design flood standard because the satisfaction with flood control demands will be crucial to guaranteeing a dam safety. Meiyaogou Reservoir and Ertanggou Reservoir are of class III projects consisting of dams of Grade 3, 50-year-recurrence design flood standard and 1000-year-recurrence check flood standard, so that the discharge capacities are fully consistent with related requirements; Alagou Reservoir is of class III

project consisting of a dam of Grade 2, 100-year-recurrence design flood standard and 2000-year-recurrence check flood standard, so that the discharge capacities are fully consistent with related requirements

 earthquake

Earthquake could deadly damage the rock mass beneath the dam base and ancillaries. The geological reports of three projects indicate that dam area of proposed reservoirs is comparatively stable with less probability of occurrence of earthquakes. Hence, the possibility of earthquake that extensively damage the projects at a large area is at a lower side.

 Reservoir bank ruin

Reservoir bank ruin will lead to a reservoir leakage and reservoir bank instability and endanger dam safety.

Thus, the geological reports of three projects indicate that dam area of proposed reservoirs is comparatively stable with less probability of occurrence of earthquakes. Hence, the possibility of earthquake that extensively damage the projects at a large area is at a lower side.

 dam foundation breakage

Dam safety is subject to the deformation, permeability and stability of dam foundation to a quite extent. A fine dam foundation shall have adequate capability to fight against deformation, bear loads, show a low permeability and possess intact rock mass so that dam foundation breakages would not happen, such as large deformation destroying the dam foundation, exceedance of uplift due to over pressure of leakage water or instability of sliding of rock mass that is a part of dam body or dam base.

Thus, the geological reports of three projects indicate that the proposed reservoirs would not trigger reservoir immersion and permanent leakage.

 improper construction and utilization of material

Improper behaviors include that poor concrete placement quality due to unstandardized construction workmanship; dam splitting, expansion and erosion due to chemical reactions of alkaline aggregates in concrete; leakage due to poor quality of joint grouting. Those improper construction and utilization of material will degrade dam body, destroy dam body locally and finally threaten dam safety. But those improper people’s behaviors can be strictly controlled by means of application of codes and specifications.

 terrorism attack

The consequences of the accidents of terrorism attacks are of graveness. However, the possibility of terrorism attacks is quite rare and unforeseen.

Generally, the dam failure of proposed reservoir projects is at a quite lower side.

1 dam failure of existing reservoirs

In accordance with the Dam Safety Policy OP4.37 issued by the World Bank, PMO of Turpan Water Conservation Project (Turpan Water Resources Bureau) entrusted a Dam Safety Expert Panel that is consisting of Nanjing Hydraulic Research Institute and Dam Safety Management Center under the Ministry of Water Resources Bureau of China to conduct an evaluation over the dams of existing reservoirs which the proposed project would be concerned. This Dam Safety Expert Panel has figured out 4 existing reservoirs according

to the WB's requirements, including PuTaoGou Reservoir, YaErNaiZi Reservoir in Turpan City, KeKeYa Reservoir in ShanShan County and KanErQi Reservoir in TuoKeXun County, in addition, proposed contingency program.

 PuTaoGou Reservoir

A.risk identification

PuTaoGou Reservoir is of a self-filling reservoir without flood control problem, and the stability of main dam and embankment are all satisfied with related code and standard. Hence, Overtopping or dam failure would not occur with PuTaoGou Reservoir. However, in case that PuTaoGou Reservoir suffers a terrorist attack, such as jagging the dam crest, reservoir water may flush through the jag and get the dam failed.

The core wall of the main dam of PuTaoGou Reservoir has a bottom of 1m wide. It is specified in the Design of Roller Compacted Embankment, SL274-2001, that earth-made impervious part should have a thickness not less than 1/4 of the water head, so the main dam's core does not meet stability requirement. Given a damage with the main dam's geotextile membrane, the core bottom could be destroyed by leakage and finally lead to a dam failure.

When multiple frequency floods occur in the Meiyaogou River Basin where the PuTaoGou Reservoir is located, the dam and its downstream reaches would risk in various kinds. The PuTaoGou Reservoir is designed to have a NPL of 125.00m, but its reservoir impoundment plan shows that the highest filling level as so far is 117.25m. In general, the most possible emergency with this reservoir would be as follows:

a. Under NPL of 125.00m, main dam's geotextile membrane is broken, a leakage occurs at El.90.00 of core wall bottom, dam failure happens as a result of dam piping;

b. Under present highest NPL of 117.25m, main dam's geotextile membrane is broken, a leakage occurs at El.90.00 of core wall bottom, dam failure happens as a result of dam piping;

c. Under present highest NPL of 117.25m, main dam suffers a terrorist attack, dam crest is jagged, the reservoir water may flush through the jag and get the dam failed;

B. analysis on risk damages

In the event of a dam failure, both upstream and downstream of the dam would suffer a lot. At the upstream, sudden discharge of a large quantity of water will get reservoir water level drop down sharply, reservoir bank ruin happens, wave surge induced by bank ruin will impact the dam sequentially. However, the most damages would occur at the downstream because sudden discharge of huge amount of water will cause high wave surge and flush out in a manner just like overturning the mountains and upsetting the sea, gravely destroys would be imposed.

C. preventive measures and mitigations measures

a. establishment of emergency and contingency system

Centering Turpan Flood Control Command Centre, Turpan establishes a flood control and emergency institutions at various levels from bottom up, the administrative chief of each level is responsible for his level's command centre. Turpan's flood control institutions have

two levels as: Turpan City flood control headquarters and township/national farm flood control command centre.

b. emergency headquarters leaders and staff and institutions involved

The emergency headquarters is Turpan Flood Control Command Centre, it shall strictly follow the principle of administrative chief taking responsibility. The Mayor who is also the chief commander is assigned to be in charge of whole flood control issue. The vice commanders are the leaders from city committee and government. All staff members of the centre are the leaders from related township, national farms, who shall be the chief of those institutions. Turpan PuTaoGou Reservoir Contingency Program gives a detailed list describing names, positions and institutions of the leaders and members of this emergency command centre.

c. emergency inspection patrol

Patrol route: PuTaoGou Reservoir—YaErNaiZi Reservoir;

Patrol time: from 18 p.m. to 20 p.m. every day (Beijing Time);

The name list of possemen consisting of the patrol team is included in the Turpan PuTaoGou Reservoir Contingency Program.

d. rescue team

Rescue team members must obey orders, follow mission, come at commander's order and do a good job. Those members shall be given training and mobilization advertising, and they shall an awareness of devoting into a rescue at once in case of an emergency.

Such a rescue team consists of the youth and able men from nearby PuTao Township, QiaTeKaLe Township as well as possemen from original weed farm. Once a pre-alarm or emergency arises, such team shall be well mobilized by the Party Secretary or government at township level to conduct rescue. When an emergency is beyond the capacity of township level, the flood control and emergency headquarters at city level shall do all its best to mobilize the human resources from the institutions involved or call for a hand from local army.

 YaErNaiZi Reservoir

A. risk identification

The status-quo of the safety situation of this reservoir's dam, the field inspection result and the dam data pertinent show that the most possible emergencies of this dam would be as follows: a. in the event of a flood over 500-year-recurrence or equal to a 500-year-recurrence check flood of 16.93m, but the gates at the sluice and discharge outlets can be handled normally, meanwhile the emergent spillway can't ensure a smooth discharge; b. in the event of a reservoir NPL of 15.00m, a piping occurs at downstream dam toe and destroys dam fill; c. in the event of a large-scale mountain collapse (it could block the normal discharge through emergent spillway), then reservoir level may rise up during flood period, and reach dam crest level even exceed dam crest level; d. in the event of multiple-frequency flood occurring in the TaErLang River Basin (YaErNaiZi Gulley) where the reservoir is located, emergencies in some ways happed at the dam and its upstream; e. in the event of failure of the gates at the sluice and discharge outlets, those gates can be handled normally.

B. analysis on risk damages

In case of a dam failure, the overtopping flood may ruin reservoir management station within 30s, rush out of the YaErNaiZi Gulley after 2 minutes approximately, devour copper

mine plant on the right bank of the gulley entrance (about 0.8km away from the dam), swallow 8 rural household and their irrigation land in YaErBa Township on the left bank of the gulley entrance, after that, run down continuously at a high head along the downstream route of the gulley, overtops a country road after about 15 minutes, flood the ChunGuang Group No.1 totally and its irrigation district of YaEr Township of 1.3 km downstream after about 20 minutes, flood YeMuShi Village and its irrigation district of 1.5 km downstream after 25 minutes, and impose submergence losses to AiDingHu Farm, Qianjing Goups No.1, No.2 and No.3, Branch No.3 of National Farm No.221. Thus a dam failure not only destroys the reservoir project itself but also causes heavy economical losses to the downstream area that will be submerged, even grave disasters of human life without a timely alarm.

C. preventive measures and mitigation measures

a. fight against collapse and slide. In case of an emergency of collapse or slide of reservoir dam, throw blocks, earth/sandbags or lead (bamboo strip) caged stones. Firstly, throw them to the locations where collapse or slide is quite extensive, then throw them in orders specified, until the bank or slope is stable.

b. fight against piping. When leakage paths occur at the dam downstream side or foundation, given small paths, cotton, straw bags, fibre bags or wedges made of straw bound in bundle can be used to calk the paths; given big paths, cotton, straw bags, fibre bags or wedges made of straw bound in bundle can be used first, then the path shall be covered by tarpaulin or net cloth, compacted by earth bags, sandbags and finally sealed with clay tightly.

c. fight against leakage. In the event of a leakage, the method of “cut off leakage from upstream side, guide leakage water out from downstream side” is taken. The details are that: at the upstream side, compact the beam with clay material with low permeability or tarpaulin or geotextile membrane to reduce water going into dam body; at the downstream side, use sandstone, geotextile, firewood or straw to play a filter role to prevent the losses of earth fills, so that the phreatic line of dam body can lower down, and dam stability can be kept. It is noted that clay material is forbidden to used at the downstream side, otherwise the phreatic line of dam body would rise up and worsen the leakage scope and emergency situation.

d. fight against pitfall. In the event of a pitfall on the dam, clay material packed in the straw bags, burlap bags or fibre bags can be used to fill the pitfall directly, then the pitfall can be filled with clay as the case may be.

e. fight against cracks. In the event of a crack and heavy leakage accompanied, a shaft shall be dug along the crack at an interval ranging from 3m to 5m to do cut off. The shaft shall go 0.3m~ 0.5m deeper than the crack and have a bottom width of 0.5m least. At the upstream side, beam shall be made to close the leakage paths; at the downstream side, filter and leakage water guiding out shall be prepared well.

f. fight against wave surge. The wave surge in the reservoir could seriously erode the dam and endanger dam safety. Straw mats and straw bundles can be placed on the upstream side to mitigate erosion, or fibre bags and plastic film can be braced by bamboo and extended on the water surface to ease up the wave surge.

g. fight against overtopping. In case of a flood in exceedance of design standard or overflowing the dam crest according to the forecast, overtopping shall be prevented by means of following measures: 1. earth-made sub-cofferdam. A sub-cofferdam shall be built up on the dam crest close to the upstream side and 0.5~1.0m away from the dam abutment. Such sub-cofferdam shall be 0.5m~1.0m wide, in a gradient no more than 1:1, and with a height more than the maximum possible flood level. When carry out emergent construction,

first cut a trench along the determined axis of the sub-cofferdam with a depth of about 0.2m and a bottom width of about 0.3m and in a slope of 1:1, then clean up dirot and sundries, finally scarify the trench bottom surface or plough it into small ditches to facilitate the joint between fresh earth and previous earth. Clay material shall be ideal. 2. earth-made sub-cofferdam. Pack earth in the strawbags or fibre bags, to 70~80% of a bag capacity, leave it open, no binding needed, facilitate placement. Bag placement can be done at the place 0.5m ~100m away from the downstream abutment, bag mouth shall be put toward the downstream side, bag seams shall be placed staggered. This sub-cofferdam shall be sloped 1:0.5 at the upstream side with its top higher than the maximum possible flood level. 3. piles-made sub-cofferdam. A row of piles shall be driven at the upstream side of 0.5~1.0m away from the dam abutment at an interval of 0.5m~1m. The exact length of piles shall depend on the height of the sub-cofferdam. Piles shall go into the earth at a depth of ⅓□½ of the whole pile length. Tree branches or wooden boards are bound to the downstream side of the piles by means of lead wire or hemp, and then stone blocks and clay are filled thereupon.

□ KeKeYa Reservoir

A. risk identification

The status-quo of the safety situation of this reservoir's dam, the field inspection result and the historic failures of concrete-faced dams show that the most possible emergencies of this dam would be as follows: a. flood no more than flood control standard; b. flood in exceedance of flood standard; c. dam failure flood: in the event of a flood over 1000-year-recurrence or equal to a 1000-year-recurrence check; d. in the event of a large-scale mountain collapse, then the spillway blocked impairs normal flood discharge, the reservoir level may rise up during flood period, reach even exceed check flood level, finally dam failure occurs; e. in the event of failure of the gates at the diversion tunnel (which is also discharge tunnel), those gates can be handled normally.

B. analysis on risk damages

In case of a dam failure, the overtopping flood may ruin KeKeYa river basin management station that is only 0.3km from the dam, run down continuously at a high head along the KeKeYa river valley, draw down within 2m after reaching KeKeYa Village of 3~7 km downstream, and drop within 0.5 m when reaching ShanShan Township of 45km downstream. The overtopping flood will submerge KeKeYa Village. Northwest of ShanShan Township and Railway Lanzhou - Xinjiang, national road No.312, and agricultural irrigation district. Thus a dam failure not only destroys the reservoir project itself but also causes heavy economical losses to the downstream area that will be submerged, even grave disasters of human life without a timely alarm.

C. preventive measures and mitigations measures

a. establishment of emergency and contingency system

ShanShan County People's Government is the highest commanding body. Its office is located in the ShanShan County river basin management official building.

b. emergency headquarters leaders and staff and institutions involved

The emergency headquarters is Shanshan County Flood Control Command Centre; it shall strictly follow the principle of administrative chief taking responsibility. The County Chief who is also the chief commander is assigned to be in charge of whole flood control issue. The vice commanders are the leaders from county committee and government. All staff members of the centre are the leaders from related township, national farms, who shall be the chief of those institutions. ShanShan County KeKeYa Reservoir Contingency

Program gives a detailed list describing names, positions and institutions of the leaders and members of this emergency command centre.

c. reporting, notification and publication of emergency

Once an emergency is shot by the observation people, patrol people or guard people, they shall immediately report it to the commander Mr. Zhu Jing Gang (director of ShanShan County Water Resources Bureau, cell phone: 13909958286) or to the vice commander Mr. Shi Chang Shuang (chief of KeKeYa River Basin Management Station, telephone: 8328666), and record specific location of emergency and its extension, receive the orders released by the commander or vice commander, do observations and inspection more densely, and report the evolvement of the emergency situation.

d. emergency inspection patrol

Upon the launch of a contingency program, risk relief team shall assign proper human resources based on the actual conditions (2 people least per shift) to keep an eye on the monitoring, measurement and patrol over the locations and extension of the emergency. Those people shall be on the duty around the clock in turn, timely write down emergency and its sequences and report to the commander or vice commander.

e. emergent evacuation and temporary resettlement in case of dam failure and flood

In case of emergency that would induce dam failure or occurrence of dam failure, the commander shall call for ShanShan County People's Government to evacuate the people and property within the scope of flood submergence and provide resettlement properly. The residents at the downstream should evacuate within 30 minutes after the release of an evacuation alarm. In addition, the basic living facilities and standard shall be guaranteed with the people evacuated (including reservoir management staff) covering their living, sanitation, medical, traffic, communication and education. Temporary depositary to receiving the people's properties (including livestock) and necessary security measures shall be prepared well by related departments and principals.

 KanErQi Reservoir

A. risk identification

The status-quo of the safety situation of this reservoir's dam, the field inspection result and the historic failures of concrete-faced dams show that the most possible emergencies (risks) of this dam would be as follows: a. flood no more than flood control standard; b. flood in exceedance of flood standard; c. dam failure flood: in the event of a flood over 1000-year-recurrence or equal to a 1000-year-recurrence check; d. in the event of a large-scale mountain collapse, then the spillway blocked could impairs normal flood discharge, the reservoir level may rise up during flood period, reach even exceed check flood level, finally dam failure occurs;

B. analysis on risk damages

The flood routing results of a dam failure show that in case of a dam failure under the check flood level, the overtopping flood may promptly ruin KanErQi river basin management station that is only 0.3km from the dam, run down continuously at a high head along the KanErQi river valley, draw down within 2m after reaching the northeast of HuoCheZhan Township of 13 km downstream, and drop within 1 m when reaching QiKeTai Township of 20km downstream. The overtopping flood will submerge ShanShan County Railway Station, east region of HuoCheZhan Township, east region of QiKeTai Township, Railway Lanzhou—Xinjiang, national road No.312, HaTu oil field and agricultural irrigation

district. Thus a dam failure not only destroys the reservoir project itself but also causes heavy economical losses to the downstream area that will be submerged, even grave disasters of human life without a timely alarm.

C. preventive measures and mitigations measures

a. establishment of emergency and contingency system chart

Based on the staffing of KanErQi river basin management station, the emergency and contingency headquarters will consist of a command center, risk relief team and rescue team as well as headquarters office.

b. headquarters leaders and staff and institutions involved

The ShanShan County People's Government shall be the highest body among the entire emergency and contingency system responsible for the KanErQi reservoir dam safety management. Its office is located in the ShanShan County KanErQi river basin management official building. Such headquarters and commander shall play a leading and coordination role in case of an emergency.

c. establishment of a command centre

The main responsibilities of this center is to keep close contact with the ShanShan County People's Government, ShanShan County Water Resource Bureau, ShanShan County People's Government Flood Control and Drought Relief Headquarters, ShanShan County armed police force and the downstream possemen; release the order of launch and end of a contingency situation; fully lead the application of contingency program and running of headquarters; organize experts to discuss the situation; put forward a rescue plan; conduct emergency dispatching, mobilize rescue team and material; coordinate with Shanshan Railway Station, HuoCheZhan Township, QiKeTai Township and TuHa oil field at the downstream of the dam and release people evacuation order. The name list and contacts are shown in the table of KanErQi Reservoir Contingency Program.

d. risk relief team

The main responsibilities of this team are to be responsible for the safety, security and anti terrorist of KanErQi reservoir dam and its affiliates; do patrol, monitoring and alarm upon a risk of the dam, report and transfer related information; do a good job assigned by the headquarters, call for a hand from TuHa oil field public security bureau and the armed possemen of HuoCheZhan Township and QiKeTai Township; and call for help from the people's armed force department, armed force, policies of ShanShan County.

e. rescue team

The main responsibilities of this team are to recruit risk relief team's human resources and in charge of the security at the entrance into the dam.

f. headquarter's office

There is an office under the headquarters responsible for routine issues.

g. downstream emergency and rescue team

In case of an emergency but inadequate working staff members, call for the help from TuHa oil field public security bureau and the armed possemen of HuoCheZhan Township and QiKeTai Township. The emergency and rescue team at the downstream of the KanErQi reservoir can consist of the people from ShanShan County Armed Force Fire Fighting Unit, armed possemen of HuoCheZhan Township and QiKeTai Township, staff members of

industry line, mine line and enterprises, medical personnel and ordinary masses. This team shall follow the orders of the headquarters. The number of people and equipment of this team shall be provided based on the grade of an emergency. All team members shall meet at the place designated by the headquarters, and take the bus to the reservoir site to carry out risk relief and relief actions. In case of an dam failure flood, the team shall help the residents within the downstream submergence area to do evacuation and carry their property out.

4.1.1.4.4 Risk of radioactivity

□1□analysis on the risk

Pertinent investigations indicate that there is a slag left by previous Yuergou Coal Mine and No.505 Mine in the river course of the Yuergou River Basin at the north of the Alagou River. The slag of the mine tailings contains radioactive matters. When quarrying and borrowing of aggregates for the construction of Alagou Reservoir, the aggregates mixed with mineral slag may be quarried together, this would impose a probability of unfavorable impacts on the health of project construction people and reservoir management staff.

□2□preventive measures

□ set up a security belt around the stacking place of radioactive matters and potential radioactive zone, strictly forbid to quarry aggregates and borrow soil from the river course at the downstream of Yuergou Coal Mine slag;

□ set up a clearly visible alarm board at the perimeter of this area;

□ do a good job of dissemination and training for the construction people, tell them the existence of radioactive matters, incidence and serious consequence.

The cost of this part has been list in the line of routine activities.

4.1.1.4 Impact of plant diseases and pests

After the service of water conservation project, the change in the irrigation way could increase the utilization of agricultural chemical products in the project area and bring on negative environmental impacts to some extend.

In view of this unfavorable impact, a separate Disease and Pest Management Plan is included in the project. Following measures will be taken in the water conservation project area to limit the increment of agricultural chemical productions and its negative impacts on the regional environment during future operation period of the project.

Mitigation measures: ① during the implementation period, take a composite method to integrate together the pesticide use, agricultural control, physical control and biological control. ② the use of pesticide shall follow the principle of economy, safety and effect. ③ Turpan Prefecture WB PMO shall keep contact with the plant protection and quarantine stations at prefecture, city and county levels, and request them to recommend high effective and low poisonous pesticide.

Cost of Management of Plant Diseases and Pests

Table 4.1-3

Time (Year)	Project	Location	Trainee	Frequency	Unit Price (Yuan)	Sub-total (Yuan)	Implement a-tion Institution	Monitoring Institution

2012	training	Good running WB project area	technician	1	7800	78000	PMO	WB
2012		Turpan Prefecture	WUA members	aperiodically	2500	5000		
2013		Good running area in China	technician	1	3750	37500		
2013		Turpan Prefecture	WUA members	aperiodically	2500	12500		
2010-2014	Pest monitoring evaluation		Water conservation area	Once per month	15000	144000		
Total			277000					

4.1.2 Analysis of Other **Environmental Impacts of the Project**

4.1.2.1 Environmental Impacts during Project Design Period

The dominant jobs during the design stage are field investigation and design jobs without unfavorable impacts on the ambient environment. Design results during this stage will be the fundamental reference for project build, implementation and operation. The design shall consider the project from project itself and environmental protection two prospects, optimize design schemes, and carry out selection and optimization in terms of project site selection, arrangement of disposal yards, construction conditions and construction ways so as to minimize the scope of disturbance and interference, reduce the quantities of permanent mucks and avoid or cut down unfavorable impacts on the environment during construction period and operation period.

Besides, from the perspective of environmental protection, the basic ecological discharge and discharge way are proposed in respective EIA reports based on the actual conditions of the river basin where the reservoir alike projects will be built.

(1) Meiyaogou Reservoir Project

Meiyaogou Renmin Canal Headworks was built in 1950s-60s. It is the first water retaining and conveyance works on the Meiyaogou River. However, the water diversion conducted by the Renmin Canal Headworks dries up the downstream river reaches. The runoff could not reach the downstream reaches except that the flood in the upstream is very big and can't be handled by the canal completely. It is obvious that the service of Meiyaogou Renmin Canal Headworks has converted the Meiyaogou River into a channel, and the river courses downstream the headworks are dry up generally.

The proposed Meiyaogou Reservoir dam site will be located at the place of about 4 km downstream to the Renmin Canal Headworks. There is no aquatic life and distribution of forest and grass along the river course downstream the proposed dam site, which needs

nothing ecological discharge demands. In addition, the development of this project will not extend dry-up river course and dry-up period. In this case, the development of this project will have no requirement of basic ecological discharge.

（2）Ertanggou Reservoir Project

 Determination of basic ecological discharge

Since the river reaches downstream of the proposed Ertanggou Reservoir dam site have no special and sensitive ecological water demands, only basic ecological discharge is required. The ecological water demands are determined by means of the calculation method recommended in the Technical Instructions for Evaluation on the Environmental Impacts of Ecological Discharge, Low Temperature Water and Fish Passing Facilities in Hydropower and Water Conveyance Projects (provisional) issued by the Ministry of Environmental Protection of the People's Republic of China. French "Country Method" is used to determine the ecological water demands of the river reaches. It is specified in this Method that the minimum ecological discharge should not be less than the 10% of the mean annual average discharge. The mean annual average discharge at the proposed dam site of Ertanggou Reservoir is 2.52 m^3/s, its ecological discharge is taken at 0.25 m^3/s.

 Evaluation on the satisfaction degree of basic ecological discharge cut at the cross section of Ertanggou Reservoir dam site

Based on the status-quo of river course, the river reaches downstream of the dam site will be diverted through gates No.0 & 1. Since the river reaches below the gate No.1 have been dry up, the basic ecological discharge shall least maintain a continuous flow along the river reaches of 4.6 km long between the cross section of dam site and gate No.1.

The monitoring and measurement data available from the Ertanggou Hydrological Station indicate that the mean annual average flow through the station controlled cross section (located at 100m upstream to the project dam site) is 0.22 m3/s in March, which is the smallest value throughout a year. Because the temperature is quite cold in March, no diversion will be done through gates No.0 & 1 to protect headworks; It is introduced by the management station people that there has been no dry-off phenomenon at the gate No.1 in March. Thus, based on the actual conditions, the discharge of 0.25 m3/s can maintain a continuous flow along the river reaches of 4.6 km long between the cross section of dam site and gate No.1. Hence, the basic ecological discharge determined with the project will not extend dry-up river course and dry-up period of the Ertanggou River.

 guarantee of basic ecological discharge of Ertanggou Reservoir

The design of main civil works that a glass lined steel pipe in a diameter of 500 mm will be erected at the outlet of irrigation discharge tunnel, and routed along the dam access road to the dam downstream riverbed, this pipe will provide the basic ecological discharge. The irrigation discharge tunnel will be designed to have an invert at El.1435m, while the reservoir will have a minimum pool level of El.1439.00m, the invert is lower than the minimum pool level, thus this project can guarantee a basic ecological level through the dam cross section at any time.

（3）Alagou Reservoir Project

① Determination of basic ecological discharge

Suffering the impact of reservoir dispatching, regional ecological water demands will be influenced unfavorably due to the reduction of flow in local downstream river reaches. The river reaches with flow reduced will be about 3.6 km long between dam site and the confluence of Alagou and Yuergou, and there is no flow contribution from other basins. Hence, a certain discharge shall be considered with this river reaches to maintain a basic ecological discharge and keep continuous flow along the river course. Since the river reaches downstream of the proposed Alagou Reservoir dam site have no special and sensitive ecological water demands, only basic ecological discharge is required. It is specified in the French "Country Method" that the minimum ecological discharge should not be less than the 10% of the mean annual average discharge. The mean annual average discharge at the proposed dam site of Alagou Reservoir is 4.06 m^3/s, its ecological discharge is taken at 0.4 m^3/s.

 Evaluation on the satisfaction degree of basic ecological discharge cut at the cross section of Alagou Reservoir dam site

The 50-year series monitoring and measurement data available from the Alagou Hydrological Station indicate that the mean annual average flow through the station controlled cross section is 0.4 m^3/s in March. It is introduced by the management station people that there has been no dry-off phenomenon along the river longer than 3.6 km between the station and river out of the valley. Thus, based on the actual conditions, the discharge of 0.4 m^3/s can maintain a continuous flow along the river reaches. Hence, the basic ecological discharge determined with the project will not extend dry-up river course and dry-up period of the River.

 guarantee of basic ecological discharge of Alagou Reservoir

Since the basic ecological discharge of this project is less, it is recommended that a siphon conduit shall be erected to delivery water to the downstream. This siphon conduit can be adjusted to get a good water intake position to ensure a smooth basic ecological discharge. However, this measure is subject to people's behaviors, it is recommended to strengthen management and monitoring by engineering administration department and Tuokesun County Environmental Protection Bureau during project operation period and aperiodically inspect the discharge measures so as to guarantee making in place those discharge measures.

4.1.2.2 Environmental Impacts during Construction Period

For possible adverse impacts that may commonly exist in the course of implementation of the World Bank Financed Turfan Prefecture Water Conservation Project, see Table 4.1-2.

Common Adverse Impacts on Environment During Implementation

Table 4.1-2

SN	Source item		Adverse environmental impact
1	Water environment	Production waste water	has adverse impact on local surface water environment, surface vegetation, and soil.
		Domestic sewage	If domestic sewage is not strictly treated and strictly discharged, it will not only pollute the surface water and groundwater in the neighborhood but also breed mosquitoes and flies and spread bacteria and, as a result,risk the health of the construction staff and damage ecological and living environment.
2	Atmospheric environment	Exhaust gas during construction	Exhaust gas from fuel-powered machinery and waste gas from coal burning in construction work and life of construction staff will have adverse impact on those who work with intensive machinery operation for a long time.
		Dust emission during construction	Construction, excavation, highway transportation and so on may emit dust to create adverse impact on the atmospheric environment and mainly on the construction staff around the construction site.
3	Acoustic environment		During construction, noise pollution mainly comes from constant noise such as produced by mixer plants, blending machines, sieving plants, belt feeders, and so on, from non-constant noise such as strong noise produced by blowing up, which is very loud, and from dynamic noise produced by construction machinery such as dump trucks, water wagon, load-carrying vehicles, and so on. Noise mainly has impact on construction staff.
4	Solid waste		Solid waste generated during construction mainly includes spoil, debris, and so on and domestic waste from construction staff. Large quantities of spoil will be generated from production during construction. If relevant measures are not taken to protect against it, a lot of soil and water losses will be caused. Domestic waste mainly comprises fruit peel, paper scraps, vegetable leaves, refuse, and so on discarded from the daily life of the construction staff, which have high content of organic matter. Randomly piling and dumping domestic waste will affect the living environment and health of the construction staff as well as create adverse impact on local landscape environment.
5	Ecology and environment		① impact on soil: permanent land occupation will completely change the type and properties of the surface cover within the occupied area and the surface soil will be unrecoverable permanently. During construction the surface soil on the gravel and earth borrow sites will be removed and should be backfilled with the original surface soil at the end of construction. In the process of soil backfill, the compactness, permeability and physical properties of the soil will be affected by disturbance of machines and so on. ② impact on vegetation: the surface vegetation within the permanent land occupation and reservoir inundation areas will be permanently replaced. Temporary land occupation tend to cause soil and water losses due to destruction of the surface cover and vegetation. Therefore, temporary protection work should be done well during construction. Besides, concentrated discharge of production and domestic waste water will also adversely affect the vegetation if not properly disposed of. ③ impact on wild animals: wild animals within the construction areas are mainly the usual rodents and small reptiles. The reservoir construction will have impact on wild terrestrial animals mainly through construction noise, land occupation, reservoir inundation, and activities of construction staff in the neighborhood of the reservoirs and their planned areas.

6	Soil and water loss	Within the land occupation areas surface soil and vegetation are destroyed, which will increase exposed area and intensify soil and water losses. During excavation, the loose earth and stone piled and backfilled provide materials for wind erosion and water erosion and accelerate soil and water losses in the construction areas. If not taken good care of, temporarily kept spoil during construction will emit dust when there is a strong wind and, as a result, affect the health of the construction staff and cause soil and water losses.
7	Health of people	When a large number of construction staff gather together, there will be high chance of creating conditions for incidence of enteric infectious diseases and respiratory infectious diseases, which will affect the health of the construction staff, if sanitation and living conditions are poor or hygiene and disease control are not in place.
8	Cultural relics	Construction and excavation may be concerned with cultural relics.

4.1.2.3 Environmental Impact during Project Operation Period

During the operation of World Bank Financed Turfan Prefecture Water Conservation Project, the subprojects that have adverse impact on environment are mainly reservoir construction schemes. The subprojects of water saving irrigation, canal construction or reconstruction and Kariz system preservation will not create adverse impact on the ambient environment. For possible common adverse impacts of reservoir construction on environment, see Table 4.1-3.

Common Adverse Environmental Impacts during Operation

Table 4.1-3

SN	Source item		Adverse environmental impact
1	Hydrological regime	Hydrological regime in reservoir areas	After inundation of the reservoir, water level will rise significantly from the front to the tail of the dam. Area of water surface also becomes vast from the previous frequent dry-up or narrow area, which will change the terrestrial habitat into aquatic habit. Due to the high water level and deep water body, the gradient ratio of water surface becomes small and flow slow in the reservoir.
		Hydrological regime downstream	Hydrological regime in the rivers downstream is changed from natural runoff into artificially regulated runoff. The reservoirs will effect regulation in accordance with the production demand of various sectors and the incoming water in the natural rivers. Owing to the regulation and storage of the reservoirs, the monthly runoff distribution within a year in the rivers downstream will change.
2	Water temperature	Water temperature in reservoir areas	The construction of the project will change the water temperature pattern in the rivers of the reservoir areas.
		Temperature of water discharged downstream	The temperature of the water discharged downstream form the reservoirs will be higher in spring, which will be good for crop growth in the irrigation areas downstream. In summer, the temperature will be a little lower, but the atmospheric temperature in Turfan in summer is high, so is the earth surface temperature, which will heat the irrigation water. Besides, the water discharged downstream form the reservoirs will need to flow through more than 20 km open canals in its delivery, which makes water temperature go up gradually. Therefore, the temperature change of the water discharged downstream form the reservoirs will not affect agricultural production very much.
3	Water quality		□ After inundation of the reservoirs, the water body will expand dramatically, water will flow slowly and the capacity is greater. Then the sediment of suspended matter will be stronger and the concentration of suspended matter is lower. Without increasing pollutants discharge, the quality of the water in the reservoirs will basically remain the same. In order to prevent worsening of water quality, the bottoms of the reservoirs should be well dredged before water storage. □ Strict measures must be taken to treat the domestic waste water generated during project operation. The treated water will be utilized in a comprehensive manner and may not be discharged into the rivers.
4	Solid waste		Solid waste mainly comprises fruit peel, paper scraps, vegetable leaves, refuse, and so on discarded from the daily life of the reservoir management staff, which have high content of organic matter. Randomly piling and dumping domestic waste will affect the living environment and health of the reservoir management staff as well as create adverse impact on local landscape environment.
5	Dry-up of rivers		Affects downstream water environment and aquatic ecology.

4.2 Mitigation Measures

4.2.1 Reservoirs

4.2.1.1 Mitigation **Measures During Project Design**

4.2.1.1.1 Common measures

Following measures will mainly be taken to mitigate environmental impacts of the project during the design of the three reservoirs:

□1□ environmental justification analysis of the selection of the dam sites;

□2□ environmental justification analysis of the selection of the borrow sites;

□3□ environmental justification analysis of the selection of the spoil disposal sites;

□4□public participation in surveys

The above-mentioned measures taken for each of the reservoirs will vary. For specific information, see 4.2.1.1.2.

4.2.1.1.2 Specific measures

□1□Meiyaogou Reservoir

During the design of Meiyaogou Reservoir, consideration was given as much as possible to environmental protection requirements in terms of comparison and selection of the dam site, selection of the spoil disposal site, construction design organization, so on, so as to achieve the maximum benefits with the least possible disturbance and change in environment.

① Selection of dam site

At this stage, two optional dam sites, i.e. a upper site and a lower site, are preliminarily compared and selected.

The upper and lower sites have basically the same conditions and neither has environmental constraints. The type of occupied land of both sites is also basically the same and the upper one will inundate less area than the lower. The impact of inundation can be mitigated through compensation measures. The excavation at the C4 and C5 borrow sites of the upper option can be utilized. The upper site will enable water delivery by gravity, which will save staff and energy input. At the same time, the upper one will involve more earthwork, which will cause more soil and water losses, but the impact can be mitigated through soil and water conservation measures. The construction of the dam at the upper location may create impact on the villagers of Meiyaogou, but it can be mitigated through strict management measures.

Therefore, it is believed that the recommended upper site is environmentally reasonable.

□ Environmental justification analysis of the selection of the borrow sites;

At the current stage, the selected C3 gravel borrow site is located in the river bed and Level I terrace of the reservoir; C4 borrow site rests in the left side of the dam; and C5 borrow site lies in Level III terrace on the right bank. There is no vegetation in either C3 site or C4 site while in C5 site there are trees planted by people.

With regard to C3 borrow site in the reservoir area, the river bed is dried up with only a few shrubs growing down there. At the time of excavation, the headwork of Renmin Canal will be used for diversion, which will reduce scouring of water. Before geo-membrane is laid, the reservoir basin should be leveled. Therefore, the exploitation at this borrow site will not create major impact. C4 site is located on the left bank, where there is basically no vegetation. The exploitation will facilitate the stability of the reservoir bank, expand the reservoir storage capacity, and the excavation will be utilized. At the time of exploitation, soil and water losses should be prevented with care, which will not create major impact. C5 borrow site will be excavated on the Level III terrace on the right side of the river bed so as to increase the reservoir storage capacity. In this place there are some abandoned factory workshops and a woodland in the southern area. The site can serve as both a borrow site and an inundated area of the reservoir. It will be compensated for in the form of money.

For environmental justification analysis of each of the borrow sites, see Table 4.2-1 below.

Table 4.2-4. Analysis of Environmental Rationality of Material Ground Site Selection

Items	Sand/gravel material ground	Rock material ground	Earth Material Ground	Evaluation of Environmental Rationality
Is it within environmentally sensitive area (ESA) such as nature reserve, zone of famous scenery, zone of cultural heritage?	None of these material grounds is within ESA.			Rational
Is it at site of important resources such as basic farmland and land of special local product and so on?	The earth material ground will be located on a piece of dry wasteland outside zone of basic farmland. The sand/gravel material ground at Yuegou will be located on a piece of Gobi desert and flood plain, while the sand/gravel material ground at the dam site is on the river bed. These 2 material grounds have nothing to do with basic farmland. Therefore, the material grounds are not at site of important resources			Rational
Is it within environmental risk area with problems such as land collapse, slope slide, mud-rock flow, flood discharge, big wind passage and so on	The geological condition at the place where all the material grounds are located is stable. They are not within environmental risk area.			Rational
Are the environmental sensitive targets impacted?	There is no environmental sensitive target close to any of the material grounds, the targets such as residential area and rare vegetation.			Rational
Is it possible to rehabilitate the landscape, vegetation and land?	The earth material ground will be located on a piece of dry wasteland, the sand/gravel material ground at Yuegou will be located on a piece of Gobi desert and flood plain and the sand/gravel material ground at the dam site is on the river bed. The original vegetation is very limited. The development of material grounds has very limited impact on the local vegetation, but the local vegetation will be rehabilitated after the use of the material grounds.			Basically rational
Does the transport route pass through any place that should not thus impacted, the places such as urban district, residential area, school and so on?	None of the transport route for the material grounds will pass through any place that should not thus impacted.			Rational

In conclusion, the selection of the borrow sites is basically reasonable.

In accordance with the survey, there are some dregs from the previous Yuegou Coal Mine

and Mine-505 at the riverbed of Yuegou Catchments at the north of Alagou District. The tailings and spoil content 3 radioactive substances such as uranium, thorium and radium-226. The dregs are the small quantity of tailings and spoil mixed in the sand and gravels on riverbed after clearance. Although the radioactivity dosage is relatively small, there are still possible impacts on the regional environment and public health. To avoid any risks of radioactivity, therefore, it is suggested to forbid excavating sand, gravel or earth material downstream the tailings and spoil at the riverbed in Yuegou.

 Rational Analysis of Waste Dumping Site Selection

There will be 292,100 m^3 of engineering spoil from the project. It is planned to have one set of waste dumping site (7.8 ha) in the gully 5 km from the railway at the right bank. The elevation of the original ground is 804 m, and the waste dumping will make an elevation of 810.5 m.

This waste dumping site will be located at a piece of lowland in the gully. There is no rare vegetation/wild animal or residential area within or around the impacted area of the waste dumping site. From the viewpoint of environmental protection, the site selection is reasonable. However, the dumping site must be protected during its functional period in favor of soil conservation.

 Public Participation

Public participation aims at soliciting the opinions of the impacted public on environmental issues before/during/after the project construction so as to improve the project design.

The EIA staff for Alagou Reservoir construction has twice carried out activities of public participation. The first action was made one week after they were entrusted, while the second action was made after drafting EIA report. Considering different target groups, multiple measures of public participation were taken such as posters, questionnaires, interviews and forums. The overall considerations of the public are:

A. Alagou Reservoir construction will play a very important role for the development of Tuokesun County. It will effectively alleviate the pressure of water supply to irrigation and petroleum extraction in favor of local socio-economic development, livelihood upgrading and social stabilization.

B. Generally speaking, Alagou Reservoir construction will not have much impact on the environment. Although there will be less water downstream the dam site, this will no become a big adverse impact on the environment.

At the same time, the public contributed some proposals to Alagou Reservoir construction:

A. It is proposed to strengthen environmental protection (especially the protection of www environment) during the construction period, so that water pollution in Alagou River due to the construction will be avoided and the quality of water use downstream will not be impacted.

B. With diverging water from the mainstream of Alagou River, the ecological environment and scenic environment downstream the dam site will be impacted. Therefore, the project should pay attention to both the development and protection to make sure there will be no

dry-up downstream the dam site.

C. The engineering staff should highly respect the custom and habits of the indigenous people, take serious consideration of the vital interest of the local farming herdsmen, and be strictly abided by the legal regulations of environmental protection.

Management of the solicited opinions in the public participation:

A. The key point of environment protection during the construction period is the protection of water resources. For this, EIA report of Alagou Reservoir construction has pointed out target-oriented measures of environment protection. The required budget has been integrated into the overall budget of the project construction. At the same time, an action plan of environment management and supervision during the construction and operation periods has been formulated, in which responsible person, executor and supervisor are arranged.

B. EIA report of Alagou Reservoir construction has pointed out the quantity and patterns of ecological baseflow discharge at the cross section of the dam site during the project operation.

C. To satisfy the requirement of the local public for good social security during the project construction, the management of the workers will be strengthened and how to respect the custom and habit of the indigenous people will be one of the items in capacity building so as to keep the local social security in good order.

4.2.1.2. Mitigation Measures in the Construction Period

In terms of the main structures and construction pattern, the 3 reservoirs to be built in the project look basically the same. Since they are located in different natural environment and social environment, the environmental issues in each of them are different. Therefore, the countermeasures have both something in common and in difference.

4.2.1.2.1. Countermeasures in Common

□1□ Measures for Water Environment Protection

□ Conventional explosives in engineering have relatively big impact on water quality. In order to mitigate the impacts of nitro-explosives on water quality, it is proposed to use emulsion based explosives, water/binder explosives or other environment-sound explosives.

□ In order to make sure of the effective operation of the wastewater treatment station, the construction and effective operation of the wastewater treatment station should be included as one of the clauses in the project contract.

□ The environmental management sector of the project should make regular checks and supervisions in the field to timely handle the situation of wastewater treatment and rectify any problems observed in forms of oral and written recommendations.

□ Reservoir bed should be cleared.

With the above measures, the nearby water body can be protected from contaminations by the construction wastewater and domestic sewages.

□2□ Measures for Air Environment Protection

□ Dustproof Measures

A. Earthwork and Stonework

In excavation activities at dam site and material ground, measures such as of dust control water spraying (mainly at the excavating, dumping and loading sites) will be taken to accelerate dust deposition and reduce the time span and scope of the dust impact. The quantity and frequency of water spraying will be set according to the weather conditions and dusting situation.

B. Dust Treatment at Concrete Preparation

The concrete preparation system should be supported by dust control water spraying around to reduce the time span and scope of the dust impact.

C. Dustproof at Roads and During Transportation

Vehicle dust is generated mainly from road surface, road damage and the goods on a running vehicle. It can be reduced when effective control measures are taken.

Air pollution should be prevented in the process of transportation. When transporting a dusty material, the material should be properly moistured or covered with canvas. When transporting bulk cement, the tank should be well sealed. When transporting bagged cement, it must be properly covered. In addition, the vehicles should be frequently cleaned. Damaged road should be timely repaired, and the temporary roads at construction sites should be covered with pebbles so as to reduce dust.

D. Water-Spraying Vehicles

The construction sites should be equipped with water-spraying vehicles especially at the material excavating, stacking and loading sites as well as roads. The quantity and frequency of water spraying will be set according to the weather conditions and dusting situation.

E. Labor Protection

In accordance with the national stipulations on labor protection, on-site engineering staff should be access to dustproof respirator.

□ Control Measures against Waste Gas from Machine

The waste gas emission of construction vehicles and machines is of intermittent and mobile features. The vehicles and machines should be well managed:

A. In order to reduce the emission of CO_2 and NO_2 in favor of air protection, machines and vehicles in line with the national standards relevant should be employed in the project construction, so that the waste gas emission will below the limit of national standard.

B. On the basis of Car Scrapping Programs, mandatory update will be practiced to the poor vehicles of high consumption, low efficiency and the tail gas emission seriously exceeding the limit.

C. The machines will be maintained in good conditions.

□ Waste Gas Management in Tunnel Engineering

Tunnel engineering will generate toxic gas and much dust and the environmental conditions in a tunnel restrict the waste gas and dust from diffusing, which is quite harmful for the health of engineering staff. Therefore, the sections of drilling and exploding practices are equipped with ventilation and dust removal equipment such as axial-flow fans and air purifiers.

Evaluation of the Measures: With the above environmental mitigation measures, the impacts of waste gas and dust on the health of engineering staff and air environment will be effectively reduced.

□3□Measures of Noise Control

□ The engineering staff will be access to earplug, ear protector, cotton and headpiece of noiseproof according to the actual conditions.

□ The roads and vehicles will be properly repaired and maintained to reduce noise.

□ The vehhicle to be employed will be of low noise and in line with regulations such as Limits of Noise Emitted by Stationary Road Vehicles (GB16170-1996) and Limits and Measurement Methods for Noise Emitted by Accelerating Motor Vehicles (GB1495-79).

□ Machine base of vibration reduction will be used for an equipment with large vibration.

Evaluation of Measures: With the above environmental mitigation measures, the impacts of noise on the engineering staff will be reduced to an acceptable level.

□4□Treatment of Domestic Garbage

□ Mobile recycling collection points and garbage bins will be arranged at the temporary living quarters, and these sanitation facilities will be regularly managed to prevent and reduce mosquitoes and flies.

□ Garbage truck will be equipped to carry the domestic garbage for landfill disposal.

□ Information publicity on sanitation will be strengthened for capacity building of sanitation and environmental protection among the engineering staff.

Evaluation of the Measures: With the above environmental mitigation measures, the impacts of domestic garbage on the environment will be greatly reduced, and there will be no permanent impact on the environment.

□5□Measures in Favor of Ecological Environment

□ Protection of terrestrial plants

The construction activities will unavoidably generate some impacts on the plants. To mitigate the impact, the scope of construction sites and living quarters will be clarified according to the general arrangement plan. After the completion of engineering activities, the

temporary facilities of construction and livelihood will be demolished, and these sites together with the material grounds will be leveled for vegetation rehabilitation. The practical measures are illustrated in the chapters of soil conservation of the project reports. The compensation for the inundation and occupation of farmland and forest land in the project will total to 51.7671 million yuan, including 8.46 million yuan for Meiyaogou Reservoir, 23.8182 million yuan for Ertanggou Reservoir and 19.4844 million yuan for Alagou Reservoir.

 Protection of terrestrial animals

A. In the construction period, information publicity of ecological protection will be strengthened among the engineering staff and the local people by means such as of leaflets and information boards to reduce impact on wild animals.

B. A mechanism of punishment against damaging ecological environment will be set up. Any of the engineering staff is forbidden to hunt wild animal. To mitigate the impact, the scope of construction sites and living quarters will be clarified according to the general arrangement plan. Fire will be forbidden outside the construction sites.

C. Most of the wild animals look for food in the morning, early evening or at night, and noon is the time for rest. In order to reduce the disturbance of engineering exploding against wild animals, the pattern, quantity and time of the exploding activities should be well planned.

D. Supervision on environmental protection will be strengthened. Supervision institution of environment protection will be set up and be equipped with full-time staff. The engineering staff will be upgraded with environmental protection education. Any illegal hunting of wild animals will be punished according to the law.

Evaluation of the Measures: With the above environmental mitigation measures, the impacts of the construction on ecological environment will be reduced to an acceptable level.

（6）Health Protection during the Construction Period

 Sanitation Management at the Living and Management Quarters

After the civil construction of temporary living quarter and management quarter is completed, the sites should be cleared. The sewage pit and garbage should be treated for landfill disposal after disinfection with lime.

 Protection of Drinking Water

Drinking water will be purified and disinfected. The practical measures will be: After sedimentation and filtration, chloride of lime is added into the water for disinfection. The residual chlorine in water above 0.3 mg/l after 30 minutes will be effective to eliminate pathogens of infectious intestinal diseases in water. Then, the water is safe to drink.

Since river is the only water source for construction and livelihood, the water quality is easily impacted. Therefore, the water source should be protected. The measures will be: No temporary facility such as of living quarter, management quarter or construction sites as well as toilet, seepage pit, garbage pile or other dirt will be allowed 100 m within around the water source.

□ Treatment of Garbage, Feces and Sewage

The domestic sewage, construction wastewater and garbage will be properly collected and treated.

□ Pest Control

Sites of poor sanitation are good places for vector animals such as mosquitoes, flies and rats. Then, the opportunities to be infected will increase. Therefore, attention will be paid to controlling these pests in the living quarters.

□ Prevention and Quarantine

Before entering the construction sites, all the cooking staff and the sampled engineering staff should pass the medical examination. The rate of random sampling will be 15%.

Evaluation of the Measures: With the above sanitation and medical measures, the health of the construction people will be safeguarded.

□ Crowd-dispersal from Blast Site

Explosives will be operated by person specially assigned for them. Blast site must be closed with color stripes to warn people of the danger zone. All the people must be dispersed before an exploding activity.

□7□Cultural Relics

Once cultural relics are found during the construction, the sector of cultural relics protection should be immediately informed of the event and the site should be well-protected. The engineering will continue when the cultural relics is properly managed. The cost thus generated will be shouldered by the project itself.

（8）Information Publicity of Environmental Protection

Before the construction, information publicity and education on the legal regulations and the project guidelines of environmental protection will be done among the engineering staff to upgrade their awareness of environmental protection. The approaches will include lecturing, material distribution and information boards.

Evaluation of the Measures: The measures of information publicity can practically upgrade the engineering staff of their awareness of environmental protection. These activities should be done throughout the project construction.

□9□Risk Prevention Measures in the Construction Period

□ Prevention and Control Measures for the Transportation, Store and Use of Explosives, Oils and Other Dangerous Goods

A. In accordance with the relevant regulations from Ministry of Public Security, the transport of dangerous goods should be carefully planned before the transport and well handled in the whole process. The planned activities will include the routes, vehicle and time of transport as well as transport escorts and hand-over and acceptance.

B. According to the current regulations on storing dangerous goods, the user is required to submit the quantity of daily use to the supply, who will deliver the dangerous goods according to the plan of daily transport so as to avoid long time store of dangerous goods.

C. The stipulations for the use of dangerous goods will be strictly followed. The operator must have induction eligibility.

D. It is very hot in Xinjiang summer. The vehicle to transport dangers goods should be protected from insolating. Proper time of transport should be selected and proper measures of cooling should be taken.

E. Management of transportation safety will be strengthened. Only the drivers of good skill and high sense of responsibility will be arranged to transport dangerous goods for safe driving

F. Once there is an accident when dangers goods leaks in a river in the transport or when the river water is polluted by construction wastewater and/or domestic sewage, the water quality at the accident area should be checked immediately, and the diffusion and impact scope should be investigated. The communities and governments downstream should be timely informed of the accident to prevent the people and crops downstream from hazard. At the same time, this should also be reported to the upper authorities.

G. Once there is an accident of oil leakage or there is an explosion accident, the accident area should be immediately evacuated of people. If the road or river is blocked by the explosion accident, the traffic congestion should be eased and the river should be dredged up.

H. Professional team should be designated to investigate and evaluate the accident. The report will be one of the evidences for decision-making.

I. Explosives and other very dangerous goods will be managed and operated by person specially assigned for them. 100 m around explosive store will be recognized as dangerous area and security cordon is arranged. In explosion operation, 100 m around the explosion zone will be evacuated and closed.

 Management of Wastewater from Fire Fighting

A. The management staff of the power station will be upgraded in the awareness of fire safety through information publicity and education.

B. Management regulations of safe production will be formulated and executed.

C. There should be drainage around the oil storage. At the end of the drainage, a concrete tank with a volume of 1.5 times of the maximum water use in a fire fighting will be constructed to collect the wastewater from fire fighting. It is forbidden to randomly discharge the wastewater from fire fighting.

Evaluation of the Measures: With the above environmental mitigation measures, the impacts of the accident will be reduced to minimum level.

4.2.1.2.2. Target Features and Countermeasures

（1）Management of Water Environment

□ Treatment of Construction Wastewater

A. Treatment of the wastewater from sand/gravel washing

a. Construction of Meiyaogou Reservoir

The procedures of wastewater treatment are illustrated in Fig 4.1-1. The wastewater flows from sand washing machine into wastewater regulation pool. The wastewater with high suspended solids is pumped to fine sand recycling processor, in which 80% of the fine sand with diameter above 0.035 mm is recycled. The screen filtered water flows into sand basin for the 1st sedimentation. After adding flocculant, the supernatant flows into sand basin for the 2nd sedimentation. Finally, supernatant will be used after flocculation and sedimentation.

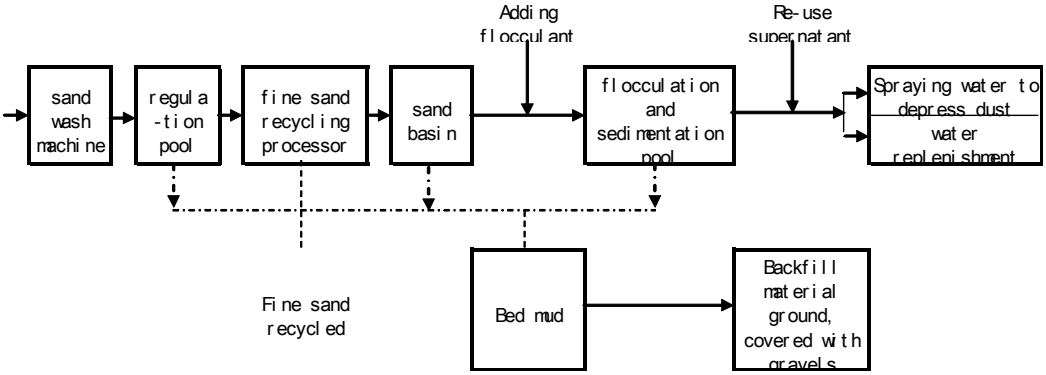


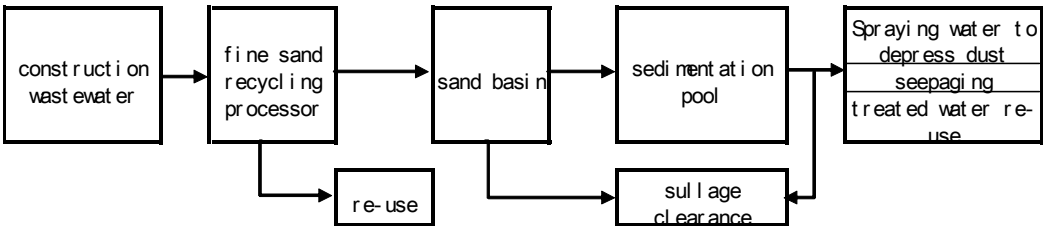
Fig. 4.2-1. Procedures of Wastewater Treatment on Washing Sand/Gravel for Meiyaogou Reservoir

The sand/gravel processing system for the construction of Meiyaogou Reservoir will be located at the river bed downstream the main dam. One set of sand basin and one set of flocculation and sedimentation tank will be constructed. They will be directly excavated without anti-seepage. On the basis of containing the wastewater for 2 days, the specification of sand basin will be length x width x depth = 20m×10m×2m, while the specification of flocculation and sedimentation pool will be length x width x depth = 20m×10m×2m. In the intermittent phase of sand washing, the water in sand basin is pumped out. When the slurry becomes dry, it is excavated and carried to dumping sites. After the completion of Meiyaogou Reservoir construction, the sand basin and flocculation and sedimentation pool will be backfilled flat.

b. Construction of Ertanggou Reservoir

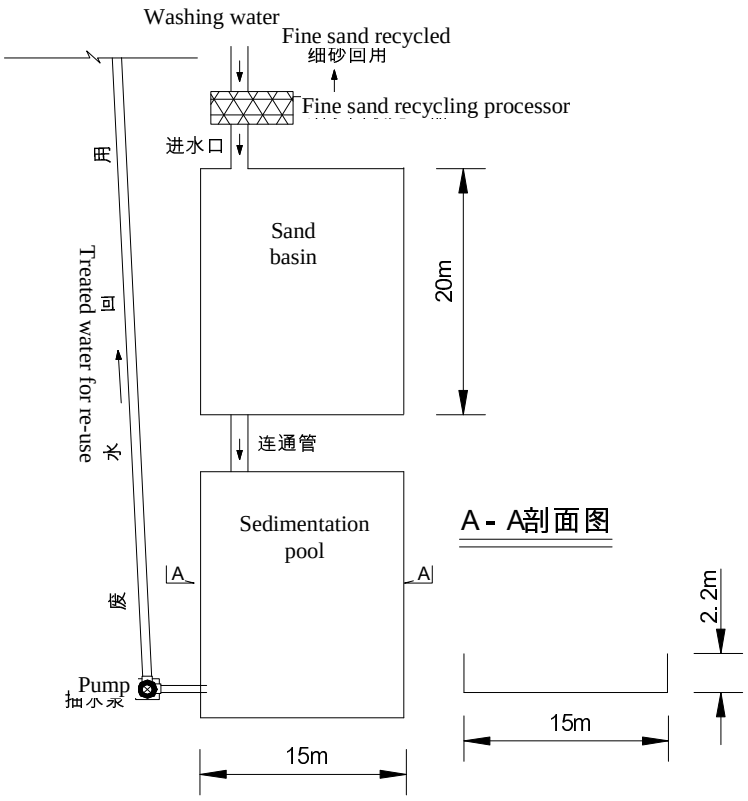
The procedures of wastewater treatment are illustrated in Fig 4.2-2. The wastewater from sand/gravel process flows into fine sand recycling processor, in which 80% of the fine sand with diameter above 0.035 mm is recycled. The screen filtered water flows into sand basin for the 1st treatment and to the sedimentation pool for the 2nd treatment. After twice sedimentation, the treated water will be pumped into water tank for re-use.

Fig. 4.2-2. Procedures of Wastewater Treatment on Washing Sand/Gravel for Ertanggou Reservoir



The sand basin and sedimentation pool will be arranged within the sand/gravel screening ground. On the basis of containing the wastewater for one day, the specification of these 2 structures will be length x width x depth = 20m×15m×2.2m. They will be directly excavated without anti-seepage lining-up. In the intermittent phase of sand washing, the water in the sedimentation pool is pumped out. When the slurry becomes dry, it is excavated and carried to dumping sites. After the completion of Meiyaogou Reservoir construction, the sand basin and flocculation and sedimentation pool will be backfilled flat. The typical design is illustrated in Fig 4.2-3.

Fig. 4.2-3. Typical Design of the Procedures of Wastewater Treatment on Washing Sand/Gravel for Ertanggou Reservoir



c. Agriculture of Alagou Reservoir

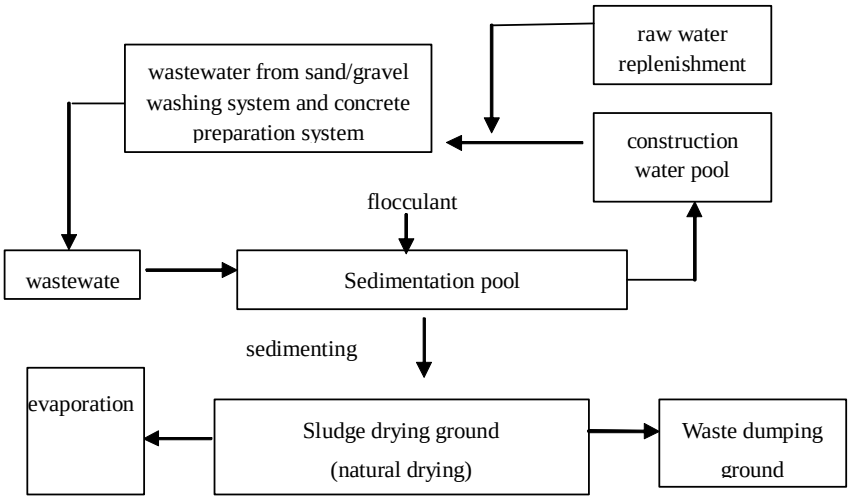
The procedures of wastewater treatment are illustrated in Fig 4.2-4. The wastewater from sand/gravel process will be treated with flocculation and sedimentation. The wastewater will

be discharged after static sedimentation in a sedimentation pool, when the treated water is in line of Integrated Wastewater Discharge Standard (GB8978-1996). When the slurry in the sedimentation pool becomes dry, it is excavated and carried to dumping sites.

The main structures in the designed system will be sedimentation pool, sludge drying pool and construction water pool. 2 sets of sedimentation pools (12m×10m×3m) will be excavated between the sand/gravel processing zone and concrete preparation zone. Since coarse sand takes larger proportion in the suspended solids in the wastewater from sand/gravel washing system and concrete preparation system, the sedimentation capacity is large. The technical specification can be satisfied, after the wastewater with high suspended solids pass through a static sedimentation for 1.5 hours.

2 operators will be required in the wastewater treatment. The sludge will be transported by 5 ~ 10t vehicles.

Fig. 4.2-4. Procedures of Wastewater Treatment on Washing Sand/Gravel for Alagou Reservoir



Evaluation of the Measures: With the above environmental mitigation measures, the impacts of the wastewater from the sand/gravel washing systems for the construction of the 3 reservoirs will be reduced to the level that the nearby water body will not be polluted.

B. Wastewater Treatment in Concrete Preparation System

After evaporation and infiltration, the suspended solids in the wastewater from the sand/gravel washing system and concrete preparation system will spread over the ground in form of crust. It should be cleared after the completion of the construction.

Evaluation of the Measures: With the above environmental mitigation measures, the impacts of the wastewater from the sand/gravel washing systems for the construction of the 3 reservoirs will be reduced to the level that the nearby water body will not be polluted.

C. Treatment of Oily Wastewater

The structures for the treatment of oily wastewater will be composed mainly of sedimentation pool and water tank.

A rectangular pool will be constructed near a machine repair station to collect oily wastewater. Oil removal material will be arranged at the entrance of the pool. The oily wastewater flows into the pool through the oil removal material by gravity. When the pool is filled up, the floating oil is collected. After the oil wastewater stays in the pool for 12 hours, it is discharged into water tank for re-use. There is no need for mechanical maintenance in this simple structure. In the operation, the oil removal material will be regularly cleaned or replaced, and the floating oil will be timely collected. After the completion of the construction, the sedimentation pool will be backfilled flat.

Fig. 4.2-6. Procedures of Oily Wastewater Treatment in Sedimentation Pool

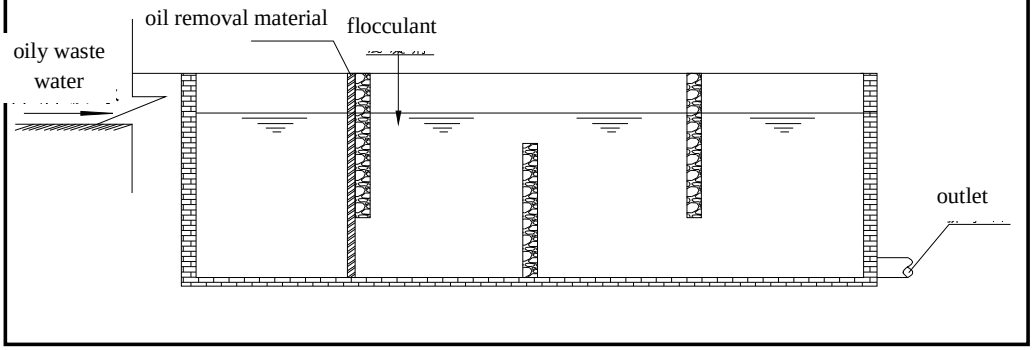
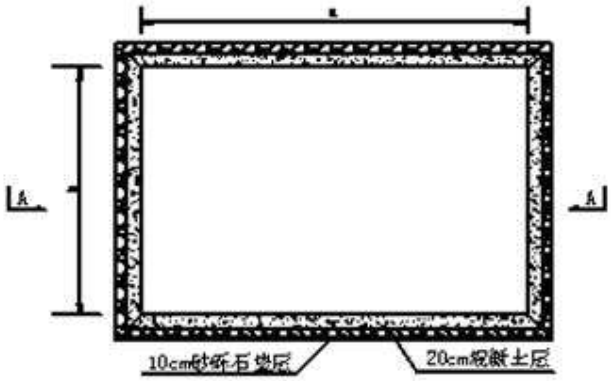


Fig. 4.2-7. Typical Design of Wastewater/Sewage Treatment



10 cm sand/gravel bedding 20 cm concrete

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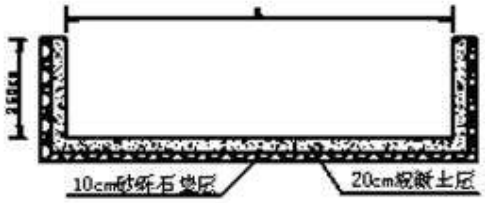

10 cm sand/gravel bedding 20 cm concrete

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Table 4.2-8. Specification of Oily Wastewater Treatment Structures for the Construction of 3 Reservoirs (unit: m^3)

Items	Rectangular Basin	Water Tank
Meiyaogou Reservoir	4m×3m×1.5m	4m×3m×1.5m
Ertanggou Reservoir	2.5m×2m×2.3m	2.5m×2m×2m
Alagou Reservoir	4.0m×2m×2.3m	2.5m×2m×2m

Evaluation of the Measures: With the above environmental mitigation measures, the impacts of the oily wastewater from the construction of the 3 reservoirs will be reduced to the level that the nearby water body will not be polluted.

D. Management of Domestic Sewage

a. Construction of Meiyaogou Reservoir

Septic tank will be built in the living quarter for the treatment of domestic sewage. The floor and walls of the septic tank will be built of C20 concrete (20 cm thick) with a bedding of 10 cm thick underneath.

The peak of sewage production will be 49m^3/d. The capacity of sewage tank is designed to be 250m^3 for 5 days. The specification of the septic tank will be length x width x depth = 15m×10m×2m.

Table 4.2-9. Amount of Works for Septic Tank (unit: m^3)

Item	Earthwork and Stonework Excavation	C20 Concrete Work	Bedding of Sand and Gravel
Septic tank	300	50	15

Dry toilet of brick-concrete structure will be built at living quarter with anti-seepage treatment with cement laid stone masonry. After the completion of the construction, the dry toilet will be cleared, disinfected and buried.

Environment-sound toilets will be built at engineering sites. This kind of toilet will be easy to build and dismantle.

For the construction of Meiyaogou Reservoir, one set of dry toilet (80m^2) and 3 sets of environment-sound toilets (20m^2/set) will be constructed.

b. Construction of Ertanggou Reservoir

Since the structure of Ertanggou Reservoir Management Center will become a permanent structure of management, WSZ sewage treatment system will be used for this structure.

At the temporary living quarter, sewage will be collected into a sewage tank through pipeline for regular treatment. The treated water can be used for watering vegetation, in which the water disappear through evaporation and there will be no impact on the water body nearby. No construction activity in winter implies no domestic sewage then.

It is planned to build 3 sets, 2 sets and 3 sets of environment-sound toilets (10m^2/set) respectively at (i) temporary living quarters, (ii) no-fixed living quarters, and (iii) engineering sites close to the dam, diversion tunnel and other sites near the river. Environment-sound toilets will be built at engineering sites. This kind of toilet will be easy to build and dismantle.

c. Construction of Alagou Reservoir

According to the features of Alagou Reservoir arrangement and the quantity of sewage production, the sewage treatment system will be constructed near the temporary living quarter. It is proposed to built a septic tank of Model 10-40B10. The treated water will be collected into an anti-seepage water tank (600m^3). The treated water can be used for watering vegetation, in which the water disappear through evaporation and there will be no impact on the water body nearby.

Evaluation of the Measures: With the above environmental mitigation measures, the impacts of the domestic sewage from the construction of the 3 reservoirs will be reduced to the level that the nearby water body will not be polluted.

E. Reservoir Bed Clearance

a. Meiyaogou Reservoir

In accordance with the technical requirements for using geotextile membrane, the structures in the reservoir area will be demolished, the trees being cut and the floating debris being cleared.

After the structures are pushed down, the construction wastes will be carried to permanent dumping ground. The floating debris will be cleared. All the trees will either be cut or transplanted outside the reservoir area. The residual stumps should not exceed 0.3m above the ground surface.

b. Construction of Ertanggou Reservoir

In the operation period, it is predicted that the water surface of Etanggou Reservoir will be 0.9 km^2. The inundation will involve in varieties of houses, auxiliary structures, tombs, trees,

special structures and other on-the-ground structures. In order to prevent the reservoir and its water from impacts of the said items, it is necessary to clear up the reservoir bed. The concrete measures will include:

Clearance for Health and Epidemic Prevention

The clearance for health and epidemic prevention will be done under the technical guidance of the local sector of health and epidemic prevention.

There are 16 sets of manure pits in the inundation-impacted area. After the dirt is removed outside the reservoir area, the pits will be disinfected with lime (1 kg/pit) and backfilled with soil.

There are 3240.8m^2 of livestock stables in the inundation-impacted area. The method to clearance is the same as for the manure pits above.

There are altogether 99 sets of tombs (including 20 ancient tombs) to be removed outside the reservoir area. Of the above, all the tombs younger than 15 years will be removed, the tombs older than 15 years will be managed in accordance with the local culture. After the removal, the tomb pits will be disinfected with chloride of lime (1 kg/pit) and backfilled with soil.

Clearance of Trees

In the reservoirs area, 167.86 of trees will be clear, including 21.37 mu of fruit plantations and 167.86 mu of other trees, in addition to 958 pieces of scattered trees.

Before the reservoir impoundment, all the trees above will either be cut or transplanted outside the reservoir area. The residual stumps should not exceed 0.3m above the ground surface.

Clearance of Structures

In the reservoir area, 2960.07m^2 of varieties of houses will be demolished and cleared. The height of the remaining part should not exceed 0.5 m above the ground surface. The floatable things will be managed in line of the regulations for health and epidemic prevention.

The auxiliary structures include fencing walls, threshing grounds, cellarage, manure pits, livestock stables, water tanks, stoves and ovens. They will be demolished together with the houses.

Clearance of Special Structure

In the inundation-impacted area, there is a hydrological station. It should be cleared before the reservoir impoundment.

c. Alagou Reservoir

The scope of Alagou Reservoir bed clearance is the area below the normal water level (940.77m).

Clearance for Health and Epidemic Prevention

Domestic garbage and excreta from livestock stables and toilets should be completely cleared. The remaining should be disinfected with chloride of lime (l kg/m^2). The treatment of excreta should follow Hygienic Standards for Sanitization of Human Excreta" (GB 7959-1987). The manure pits and sewage pits should be disinfected with chloride of lime (l kg/m^2) and buried.

The floor of houses, livestock stables and toilets as well as the walls 2m above ground will be sprayed with 4% supernatant of chloride of lime (0.3 kg/m^2). The time of disinfection should be no less than 30 minutes.

The above activities of clearance for health and epidemic prevention will be done in the order a resettlement, clearance and demolishment.

The floatable things such as leaves, branches and crop residues should be burnt on the site.

Demolishment and Clearance of Structures

In the demolishment of houses and auxiliary structures, the principle of “disinfection before demolishment” should be followed. Houses and sheds/stables will be demolished manually. The recyclable materials will belong to the owner, and s/he can carry them back home for re-use. The floatable things such as leaves, branches and crop residues should be burnt on the site. The walls should be pushed down and leveled.

The water wells (pits), cellarage, shaft sinking and drifting and other underground engineering in the draw-down area of the reservoir will be properly managed on the basis of the geological conditions.

Clearance of Trees

Before the reservoir impoundment, all the trees above will either be cut or transplanted outside the reservoir area. The residual stumps should not exceed 0.3m above the ground surface.

Evaluation of the Measures: Before the impoundment, bed clearance of the 3 reservoirs will be done strictly following the above measures to effectively reduce the contamination possibility against the water quality.

□3□Management of Air Environment

Sensitive Points in the Construction of Meiyaogou Reservoir

Dustproof at Roads and During Transportation:

Vehicle dust is generated mainly from road surface, road damage and the goods on a running vehicle. It can be reduced when effective control measures are taken.

Air pollution should be prevented in the process of transportation. When transporting a dusty material, the material should be properly moistured or covered with canvas. When transporting bulk cement, the tank should be well sealed. When transporting bagged cement, it must be properly covered. In addition, the vehicles should be frequently cleaned. The speed should not exceed 20 km/h when passing by Meiyaogou Village and the living quarters. Damaged road should be timely repaired, and the temporary roads at construction

sites should be covered with pebbles so as to reduce dust. In hot dry period, water spraying 4~6 times a day will be required at sensitive areas.

Generally speaking, a diesel engine discharges more tail gas with higher contents of pollutants. Most of the vehicles in the construction are of diesel engine, and it is required to be equipped with tail gas cleaner.

Evaluation of Measures: With the above environmental mitigation measures, the impacts of waste gas and dust from the construction on the sensitive target will be reduced to an acceptable level.

□4□Measures of Noise Control

Sensitive Points in the Construction of Meiyaogou Reservoir

The engineering time will be properly arranged. Whenever possible, engineering activities at night (from 22:00 to 09:00) should be avoided.

Measures of traffic control at sensitive road sections will be taken. Warning boards will be erected at Meiyaogou Village entrances and near the school. The speed will not exceed 20 km/h and loud horning will be forbidden when passing by sensitive areas.

Evaluation of Measures: With the above environmental mitigation measures, the impacts of noise on the sensitive targets will be reduced to an acceptable level.

□5□Management of Solid Waste from Construction

□ Construction of Meiyaogou Reservoir

A. One set of mobile recycling collection point and 3 sets of garbage bins will be arranged at the temporary living quarters, and these sanitation facilities will be regularly managed to prevent and reduce mosquitoes and flies.

B. Eight sets of garbage bins will be arranged at the engineering sites.

C. Two sets of garbage bins will be arranged at the management area.

D. Garbage truck will be equipped to carry the domestic garbage for landfill disposal.

□ Construction of Ertanggou Reservoir

A. Two sets of mobile recycling collection point will be arranged at the temporary living quarter.

B. Ten sets of garbage bins will be arranged at the management area.

C. Garbage truck will be equipped to carry the domestic garbage for landfill disposal.

□ Construction of Alagou Reservoir

A. One set of mobile recycling collection point and 2 sets of garbage bins will be arranged at the temporary engineering site and living quarter.

B. Ten sets of garbage bins will be arranged at the management area.

C. Garbage truck will be equipped to carry the domestic garbage for landfill disposal.

□6□Soil Conservation

□ Construction of Meiyaogou Reservoir

Environmental protection in the project construction will cover dam construction site, road building site, material ground, electricity transmission site, temporary engineering site living quarter, dumping ground and management area. The measures will include engineering measures, biological measures and temporary measures.

A. Dam Construction Site

a. Engineering measures will include the construction activities of dam, spillway, diversion/flood discharging tunnel, water supply culverts and so on. In accordance with the overall design, the slopes upstream and downstream of the dam will be protected, the spillway and diversion/flood discharging tunnel will be supported by energy dissipation and erosion control measures. The slopes at the both ends of the dam are rocky slopes and will be excavated at stable slope ratio.

b. Temporary Measures: Throughout the construction period, it should be avoided to carry out engineering activities at the days of big winds and rainfall.

In the process of construction such as dam building, masonry retaining walls will be built at downstream dam toe to prevent the soil and stone from dropping into the river downstream. Measures will be taken to protect the original land condition in the activities such as of excavation and stacking for the sake of soil conservation. Whenever possible, the excavated soil will be re-used, and it will be properly managed in the temporary stacking period. Effective measures will be taken to prevent any water-soil loss such as slope slide in the engineering activities. After the completion of the construction, the engineering site will be cleared.

The masonry gravity wall will be 0.5 m wide at the top, 1.0 m in height, ramp slope ratio of 1:0.3 and 0.5 m in base depth.

B. Road Building Site

The roads here mainly refer to the roads between the dam sites and the material grounds and between the reservoirs and the related structures. Dustproof measures such as water spraying will be taken during the construction. Measures of soil conservation will be taken. After the completion of the construction, the occupied land will be properly managed.

C. Material Grounds

Flooding period should be avoided in the excavation of a material ground. The excavated can be directly placed at the flooding side for the purpose of flood prevention and guidance. After material excavation, the material ground should be leveled. A material ground should be excavated at stable slope ratio. Before the material ground excavation at the left bank, bagged dregs retaining ridge should be built under the excavation site. After the material excavation, the ground should be properly managed such as pebble mulching.

The material ground of construction aggregate will be located at the beach upstream. For the sake of soil conservation, dregs retaining ridge will be built under the exaction site before the excavation. The excavated stone will be place inside the dregs retaining ridge. After the material excavation, the ground should be properly managed such as leveling. The bagged dregs retaining ridge will be 0.75m wide at the top, 0.75m in height and 1:0.5 in slope ratio.

D. Electricity Transmission Site

The construction of the facilities for electricity transmission should be arranged to reduce the exposure time of the excavated materials. After the construction, the ground should be properly managed.

E. Land Temporarily Occupied for Engineering Site and Living Quarter

The land temporarily occupied for engineering will be the sites for concrete, reinforcement and wood preparation, while the land temporarily occupied for living quarter will include dormitories, sheds and so on.

During the construction period, measure of water spraying will be done at the engineering sites and living quarters to alleviate dust problem. After the construction, the temporarily occupied land will be properly managed such as of leveling and pebble mulching.

F. Dumping Ground

Bagged retaining walls/ridges will be built around a temporary dumping ground. The walls/ridges will be 0.75 m wide at the top, 0.75 m in height and 1:0.5 in slope ratio. The dumped things will be covered in the days of big wind and rainfall. After the construction, the temporarily occupied land will be properly managed such as of leveling and pebble mulching.

Both permanent material stacking ground and permanent dumping ground will be located at the mesa upstream the auxiliary dam at the right side. For the road between permanent dumping ground to the dam site (0.5 km), the average height of the leveled dumping will be 3m. For the sake of soil conservation before stacking, masonry retaining walls will be built around a temporary dumping ground. The walls will be 0.5 m wide at the top, 1 m in height, 1:0.3 in slope ratio and 0.5 m of base depth. The stacked material will be covered at the days of big wind and rainfall. If it is to be mulched with stone, the under-layer and up-layer will be 100 mm and 200 mm in diameter.

G. Permanent Living and Officing Quarters

After the completion of the management station, the land will be leveled and greened. The species to grow will include Haloxylon ammodendron, Calligonum polygonoides and Astragalus adsurgens. The total coverage of greening will be 0.04 ha.

 Construction of Ertanggou Reservoir

The soil conservation activities in the project construction will cover the primary construction section, the special structure re-construction section and the resettlement zone. The primary construction section will include dam construction site, road building site, material excavation site, electricity transmission site, temporary engineering site and living

quarter, temporary stacking ground and flood prevention area. The measures will include engineering measures, biological measures and temporary measures.

A. Primary Construction Section

a. Dam Construction Site

Engineering measures will include the construction activities of dam, spillway, sand-wash tunnel, diversion/flood discharging tunnel and so on. In accordance with the overall design, the slopes upstream and downstream of the dam will be protected, the spillway and diversion/flood discharging tunnel will be supported by energy dissipation and erosion control measures. The slopes at the both ends of the dam are rocky slopes and will be excavated at stable slope ratio for the sake of soil conservation.

In the process of dam building, masonry retaining walls will be built at downstream dam toe to prevent the soil and stone from dropping into the river downstream.

The retaining wall will be 450 m long. This masonry gravity wall will be 0.5m wide at the top, 1.0m in height, ramp slope ratio of 1:0.3 and 0.5 m in base depth. The earthwork, backfill sand/gravels and masonry will be 361.7m^3, 123.8 m^3 and 472.5m^3, respectively.

Reservoir Management Station:

Before the construction of the reservoir management station, the surface soil will be peeled off, put at a corner of the site, kept with bagged retaining wall around and covered at the days of big wind and rainfall. The work amount of peeling/backfilling and bagged retaining wall will be 150m^3 and 43 m^3, respectively. The bagged retaining wall will be 50m long, 0.75 m wide at the top, 0.75 m in height, ramp slope ratio of 1:0.5.

Biological Measure:

After the completion of the management station, the surface soil will be backfilled, and the land will be leveled and greened. The species to grow will include Haloxylon ammodendron (140 pc), Calligonum polygonoides (140 pc) and Astragalus adsurgens (2.5 kg of seeds). The total coverage of greening will be 0.05 ha and the level ground will be 0.1 ha. In addition, a set of irrigation system will be equipped.

(Feasibility Analysis of the Biological Measures: The soils in the project are mainly sandy soil, and there is some light chestnut soil and brown soil in the reservoir area. The thin soil is loose in texture and mixed with weathered detritus. According to the climatic and soil conditions in the project area, the species to be selected are drought-endurance plants such as Haloxylon ammodendron, Calligonum polygonoides and Astragalus adsurgens.

b. Road Building Site

Before the road construction, bagged retaining walls (7200 m long) will be built at the both sides of the filled subgrades for soil conservation. The walls will be 0.75 m wide at the top, 0.75 m in height and 1:0.5 in slope ratio. The earthwork will amount to 5063 m^3. After the completion, the bagged soil will be used for plant cultivation. Water will be sprayed for dust depression.

c. Material Ground

C_{1-1} material ground: The excavation depth will be less than 4.2m with stable slope ratio of 1:2.

The activity of engineering waste dump will be combined with the excavation of construction materials downstream the dam. Since the quantity of material excavation is much larger than the waste dump, the pit for material excavation will kept big enough even with waste dump. Material will be excavated section by section. After material excavation is completed in one section, it will be backfilled with engineering waste and leveled. After the sites for C_{1-2} and C_{1-3} material grounds are leveled, gravels on the beach will be collected for mulching the site surfaces. The under-layer and up-layer gravels will be 100 mm and 200 mm in diameter. Altogether, 34.65 ha of land will be leveled, and 22.90 ha will be mulched with gravels. After the completion of the material excavation downstream, the scouring section will be protected with slope masonry to prevent the embankment from slope slide or collapse. At the same time, this section of river will be trimmed for smooth flow. The slope protection will be 1500m long and 0.3 m thick and with slope ratio of 1:3. The masonry required will amount to 1350m^3.

The material ground for C3 aggregate will be located on the riverbed (III terrace) downstream. To prevent the site of material excavation from water-soil loss, dregs retaining ridge will be built under the site before the excavation. After the excavation, the stone material will be placed inside the dregs retaining ridge (300 m long). The bagged dregs retaining ridge will be 0.75m wide at the top, 0.75m in height and 1:0.5 in slope ratio. 211m^3 of earthwork will be required to build this bagged dregs retaining ridge. After the material excavation, the site will be leveled (4.0 ha).

d. Electricity Transmission Site

In the construction of electricity transmission facility, the dregs from the wire pole pit will be put together and retained with bagged dregs retaining ridge. It will be covered at the days of big wind and rainfall. After the completion of the construction, the site will be leveled (5.30 ha). The ridge will be 1000m long, and 437.5m^3 of earthwork will be required.

The temporary pipeline for construction water supply will lie on the ground surface. The pipeline will be dismantled after the completion of the construction, and the site will be managed (0.48 ha).

In the construction of temporary electricity transmission facility, the dregs from the wire pole pit will be put together and retained with bagged dregs retaining ridge. It will be covered at the days of big wind and rainfall. After the completion of the construction, the site will be leveled (1.25 ha). The ridge will be 0.75m wide at the top, 0.5m in height and 1:0.5 in slope ratio. The ridge of 300 m long will require 131.5m^3 of earthwork.

In the construction of permanent electricity transmission facility, the dregs from the wire pole pit will be put together and retained with bagged dregs retaining ridge. It will be covered at the days of big wind and rainfall. After the completion of the construction, the site will be leveled (5.30 ha). The ridge will be 1000m long, and 437.5m^3 of earthwork will be required.

e. Temporary Engineering Site Living Quarter

Bagged dregs retaining ridge of 425 m will be built around the site. The cross section of the ridge is of the same as for that at the dam site.

After the completion of the construction, the site will be leveled (1.74 ha). If it is to be mulched with stone, the under-layer and up-layer will be 100 mm and 200 mm in diameter.

f. Temporary Material Ground

Before stacking, bagged retaining walls (1100 m) will be built around a temporary material stacking ground. The cross section of the wall is of the same as for that at the dam site. The bagged will contain 540m^3 of soil. The material will be covered at the days of big wind and rainfall (covering material 25600m^2). After the material is used up, the site (2.52 ha) will be mulched with stone. The under-layer and up-layer will be 100 mm and 200 mm in diameter, respectively.

g. Flood Prevention Area

In the process of foundation excavation for flood bank, the backfill earth beside the construction site will be retained with bagged retaining ridge (550m) and cover on top. The ridge will be 0.75m wide on top and 0.75m in height with slope ratio of 1:0.5. Altogether, 468m^3 of earth and 650m^2 of covering material will be required. To reduce the time of earth/stone stacking, engineering activities should not be arranged at the days of big wind and rainfall, if applicable. After the completion of the construction, the site (1.50 ha) should be leveled.

B. Construction Site of Special Structures

a. Site of Hydrological Station

Before the engineering, the surface soil will be peeled off. The peeling quantity depends on how much soil will be required for the forthcoming vegetation building. The soil will be retained with bagged retaining ridge. It will be covered at the days of big wind and rainfall for soil conservation.

After the completion of the hydrological station, the surface soil will be backfilled, and the land will be leveled and greened. The species to grow will include Haloxylon ammodendron, Calligonum polygonoides and Astragalus adsurgens. In addition, a set of irrigation system will be equipped.

b. Site of Simple Road Construction

Before the construction, the filled roadbed will be protected by bagged retaining ridge at the both sides for soil conservation.

C. Resettlement Zone

a. Production Area

In accordance with the resettlement action plan, 15.73 ha of farmland will be required for the resettlers due to the construction of Ertanggou Reservoir. It is planned to reclaim 13.07 ha of farmland. Vegetable cultivation will be the main crop, and there will be limited problem of

water-soil loss. At the new production area for resettlement, the following measures of soil conservation will be taken:

According to the resettlement action plan, the land reclamation will be: When the slope is between 20°~25°, farmland of sloping terrace will be built, and when the slope is less than 20°, farmland of leveling terrace will be built. Some of the farmland ridges will be protected by dry-laid stone masonry. In addition, irrigation and drainage facilities will be built around.

The terraced farmland will be reclaimed along the contour. Small structures such as water interception trench, water retaining pool and drainage channel will be constructed for water harvest and soil conservation.

Contour cultivation and intercropping will be the major patterns in the agricultural production in the resettlement zone. Then, the vegetation coverage and duration will be enlarged together with soil conservation.

b. Living Quarter

The living quarter for the resettlers will be 2.67 ha. It will be composed of the facilities of residential houses, school, roads and other infrastructures. Problems in soil conservation will take place mainly during the period of land leveling. According to the resettlement action plan, the measures of soil conservation here will include the construction of masonry retaining walls, slope protection, drainage channels and so on.

 Construction of Alagou Reservoir

The project construction will be done in 6 sections. They are dam construction site, material excavation site, material stacking ground, road building site, temporary engineering site and living quarter and special structure construction site. The measures will include engineering measures, biological measures and temporary measures.

A. Salient works area

a. Salient structure

During the process of dam filling, there will be a cofferdam on the upper side but no retaining structure on the lower side, so a retaining wall needs to be built at the dam toe on the downstream side to prevent mud and stone from entering to the lower river channel in construction. The retaining wall will be of masonry gravity wall with a length of 450m, a crest width of 0.5m, a height of 1.0m, a slope ratio of 1:0.3, and a foundation depth of 0.5m, and it requires 146m^3 of earth cut and 517 m^3 of grouted rubble.

b. Reservoir management station

Prior to the construction the management station, the topsoil in this area will be stripped and placed at a corner in a concentrated way. It will be retained by sacked earth and covered with color striped fabric in case of strong wind or rainstorm. When the station is built, make green the open spaces, backfill the land with topsoil and level it, plant bushes sacsaoul, Calligonum and seeds of Astragalus Adsurgens Pall, and furnish a complete set of irrigation system. Topsoil stripping and backfill amounts to 150mm^3, and the area to be retained with sacked earth is 50m long. The sacked earth retaining ridge will be 0.75m wide on the top, 0.75m

high, and 1:0.5 in slope ratio and require 43m^3 of sacked earth. The area to be greened is 0.05hm^2, which will be planted with 140 sacsaouls, 140 Calligonums, and sown with 2.5kg of Astragalus Adsurgens Pall seeds.

c. Access to reservoir

The accesses from the reservoir area to outside include a 2km-long road from the reservoir to the reservoir management area and a 4km-long road from the reservoir management area to Nanshan mining area. Both are of Grade 3. The roadbed will be prepared through excavation and filling, and the latter will be the major part. To prevent loss of soil and water during the roadbed construction, it's planned to use sacked earth for retaining on both sides of the filled roadbed with a retaining length of 7200m. The sacked earth retaining ridge will be 0.75m wide on the top, 0.75m high, and 1:0.5 in slope ratio and require 5400m^3 of sacked earth.

B. Quarry area

Although the quarry upstream of the dam for dam fill materials will be inundated at reservoir impoundment, it should be excavated at a stable slope to avoid landslide caused by watering. The project spoil will be treated combined with the use of the quarry upstream of the dam. Since the amount of the excavated materials is far more than that of the spoil, the excavated pit will be big enough to accommodate the spoil. The quarry will be excavated by zone. After one zone is exploited, it will be backfilled with spoil in time, and then the spoil will be spread and leveled. The surface of the filled spoil will be covered with derrick stone collected from the shoal in two layers, the lower one with stone of about 100mm in diameter and the upper one with stone of about 200mm in diameter. The spoil surface to be treated totals 5.5hm^2. As for the quarry downstream of the dam, to prevent water flow from scouring the excavated slopes and the consequent landslide and collapse of the banks, masonry slope protection is proposed for the excavation slopes of the section that may suffer scouring. Meanwhile, river dredging should be conducted to smooth the water flow. The section to be protected is 1500m long with a slope ratio of 1:3 and a protection thickness of 0.3m and requires 5985m^3 of grouted rubble.

The quarry for aggregate is at Yu'ergou Gobi. To prevent loss of soil and water on the mining surface, under which a retaining ridge will be build before exploitation, and the rock will be piled within the ridge. The ridge will be built with sacked earth, 300m long, 0.75m wide on the top, 0.75m high and 1:0.5 in slope ratio, and require 255m^3 of sacked earth. After the exploitation, the excavation slash will be treated. The land will be leveled first, and then be covered with derrick stone collected nearby in two layers, the lower one with stone of about 100mm in diameter and the upper one with stone of about 200mm in diameter. The slash to be treated totals 2.85hm^2.

C. Storage area

The temporary storage area is located at the left-bank alluvial plain 1km downstream of the damsite. To prevent loss of soil and water, sacked earth will be piled around the area prior to material storage for the purpose of retaining. The piled sacked earth will extend 720m long with a sectional size same as that of the salient works area and require 540m^3 of sacked earth. The stored materials will be covered with color striped fabric in construction in case of strong wind or rainstorm. The color striped fabric demand is 25500m^2. When the stored materials are used up, the storage slash should be treated through covering it with derrick stone collected nearby in two layers, the lower one with stone of about 100mm in diameter

and the upper one with stone of about 200mm in diameter. The slash to be treated totals 2.4hm^2.

D. Construction access area

Sacked earth will be arranged on both sides of the access during the construction period to avoid soil loss in roadbed construction and operation. The sacked earth block will be 5140m long in total with a sectional size same as that of the salient works area. When the construction is completed, the access will be demolished, and the area being occupied will be leveled and treated through covering it with derrick stone in two layers, the lower one with stone of about 100mm in diameter and the upper one with stone of about 200mm in diameter. The area to be treated totals 1.8hm^2.

E. Production and living quarter in construction

The production and living quarter in construction is situated at the foot of the mountain and is 2km downstream of the dam, covering 1.07hm^2. Temporary protective measures should be taken during the construction to prevent loss of soil, and the construction slash should be treated after the completion of construction.

The temporary protective measures in construction are: to pile sacked earth into a retaining ridge around the construction area for 425m in total with a sectional area same as that of the salient works area; and to treat the construction slash when the construction is completed, i.e., to cover the ground surface being leveled with derrick stone collected nearby in two layers, the lower one with stone of about 100mm in diameter and the upper one with stone of about 200mm in diameter. The area to be treated totals 1.07hm^2.

F. Special facilities reconstruction area

a. Relocation area for hydrometric station

Alagou Hydrometric Station will be inundated in the reservoir area, so it's planned to select a site on the upstream to rebuild a hydrometric station. The relocation area will occupy 1.53hm^2 of Gobi barren land. The planned water and soil conservation approach is as follows: the topsoil in the area will be stripped prior to the construction with an amount up to the demand of vegetation and be placed at a corner in a concentrated way. It will be retained by sacked earth around and covered with color striped fabric in case of strong wind or rainstorm. Since there are many strong wind days in the local area, it's proposed to temporarily cover the disturbed ground surface with color striped fabric until the end of the construction so as to avoid loss of soil and water due to wind erosion. When the hydrometric station is built, make green the open spaces, backfill the land with topsoil and level it, plant bushes sacsaoul, Calligonum and seeds of Astragalus Adsurgens Pall, and furnish a complete set of irrigation system.

As for the relocation area for hydrometric station, topsoil stripping and backfill amounts to 1350mm^3, and the area to be retained with sacked earth is 150m long. The sacked earth retaining ridge will be 0.75m wide on the top, 0.75m high, and 1:0.5 in slope ratio and require 112m^3 of sacked earth. The color striped fabric demand is 2200m^2. The area to be greened is 0.45hm^2, which will be planted with 1260 sacsaouls, 1260 Calligonums, and sown with 22.5kg of Astragalus Adsurgens Pall seeds.

b. Power line reconstruction area

3km of 220kV power line needs to be reestablished at other place for the project, and the construction will disturb the ground surface and result in loss of soil and water. The reconstruction area will occupy 0.16hm^2 of land. It's planned to temporarily cover the area with color striped fabric in construction and to treat the area by covering it with derrick stone after construction. The color striped fabric demand is 220 m^2, and the slash to be treated is 0.16hm^2.

c. Water supply pipe line reconstruction area

2.0km of water supply pipe line needs to be reestablished for the project, and that will occupy 0.82 hm^2 of land, of which 0.63hm^2 is Gobi desert and 0.19hm^2 is dry land. The backfill earth will be piled on one side of the pipe temporarily during the excavation period, retained by sacked earth and covered with color striped fabric. The time for temporary piling of the earth rock should be minimized in construction, and the construction should avoid strong wind or raining days as far as possible. When the pipes are installed, the occupied area will be covered with rock block.

The land to be treated totals 0.82 hm^2, and the sacked earth retaining ridge will be 550m long, 0.75m wide on the top, 0.75m high, and 1:0.5 in slope ratio, and require 468m^3 of sacked earth. The color striped fabric demand is 650m^2.

d. Communication line reconstruction area

4km of communication line needs to be reestablished at other place for the project, and the reconstruction area will occupy 1.15hm^2 of land. The prevention measures proposed are the same as those for the power line reconstruction area, and the main measures are to temporarily cover the area with color striped fabric in construction and to treat the area by covering it with derrick stone after construction. The color striped fabric demand is 450 m^2, and the slash to be treated is 1.15hm^2.

e. Simple road reconstruction area

6.5km simple road needs to be reconstructed, and that will occupy 8.45 hm^2 of land, of which 5.98hm^2 is Gobi desert and 2.47hm^2 is dry land. The roadbed will be prepared through excavation and filling, and the latter will be the major part. To prevent loss of soil and water during the roadbed construction, it's planned to use sacked earth for retaining on both sides of the filled roadbed with a retaining length of 13,000m. The sacked earth retaining ridge will be 0.75m wide on the top, 0.75m high, and 1:0.5 in slope ratio and require 11050m^3 of sacked earth.

Evaluation on the measures: The above measures to control soil and water erosion can significantly reduce the loss of soil and water for the three reservoirs during the project construction period and natural restoration period. In addition, the planting measure can increase the greening area in the project area, and that will play a certain role in improving the regional environment.

4.2.1.3 Mitigation measures during operation period

4.2.1.3.1 General measures

(1) Domestic sewage treatment measures;

(2) Solid waste treatment measures;

(3) Ecological environment protective measures - measures to prevent drying up of the lower watercourse;

Specific measures to be taken for the three reservoirs in regard to the above three aspects are presented in Section 4.2.1.3.2.

(4) Measures to prevent dam failure risk during operation period

To prevent dam failure risk, the emergency measures for the three reservoirs are: internal emergency measures, emphasizing on the measures for the dams; external emergency measures, emphasizing on the protective facilities for the safety downstream of the dam and remedy measures.

 Internal emergency measures

A. To take urgent measures to lower the water level of the reservoir, for example, to open the spillway, flood release tunnel and other water discharge facilities.

B. To immediately evacuate the construction and management personnel on the dam and in the adjacent areas to ensure the personal safety of the staff.

 External emergency measures

A. To analyze the range of inundation of the lower reaches by GIS and other information technologies, and to determine the impact range of dam failure based on the analysis results.

B. To inform the local government of the area downstream of the dam about the accident, evacuate the residents possibly impacted, and minimize the personal and property dangers to the residents caused by dam failure.

C. To clarify the quantity, position, and performance of emergency supplies and initiate the distribution and receiving procedures.

D. To ensure the accesses in the plant area and to outside are unimpeded.

E. To initiate the communication, transportation and other systems that can be used when the accident occurs.

Evaluation on the measures: The above measures can minimize the losses of dam failure.

4.2.1.3.2 Special measures

(1) Domestic sewage treatment measures

 Meiyaogou Reservoir

Meiyaogou Reservoir is staffed with 6 front-line persons. If they work in two shifts, there will be 3 front-line operators constantly, plus 4 management personnel, then the sewage

discharge will be 0.6t per day based on a per capita sewage discharge of 85L per day, and the annual sewage discharge will be up to 217t.

WSZ underground complete sewage treatment equipment is proposed to treat this part of sewage. It has a sewage treatment capacity of 1m^3/h, which can meet the demand of domestic sewage treatment for the management area. After being treated, the domestic sewage can be used to water the grasses and plants in the area and the trees along the permanent road in summer and be discharged to the desert and Gobi far away from the river course in winter.

 Ertanggou Reservoir

WSZ underground complete sewage treatment equipment is proposed to treat the sewage produced by the reservoir operators and management personnel during the operation period. It has a sewage treatment capacity of 1m^3/h, which can meet the demand of domestic sewage treatment for the management area. After being treated, the domestic sewage can be used to water the grasses and plants in the area and the trees along the permanent road in summer and be discharged to the desert and Gobi far away from the river course in winter.

 Alagou Reservoir

Alagou Reservoir is staffed with 16 persons during the operation period who will produce 4 tons of sewage per day. The domestic sewage from the reservoir management area will be collected and drained to a septic tank via pipe. The 10-40B10 septic tank built during the construction period can be used, but vehicles cannot pass over it. Due to the small flow of the Alagou River on the downstream of the reservoir, direct discharge of sewage to the river will pollute the lower reaches to a certain extent. It’s required that the treated domestic sewage be collected through an impervious tank. The impervious tank will utilize the facilities built during the construction period and will collect the outflow from the septic tank. The water can be used for plant watering in the management area or evaporate naturally and will not be discharged directly to the water body.

Evaluation on the measures: The above domestic sewage treatment measures can ensure the sewage treatment up to the standard 100%, and the comprehensive utilization of the treated water can permanently and effectively avoid the pollution of domestic sewage to the river water.

(2) Solid waste treatment measures

 Meiyaogou Reservoir, Ertanggou Reservoir

3 garbage collectors will be furnished in the management and living quarters of Meiyaogou Reservoir and Ertanggou Reservoir respectively to collect the domestic garbage in a concentrated way. The garbage will be cleared regularly each week and be transported to and filled in the solid waste landfill of Tuokexun County so as to prevent it from entering the reservoir area and polluting the water body.

 Alagou Reservoir

4 garbage collectors will be furnished in the management and living quarters of Alagou Reservoir to collect the domestic garbage in a concentrated way. The garbage will be cleared

regularly each week and be transported to and filled in the solid waste landfill of Tuokexun County so as to prevent it from entering the reservoir area and polluting the water body.

Evaluation on the measures: The above domestic garbage treatment measures can ensure a garbage treatment rate of 100% and can effectively protect the living environment of the management area.

(3) Ecological environment protective measures - measures to prevent drying up of the lower watercourse

To carry out the essentials of the Circular on Strengthening Environmental Protection in Hydropower Development (HuanFa [2005] No. 13) jointly issued by the former General Administration of Environmental Protection of China and the National Development and Reform Commission, dehydration of the lower watercourse and increment of drying-up extent of the watercourse should be avoided so as to reduce the impact on water environment and aquatic ecology.

 Meiyaogou Reservoir

Currently Meiyaogou River course is basically drying up when water is diverted from the headwork of Renmin canal; in addition, there is no ecological flow demand for the watercourse downstream of the Meiyaogou Reservoir dam. Therefore, the reservoir will not discharge water to the lower watercourse during the operation period.

 Ertanggou Reservoir

According to the design of main works, a 500mm-diameter glass fiber reinforced plastic pipe extending from the access to the dam to the riverbed downstream of the dam is proposed at the outlet of irrigation water outlet to discharge ecological base flow. The discharge is required to be not less than 10% of the long-term average flow at the damsite section, i.e., 0.25 m^3/s.

 Alagou Reservoir

A small-sized siphon pipe will be installed at the damsite to discharge ecological base flow not less than 0.4 m^3/s.

Evaluation on the measures: The discharge measures for ecological base flow can ensure no increment in drying up section of the Ertanggou and Alagou rivers during the operation period of the works.

(4) Resettlement

Among the three proposed reservoirs, only Ertanggou Reservoir involves resettlement. To solve the problem of poor soil quality of farmland in the host area for Ertanggou Reservoir, it’s required to mellow the soil of farmland in the host area to ensure the quality of the farmland not inferior to that of the original farmland.

Summary of General Mitigation Measures against Environmental Impacts of Reservoir Works

Table 4.2-10

Type	Period	EI Factor		Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Reservoir	Design stage			During the design stage of the three reservoirs, the environmental protection requirements have been considered as far as possible in the selection of damsite, quarry, and dumping area, construction planning and other aspects so as to obtain the maximum project benefit with the minimum disturbance and environmental change. In the preparation of the environmental impact report, the second time of public participation will be involved to solicit the comments and suggestions from the people that may be impacted in the project construction so as to further improve the design of main works and environmental protection measures. Meanwhile, the public comments and suggestions will be reported to the relevant authorities and monitoring departments, and the solutions will be publicized.	Designer, Environment workgroup	Environmental managements offices of Turpan City, Shanshan County, and Tuokexun County	—
	Construction period	Water environment		① Use of conventional explosive in construction will greatly influence water quality, so it's suggested to use emulsified explosive, water gel explosive and other environmental friendly explosives to mitigate the impact of explosives on water quality. ② In line with the requirements of "three simultaneousness", the Owner should include the construction and effective operation of waste water treatment station as an article of the Project Contract to ensure its effective operation. ③ Project environmental management department should oversee and inspect the construction site regularly, find out the production waste water treatment status, and put forward the corrective comments on harmful situations orally and in written. ④ Reservoir bottom clearance measures.	Constructor	Xinjiang Environmental Protection Department, environmental protection bureaus of Turpan Prefecture, Turpan City, Shanshan County and Tuokexun County	Turpan Prefecture Environmental Monitoring Station
		Ambient air	Dust	① The dam construction area and material piling area where there is quite a lot of excavation, the measure of sprinkling will be taken on days without rain (mainly for the places of excavation, dumping and loading) to speed up the dust settlement and lessen the time and scope of dust impact. The times of sprinkling and water demand will be determined according to the weather and dust yield. ② The neighboring areas of the processing system will be supplemented with dust reduction through sprinkling to lessen the time and scope of dust impact. ③ Air contamination should be prevented during the material transportation process. The dusty materials should be wetted properly or covered with canvas tarpaulin. The tanks of vehicles to transport bulk cement should be in good sealed status, and the bagged cement should be covered and closed in transport. The transportation vehicles should be often cleaned. The pavement damaged by vehicles should be repaired in time, and the temporary construction road should be paved with gravel to reduce the dust caused by poor road conditions. ④ Sprinkling trucks should be arranged in the construction area to sprinkle the excavation area, material piling area, construction road and other places with much dust on the days without rain. The dumping area should be sprinkled regularly to control dust, and the times of sprinkling will be determined according to the actual dust yield. ⑤ In the light of the relevant regulation on labor protection of China, the construction personnel on the site must be provided with dust proof mask and other protective articles for labor protection.			

Type	Period	EI Factor		Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
			Waste gas	① To control the air pollution by construction waste gas emission and reduce CO, NO_2 and other pollutants, the Constructor should select construction machinery and means of transport to ensure the waste gas emission meet the national standard. ② To implement the Standard of Vehicles Scrappage, carry out the system of mandatory renovation and scraping, and duly replace the old vehicles whose engines have high gas consumption and low efficiency and the tail gas emission seriously exceeds the standard. ③ Enhance the maintenance of the machinery equipment using fuel oil so as to keep the engines in normal and good service condition. ④In the section of tunneling by drilling and blasting, ventilation and dust removal measures will be considered in construction. The installation of axial flow ventilators and air purifiers can significantly improve the air quality.	Constructor	Xinjiang Environmental Protection Department, environmental protection bureaus of Turpan Prefecture, Turpan City, Shanshan and Tuokexun counties	Turpan Prefecture Environmental Monitoring Station
		Acoustic environment		① Distribute earplugs, earflaps, anti-noise cotton, anti-noise helmet and other personal protection articles, and choose the most proper protection articles according to the post. ② Strengthen road curing and vehicle maintenance so as to reduce noise source. ③ Vehicles in service must conform to the Limits of Noise Emitted by Stationary Road Vehicles (GB16170-1996) and Allowable Noise Limits for Motor vehicle (GB1495-79), and low-noise vehicles should be used as far as possible. ④ Use anti-vibration mounting for equipment vibrating greatly.			
		Domestic garbage		① Arrange movable garbage collectors and garbage cans in the temporary living quarters, often spray pesticide at the garbage collecting station to avoid unfavorable impact on the living and health of the construction personnel due to breeding of mosquitoes and flies. ② Furnish refuse trucks to deliver domestic garbage to the wasteyard closest to the project area, and treat the garbage by filling. ③ Do a good job in sanitation propaganda to the construction personnel and make them get used to put garbage in the garbage collector.			
		Ecological environment		① Protection of terrestrial plants Identify the scope of area for construction and forbid the construction personnel and vehicles to enter into the non-construction area. When the construction is completed, the temporary production and living facilities will be removed, and these areas, quarry, and other construction slashes will be leveled to facilitate the recovery of vegetation under natural status. ② Protection of terrestrial animals: A. Strengthen propaganda and education of the ecological protection in forms of brochure and sign plates to the construction personnel and residents around, and restrict the construction personnel to hunt the local wild animals illegally and eat birds and beasts to mitigate the impact of construction of the local terrestrial animals. B. Set up a punishment system for ecological destroying, forbid the construction personnel to hunt wild animals illegally or to eat birds and beasts; identify the scope of construction area according to the general construction layout, establish stakes and boundaries, construction personnel and vehicles to enter into the non-construction area; forbid smoking and firing in the non-construction area, and prohibit the construction personnel to use fire in the field. C. Most of the wild birds and beasts go out to find food in morning and evening, and the birds rest at the noon time. To reduce disturbance of blasting and construction noise to wild animals, blasting method, quantity and time should be planned well, and blasting in the morning, evening and noon should be minimized. D. Reinforce the environmental protection, supervision and management for the project construction, establish environmental protection and monitoring organization and specific environmental protection personnel, strengthen environmental protection education to the construction personnel, forbid them to hunt wild animals, and handle the illegal activities by law.			
		Public health		① Sanitation clearance for the construction living quarter and management area ② Protection of drinking water source and disinfection of drinking water ③ Harmless treatment of garbage, dejecta and wastewater ④ Prevention against mosquitoes and extermination of flies and rats ⑤ Prevention and quarantine for public health □ People evacuation at the blasting site			

Type	Period	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Cultural relic	Once cultural relic is found during the construction period, immediately report to the local cultural relic protection agency and protect the site well in time, and continue the construction when the relic protection agency properly handles the case. The cost arising thereof will be covered in the main works.	Constructor	Supervisor	

Summary of Special Mitigation Measures against Environmental Impacts of Reservoir Works

Table 4.2-11

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Construction period						
Turpan City Turpan City	Yaomeigou Reservoir Yaomeigou Reservoir	Production wastewater	① Wastewater from aggregate processing system will be treated by coagulation and sedimentation method. The wastewater of aggregate processing plant will flow from sand washer to wastewater regulation tank, and then the wastewater with high content of suspended solid will be pumped to fine sand recovery and treatment machine. That can recover about 80% of fine sand greater than 0.035mm. The filtered water will be subject to primary sedimentation in grit tank, and the clear liquid on the top will be added with flocculant and flow to sedimentation tank for secondary sedimentation. The top clear liquid subject to flocculating sedimentation can be used for watering of the construction site for dust reduction, vegetation irrigation, and so on. ② A rectangular tank will be built at the confluence of oily wastewater for machinery washing, and at its inlet oil-separating materials will be furnished. The oily wastewater will flow through the materials to the tank by gravity, and the floating oil will be recovered when the tank is full. After 12 hours the water will be drained to water storage tank and may be used for water spraying to reduce dust. The treatment structure is simple and free of maintenance of mechanical equipment. During the operation, the operator only needs to regularly clean and replace the oil-separating materials, clean the tanks, and recover the floating oil on time. After the construction, the bottom of the treatment tanks will be cleared with the waste residue being transformed to solid waste landfill. The treatment tanks will be filled with earth after clearance. ③ Wastewater from concrete batching system will be mainly spread on the ground surface in flake, and the cement slurry will be condensed after water evaporation and seepage and harden the ground surface. It needs to be moved after the construction.	Constructor	Turpan City Environmental Protection Bureau Turpan Prefecture Environmental Protection Bureau Xinjiang Environmental Protection Department	Turpan Prefecture Environmental Monitoring Station

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Turpan City	Yaomeigou Reservoir	Domestic sewage	① A septic tank will be built in the temporary living quarter to treat the domestic sewage, and the domestic sewage discharged in a concentrated way will be drained to the septic tank via pipes and then be subject to regular sterilization and disinfection. Septic tank: A septic tank will be arranged in the temporary living quarter lined with 20cm-thick C20 concrete on the bottom and the four sides, and its bottom will be covered with 10cm-thick gravel cushion. The daily sewage discharge of the construction area of Meiyaogou Reservoir works is 49m^3/d, the sewage receiving tank for the temporary living quarter is designed to accommodate 5 days of sewage discharge, so its design sewage receiving capacity is 250m^3. The design size of the septic tank is: L×W×D=15m×10m×2m. □ Latrine of brick and concrete structure is arranged in the temporary living quarter, and it's considered to use grouted rubble for seepage control. Only feces drying tank is considered, and the feces treated will be used as manure. The latrine unnecessary after the construction will be cleared, disinfected and embedded. ③ Environmental friendly lavatories will be built based on the number of people and the inhabitation density of the construction areas of the main works and for other works. The lavatories are simple and easy to remove, and their location can be adjusted according the need of the construction personnel.			
		Rot of plants in reservoir area and others	The construction of geomembrane requires the removal of building in the reservoir area, felling of trees, and clearance of floating matters. As for the removal of buildings, the walls will be pushed over and leveled with bulldozer, and the garbage be transported to the permanent dumping area. The matters easy to float in the reservoir will be cleared manually, and all the trees will be cut down and transported out of the reservoir area or be moved outside. The trees should be cut flush with the ground surface with the studs left over not more than 0.3m over the ground surface. The remaining branches, withered trees and other floating matters will be transported outside the reservoir area.	Constructor	Construction Supervisor	
Turpan City	Yaomeigou Reservoir	Acoustic environment	① Reasonably arrange the construction time, and try to avoid night construction (22:00 to next 9:00). ② Take traffic control measures at sensitive road sections and set up sign plates at both ends of the access to Meiyaogou Village to restrict the vehicle speed within 20km/h and to forbid loud horn.	Constructor	Xinjiang Environmental Protection Department Turpan Prefecture Environmental Protection Bureau Turpan City Environmental Protection Bureau	Turpan Prefecture Environmental Monitoring Station

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Ambient air	① Air contamination should be prevented during the material transportation process. The dusty materials should be wetted properly or covered with canvas tarpaulin. The tanks of vehicles to transport bulk cement should be in good sealed status, and the bagged cement should be covered and closed in transport. The transportation vehicles should be often cleaned. When passing Meiyaogou Village and permanent and temporary office and living quarters, the vehicles shall run at a speed not more than 20km/h. The pavement damaged by vehicles should be repaired in time, and the temporary construction road should be paved with gravel to reduce the dust caused by poor road conditions. In addition, the pavement in the area distributed with sensitive ambient air points shall be sprinkled 4-6 times during hot and dry period. ② During the construction period, the vehicles are most of large-scale transportation diesel vehicles. The tail gas emission and pollutant content of them are higher than those of the gasoline vehicles, so they should be installed with tail gas purifier to ensure the tail gas emission up to the standards.	Constructor	Xinjiang Environmental Protection Department Turpan Prefecture Environmental Protection Bureau Turpan City Environmental Protection Bureau	Turpan Prefecture Environmental Monitoring Station
		Domestic garbage	① 1 movable garbage collector is arranged in the temporary living quarter, furnished with 3 garbage cans. The garbage collector station will be sprayed with pesticide to prevent breeding to mosquitoes and flies and reduce the unfavorable impact to the living and sanitation of the construction personnel. ② 8 garbage cans will be provided in the areas with quite concentrated dam construction activities. ③ The management and office area will produce less garbage, and 2 garbage cans will be provided. ④ 1 refuse truck will be furnished to deliver the domestic garbage to Turpan City County wasteyard and treat it by filling.	Constructor	Xinjiang Environmental Protection Department, Turpan Prefecture Environmental Protection Bureau, Turpan City Environmental Protection Bureau	

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Soil and water conservation	① Salient works area a. Engineering measures: The salient structures consists of the dam, spillway, diversion and flood release tunnel, water supply culvert, etc.. The design of the salient works has considered such measures as slope protection for the upstream and downstream slopes of the dam, energy dissipation and anti-scouring for the spillway and diversion and flood release tunnel, rock surface for the excavation slopes on both ends of the dam, and all slopes being excavated at stable slope ratio. b. Temporary measures: Construction in strong wind day or raining day will be minimized. During the construction, masonry retaining wall is required at the lower dam toe in dam filling to avoid the earth and rock from entering the downstream river reaches and the soil erosion. It's forbidden to excavate, pile materials and harden the ground at discretion to minimize damage to the original ground. Reasonable measures will be taken to protect the soil and water resources. The excavated earth should be utilized as far as possible, and temporary protection treatment should be conducted in piling prior to the utilization. Effective measures will be taken to control and prevent landslide and other soil erosion disasters caused by construction. The area will be cleared after the construction. The retaining wall will be of masonry gravity wall a crest width of 0.5m, a height of 1.0m, a slope ratio of 1:0.3, and a foundation depth of 0.5m. ② Access area: The temporary construction roads mainly consist of the temporary roads between the damsite and the quarries and those between the reservoir structures. The measures for soil and water conservation are: to make watering and dust prevention treatment in construction and to reduce loss of soil and water in operation. The area occupied should be leveled after the completion of construction. ③Quarry area: Excavate the quarries in non-flood season. The excavated materials can be directly piled on the side for flood passing to play a role of flood prevention and release. The quarries should be excavated by zone. When the upper quarry is excavated, the excavation slash should be leveled. Although it will be inundated at reservoir impoundment, it should be excavated at a stable slope. A sacked earth residue retaining ridge will be built below the excavation surface prior to the excavation of the left-bank quarry, which will be treated after the excavated and be covered with cobble and gravel.	Constructor	Water resources bureaus of Turpan City and Turpan Prefecture, Xinjiang Water Resources Department	Unit qualified for soil and water conservation monitoring
		Soil and water conservation	The quarry for concrete aggregate is in the shoal of the upper river course. A residue retaining ridge will be built below the excavation surface prior to excavation, and the rock materials will be concentratedly piled within the ridge. The excavation slash will be leveled after the excavation, and it will be inundated at reservoir impoundment. The ridge will have a crest width of 0.75m, a height of 0.75m, and a slope ratio of 1:0.5. ④ Transmission line area: During the construction of permanent transmission line area, exposing of the excavated materials should be minimized, and the materials can be covered with color striped fabric. The land occupied will be treated after the construction. ⑤ Production and living quarter in construction: It includes the land temporarily occupied for production and living. The temporary production areas cover the areas for concrete batching, rebar processing and timber processing. The temporary living quarters cover dormitory and work shed. Temporary production and living quarter will be watered for moisture proof in construction so as to reduce the dust. The land temporarily occupied will be leveled and covered with cobble and gravel after			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Tuokexun County	Alagou Reservoir	Production wastewater	① Wastewater from aggregate processing system will be treated by flocculating sedimentation method. The main structures are grit tank, sludge drying bed, and construction water tank. Two simple 12m×10m×3m (LxWxH) sedimentation tanks will be excavated between the aggregate processing zone and the concrete batching zone. After sedimentation in the tanks for 1.5 hours, the wastewater with sand can meet the discharge requirements. Sludge will be transformed away in time according to its amount by 5-10t truck. ②A rectangular sedimentation tank and water storage tank will be built at the confluence of oily wastewater for machinery washing, and at the inlet of the sedimentation tank oil-separating materials will be furnished. The oily wastewater will flow through the materials to the tank by gravity, and the floating oil will be recovered when the tank is full. The water treated will be used for water spraying to reduce dust. After the construction, the bottom of the treatment tanks will be cleared with the waste residue being transformed to solid waste landfill. The treatment tanks will be filled with earth after clearance. The size of the sedimentation tank: LxWxD=4.0m×2m×2.3m (freeboard 0.3m), and that of the water storage tank is: LxWxH = 2.5m×2m×2m. ③Wastewater from concrete batching system will be mainly spread on the ground surface in flake, and the cement slurry will be condensed after water evaporation and seepage and harden the ground surface. It needs to be moved after the construction.	Constructor	Xinjiang Environmental Protection Department; Turpan Prefecture Environmental Protection Bureau; Tuokexun County Environmental Protection Bureau	Turpan Prefecture Environmental Monitoring Station
		Domestic sewage	The domestic sewage treatment equipment is arranged close to the temporary living quarter. It's suggested to treat the domestic sewage by 10-40B10 septic tank (vehicles cannot pass over it). The treated sewage from the septic tank will be collected by a separate impervious tank with a capacity of about 600m^3. The treated water will disappear through evaporation or be used for the greening around.			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Tuokexun County Tuokexun County	Alagou Reservoir Alagou Reservoir	Rot of plants in reservoir area and others	① Clearing for sanitation and epidemic prevention: Domestic garbage, dejecta in livestock barns and toilets and other feculence should be thoroughly cleared outside the reservoir area, and the leftover that cannot be cleared should be disinfected through mixing evenly with bleaching powder at a ratio of lkg/m^2 and then be cleared. Their pits and cesspits should be sprayed with calces at a ratio of lkg/m^2, wetted, and tamped with earth or construction residue. The ground surface and walls 2m above it of houses, livestock barns and toilets will be sprayed with top clean water of 4% bleaching powder at a ratio of 0.3kg/m^2 with disinfection duration not less than half an hour. The branches left over from the cut, withered trees, bushes, straws of crops, wastes from removal of structures and buildings, and other matters easy to float should be collected together manually and burnt on the spot. ② Removal and clearance of structures and buildings: All the buildings and their auxiliary structures within the scope of clearance should be removed, and their walls be pushed over and leveled. The removal and clearance of the buildings and auxiliary structures should follow the principle of conduct disinfection before removal. The roofs of the buildings (barns) should be removed manually. The used materials that can be reused should be recovered and used by property owner, and the materials that are easy to float and cannot be reused should be collected together and burnt on the spot. The walls will be pushed over and leveled with bulldozer. Wells (pits), cellars, laneways and other underground works within the reservoir drawdown area will be treated by filling, plugging, covering or other measures in accordance with the geological conditions of the reservoir area and the utilization requirements of the water area. ③ Clearance of woodland: The forest trees and sporadic fruit trees should be cut flush with the ground surface as far as possible with the studs left over not more than 0.3m over the ground surface. Woodland will be cleared through manually cutting.	Constructor	Construction Supervisor	
		Domestic garbage	① In accordance with the construction layout, 1 temporary collective living quarter is arranged for the project, in which 2 movable garbage collectors are provided. ② The management and office area will produce less garbage, so it's suggested to arrange 10 garbage cans to collect garbage. ③ 1 refuse truck will be furnished to deliver the domestic garbage to Tuokexun County wasteyard and treat it by filling.	Constructor	Xinjiang Environmental Protection Department, Turpan Prefecture Environmental Protection Bureau, Tuokexun County Environmental Protection Bureau	

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Soil and water conservation	① Salient works area A. Salient structure: During the process of dam filling, there will be a cofferdam on the upper side but no retaining structure on the lower side, so a retaining wall needs to be built at the dam toe on the downstream side to prevent mud and stone from entering to the lower river channel in construction. The retaining wall will be of masonry gravity wall with a length of 450m, a crest width of 0.5m, a height of 1.0m, a slope ratio of 1:0.3, and a foundation depth of 0.5m, and it requires 146m^3 of earth cut and 517 m^3 of grouted rubble. B. Reservoir management station: Prior to the construction the management station, the topsoil in this area will be stripped and placed at a corner in a concentrated way. It will be retained by sacked earth and covered with color striped fabric in case of strong wind or rainstorm. When the station is built, make green the open spaces, backfill the land with topsoil and level it, plant bushes sacsaoul, Calligonum and seeds of Astragalus Adsurgens Pall, and furnish a complete set of irrigation system. Topsoil stripping and backfill amounts to 150mm^3, and the area to be retained with sacked earth is 50m long. The sacked earth retaining ridge will be 0.75m wide on the top, 0.75m high, and 1:0.5 in slope ratio and require 43m^3 of sacked earth. C. Access to reservoir: The accesses from the reservoir area to outside include a 2km-long road from the reservoir to the reservoir management area and a 4km-long road from the reservoir management area to Nanshan mining area. Both are of Grade 3. The roadbed will be prepared through excavation and filling, and the latter will be the major part. To prevent loss of soil and water during the roadbed construction, it's planned to use sacked earth for retaining on both sides of the filled roadbed with a retaining length of 7200m. The sacked earth retaining ridge will be 0.75m wide on the top, 0.75m high, and 1:0.5 in slope ratio and require 5400m^3 of sacked earth. ② Quarry area: Although the quarry upstream of the dam for dam fill materials will be inundated at reservoir impoundment, it should be excavated at a stable slope to avoid landslide caused by watering. The project spoil will be treated combined with the use of the quarry upstream of the dam. Since the amount of the excavated materials is far more than that of the spoil, the excavated pit will be big enough to accommodate the spoil. The quarry will be excavated by zone. After one zone is exploited, it will be backfilled with spoil in time, and then the spoil will be spread and leveled. The surface of the filled spoil will be covered with derrick stone collected from the shoal in two layers, the lower one with stone of about 100mm in diameter and the upper one with stone of about 200mm in diameter. The spoil surface to be treated totals 5.5hm^2. As for the quarry downstream of the dam, to prevent water flow from scouring the excavated slopes and the consequent landslide and collapse of the banks, masonry slope protection is proposed for the excavation slopes of the section that may suffer scouring. Meanwhile, river dredging should be conducted to smooth the water flow. The section to be protected is 1500m long with a slope ratio of 1:3 and a protection thickness of 0.3m and requires 5985m^3 of grouted rubble. The quarry for aggregate is at Yu'ergou Gobi. To prevent loss of soil and water on the mining surface, under which a retaining ridge will be build before exploitation, and the rock will be piled within the ridge. The ridge will be built with sacked earth, 300m long, 0.75m wide on the top, 0.75m high and 1:0.5 in slope ratio, and require 255m^3 of sacked earth. After the			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Shanshan County	Ertanggou Reservoir	Production wastewater	① Wastewater from aggregate processing system will be treated by coagulation and sedimentation method. The grit tank and sedimentation tank are arranged in the aggregate screening yard with a design capacity of one-day production wastewater discharge. The size of the two tanks is designed as LxWxD=20mx15mx2.2m. The tanks will be excavated directly and do not need lining for seepage control. The treated water will be used for watering of the construction site for dust reduction, vegetation irrigation, and so on. ②A rectangular sedimentation tank and water storage tank will be built at the confluence of oily wastewater for machinery washing, and at the inlet of the sedimentation tank oil-separating materials will be furnished. The oily wastewater will flow through the materials to the tank by gravity, and the floating oil will be recovered when the tank is full. The treated water will be used for water spraying to reduce dust. After the construction, the bottom of the treatment tanks will be cleared with the waste residue being transformed to solid waste landfill. The treatment tanks will be filled with earth after clearance. The size of the rectangular sedimentation tank is: LxWxD=2.5mx2mx2.3m (freeboard 0.3m), and the size of the water storage tank is: LxWxH=2.5mx2mx2m. ③ Wastewater from concrete batching system will be mainly spread on the ground surface in flake, and the cement slurry will be condensed after water evaporation and seepage and harden the ground surface. It needs to be moved after the construction.	Constructor	Xinjiang Environmental Protection Department; Turpan Prefecture Environmental Protection Bureau; Shanshan County Environmental Protection Bureau	Turpan Prefecture Environmental Monitoring Station
Shanshan County	Ertanggou Reservoir	Domestic sewage	① Ertanggou Reservoir works construction management center will be used as the permanent management area, so it's considered to treat its domestic sewage with WSZ underground complete sewage treatment equipment as a combination of permanent and temporary measures. ② A sewage receiving tank will be built in the temporary living quarter to treat its domestic sewage, and the domestic sewage discharged in a concentrated way will be drained to the septic tank via pipes and then be subject to regular sterilization and disinfection. The domestic sewage sterilized can be used for greening and irrigation in summer, and it will not impact the water body quality due to evaporation and other consumptions. There will basically no sewage discharged out in winter because the project is suspended. ③ 3 environmental friendly lavatories will be built in the temporary living quarter, and 2 in the unfixed resident area based on the number of people and the inhabitation density, each with a floor area of 10m^2. In addition, 3 lavatories will be furnished at the dam, diversion tunnel, irrigation release tunnel and other concentrated construction areas close to the river, each with a floor area of 10m^2.			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Shanshan County Shanshan County	Ertanggou Reservoir Ertanggou Reservoir	Rot of plants in reservoir area and others	① Clearing for sanitation and epidemic prevention Manure pits: The inundation of the reservoir area involves 16 manure pits. Their feculence will be transported outside the reservoir area, and their pits will be disinfected with calces at a ratio of lkg/m^2 and then be filled with earth and compacted. Livestock barns: 3240.8m^2 of livestock barns is involved throughout the reservoir area, and the way of their clearance is same as that for manure pits. Tombs: 99 tombs in the reservoir area will be inundated (including 20 ancient tombs). The tombs buried not more than 15 years will be relocated and buried again, and those buried over 15 years will be treated in accordance with the local customs. The cemeteries will be disinfected with bleaching powder (1kg for each tomb), and the tombs will be tamped with earth. ② Clearance of trees. The inundation of the reservoir involves 21.37 mu of garden plots, 167.86 mu of various types of woodlands. The clearance will cover 189.23mu of land and sporadic trees. Before the reservoir impoundment, all the surface plants in garden plots and various kinds of trees must be cut down and transported outside the reservoir or transplanted outside the reservoir area. The trees should be cut flush with the ground surface as far as possible with the studs left over not more than 0.3m over the ground surface. The branches left over from the cut, withered trees, bushes, and other matters easy to float should be transported outside the reservoir area, or be burnt on the spot or treated with anti-floating measures prior to the reservoir impoundment. ③ Clearance of buildings: 2960.07m^2 of various types of buildings in the reservoir area needs to be cleared. The buildings will be removed and cleared by structure. Those that can be utilized will be fully utilized, and those that cannot be utilized will be removed manually and leveled with bulldozer. The remaining height should not exceed 0.5m over the ground surface. The wastes easy to float will be treated as per the requirements stipulated in the regulations of sanitation and epidemic prevention. Auxiliary structures including fence, threshing ground, cellar, manure pit, livestock barn, water tank, cooking range and pancake pit will be removed together with the buildings. The fences and auxiliary houses will be pushed and leveled manually, and the pancake pits and cellars will be treated with plugging, filling, covering and other measures. ④ Clearance of special facilities: The main special facility in the inundated area is mainly a hydrometric station. It will be treated prior to the reservoir impoundment with the wastes being transported outside the reservoir area.	Constructor	Construction Supervisor	

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Shanshan County	Ertanggou Reservoir	Domestic garbage	① In accordance with the construction layout, 1 temporary collective living quarter is arranged for the project, in which 2 movable garbage collectors are provided. ② The management and office area will produce less garbage, so it's suggested to arrange 10 garbage cans to collect garbage. ③ 1 refuse truck will be furnished to deliver the domestic garbage to Shanshan County wasteyard and treat it by filling.	Constructor	Xinjiang Environmental Protection Department, Turpan Prefecture Environmental Protection Bureau, Shanshan County Environmental Protection Bureau	

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Soil and water conservation	① Salient works area A. Salient works control area a. The salient structures consists of the dam, spillway, sand flushing tunnel, release tunnel, etc.. The design of the salient works has considered such measures as slope protection for the upstream and downstream slopes of the dam, energy dissipation and anti-scouring for the spillway and diversion and sand flushing tunnel, rock surface for the excavation slopes on both ends of the dam, and all slopes being excavated at stable slope ratio. Therefore, there will be almost no soil and water erosion after the completion of the project. During the process of dam filling, there will be a cofferdam on the upper side but no retaining structure on the lower side, so a retaining wall needs to be built at the dam toe on the downstream side to prevent mud and stone from entering to the lower river channel in construction. Typical design of engineering measure: The retaining wall will be of masonry gravity wall with a length of 450m, a crest width of 0.5m, a height of 1.0m, a slope ratio of 1:0.3, and a foundation depth of 0.5m, and it requires 361.7m^3 of earth cut, 123.8 m^3 of sand and gravel fill and 472.5m^3 of grouted rubble. b. Reservoir management station: Engineering measures: Prior to the construction the management station, the topsoil in this area will be stripped and placed at a corner in a concentrated way. It will be retained by sacked earth and covered with color striped fabric in case of strong wind or rainstorm. Topsoil stripping and backfill amounts to 150mm^3, and the area to be retained with sacked earth is 50m long. The sacked earth retaining ridge will be 0.75m wide on the top, 0.75m high, and 1:0.5 in slope ratio and require 43m^3 of sacked earth. Vegetation measures: When the station is built, make green the open spaces, backfill the land with topsoil and level it, plant bushes sacsaoul, Calligonum and seeds of Astragalus Adsurgens Pall, and furnish a complete set of irrigation system. The area to be greened is 0.05hm^2, which will be planted with 140 sacsaouls, 140 Calligonums, and sown with 2.5kg of Astragalus Adsurgens Pall seeds. The land to be leveled is 0.1hm^2. B. Access road control area a. Permanent road: Prior to its construction, 7200m-long sacked earth block will be made on both sides of the filled roadbed. The sacked earth ridge will be 0.75m wide on top, 0.75m high, 1:0.5 in slope ratio, and require 5063 m^3 of sacked earth. After the completion of the project, the sacked earth will be used to grow plants. b. Temporary road Temporary measures: Spray water to control dust in construction. Engineering measures: Sacked earth will be arranged on both sides of the access during the construction period to avoid soil loss in roadbed construction and operation. The sacked earth block will be 5140m long in total with a sectional size same as that of the salient works area. When the construction is completed, the access will be demolished, and the area being occupied will be leveled. C. Quarry control area Quarry $C_{1\text{-}1}$: Control the exploitation depth at less than 4.2m; and conduct excavation at a stable slope ratio of 1:2. The project spoil will be used combined with the use of the quarry downstream of the damsite. Since the amount of the excavated materials is far more than that of the spoil, the excavated pit will be big enough to accommodate the spoil. The quarry will be			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Operation period						
Turpan City	Meiyaogou Reservoir	Domestic sewage in management area	WSZ underground complete sewage treatment equipment is proposed to treat the sewage. It has a sewage treatment capacity of 1m^3/h, which can meet the demand of domestic sewage treatment for the management area. After being treated, the domestic sewage can be used to water the grasses and plants in the area and the trees along the permanent road in summer and be discharged to the desert and Gobi far away from the river course in winter.	Turpan City PMO for water conservation project	Xinjiang Environmental Protection Department; Turpan Prefecture Environmental Protection Bureau; Turpan City Environmental Protection Bureau	Turpan Prefecture Environmental Monitoring Station
		Domestic garbage in management area	3 garbage collectors will be furnished in the management and living quarters respectively to collect the domestic garbage in a concentrated way. The garbage will be cleared regularly each week and be transported to and filled in the solid waste landfill of Tuokexun County so as to prevent it from entering the reservoir area and polluting the water body.			
Tuokexun County	Alagou Reservoir	Domestic sewage in management area	WSZ underground complete sewage treatment equipment is proposed to treat the sewage. It has a sewage treatment capacity of 1m^3/h, which can meet the demand of domestic sewage treatment for the management area. After being treated, the domestic sewage can be used to water the grasses and plants in the area and the trees along the permanent road in summer and be discharged to the desert and Gobi far away from the river course in winter.	Tuokexun County for water conservation project	Xinjiang Environmental Protection Department; Turpan Prefecture Environmental Protection Bureau; Tuokexun County Environmental Protection Bureau	Turpan Prefecture Environmental Monitoring Station
		Domestic garbage in management area	3 garbage collectors will be furnished in the management and living quarters respectively to collect the domestic garbage in a concentrated way. The garbage will be cleared regularly each week and be transported to and filled in the solid waste landfill of Tuokexun County so as to prevent it from entering the reservoir area and polluting the water body.			
		Drying up of river course	A 500mm-diameter glass fiber reinforced plastic pipe extending from the access to the dam to the riverbed downstream of the dam is proposed at the outlet of irrigation water outlet to discharge ecological base flow. The discharge is required to be not less than 10% of the long-term average flow at the damsite section, i.e., 0.25 m^3/s.			
Shanshan County	Ertanggou Reservoir	Domestic sewage in management area	The domestic sewage from the reservoir management area will be collected and drained to a septic tank via pipe. The 10-40B10 septic tank built during the construction period can be used, but vehicles cannot pass through it. Due to the small flow of the Alagou River on the downstream of the reservoir, direct discharge of sewage to the river will pollute the lower reaches to a certain extent. It's required that the treated domestic sewage be collected through an impervious tank. The impervious tank will utilize the facilities built during the construction period and will collect the outflow from the septic tank. The water can be used for plant watering in the management area or evaporate naturally and will not be discharged directly to the water body.	Shanshan County PMO for water conservation project	Xinjiang Environmental Protection Department; Turpan Prefecture Environmental Protection Bureau; Shanshan County Environmental Protection Bureau	Turpan Prefecture Environmental Monitoring Station
		Domestic garbage in management area	4 garbage collectors will be furnished in the management and living quarters of Alagou Reservoir to collect the domestic garbage in a concentrated way. The garbage will be cleared regularly each week and be transported to and filled in the solid waste landfill of Tuokexun County so as to prevent it from entering the reservoir area and polluting the water body.			
		Drying up of river course	A small-sized siphon pipe will be installed at the damsite to discharge ecological base flow not less than 0.4 m^3/s.			

4.2.2 Canal building (rehabilitation) works

4.2.2.1 Mitigation measures at design stage

Following measures should be taken at design stage to mitigate the environmental impact of project construction:

 The designer should consider all the factors comprehensively, divide the permanent land use plan into more details according to the design of the surroundings, and utilize the land rationally.

 In the design, the temporary dumping areas for the construction period and the permanent dumping areas after the construction should be arranged reasonably based on the specific conditions of various canal sections, and flood-control tailing hold works and sewage-control tailing hold works should be arranged to control the spoil in a concentrated way and minimize the impact of spoil piling on environment.

 Soil and water conservation plan should be prepared well. The general layout should fully consider not only the type, mode and impacting degree of soil erosion and water loss caused by the project construction, but also the master plan of the management area for the operation period of the project.

 Great attention should be attached in design on the public health during the construction period. The dwelling conditions in the temporary living quarter should not be too simple, crude and crowded, and the area with good surroundings should be selected as the living quarter for the construction personnel to prevent the introduction and spreading of epidemic diseases.

 The construction of the works will cause great noise, so the designer should take reasonable sound insulation and noise reduction measures as required so as to mitigate the impact of construction noise on site construction personnel.

 Find out the opinions and comments on environmental problems and impacts of the public and all walks of life to be impacted through public participation before, during and after the project development so as to improve the design.

4.2.2.2 Mitigation measures at construction stage

Since the canal building (rehabilitation) works have similar construction items but different surrounding characteristics, their mitigation measures have commonness and differences. The section elaborate the general measures applicable to all works and the special countermeasures for each specific works (unless otherwise specified, the measures mentioned hereinafter will be general measures).

(1) Water environment

 Production wastewater

General measures: Production wastewater will be mainly from concrete batching and curing and cleaning and maintenance of transport vehicles and other machinery. Since the construction sites are dispersed, the wastewater from concrete batching and curing is difficult to collect and will be fully consumed through evaporation. Only minor repair and

maintenance will be conducted for the mechanical equipment at the site, so the production wastewater is mainly from washing of the batching system which is small in quantity and will be fully consumed through natural evaporation and seepage. Therefore, no mitigation measure will be taken for the production wastewater.

Special measures: Alagou Main Diversion Canal Works will have one concrete aggregate quarry area located on the riverbed 1.0km downstream of the maintain outlet of the Alagou River. The concrete aggregate will be screened on the spot. One desilting tank will be built in the concrete aggregate quarry area with a capacity of 60m^3 and a size of 10m×3m×2m (L×W×D), designed to accommodate 3-day wastewater discharge. The wastewater will be collected in the temporary desilting tank, and be used for watering the construction access and spoil to reduce dust after deposition. Finally the desilting tank will be removed and transported to the permanent dumping area, and the spot will be backfilled with the excavated earth or stone.

- Domestic sewage

Special measures:

A. Taerlang Branch Canal Works

In accordance with the construction production layout and due to the short construction period of the project, limited domestic sewage discharge and strong evaporation in the project area, it's decided that the domestic sewage will be collected in the temporary sewage receiving tank and be consumed through natural evaporation and seepage. Five tanks are arranged, one for each living quarter. The tank is designed to accommodate 2-day sewage discharge and will have a design capacity of 25.5m^3 and a size of 4m×2.8m×2.5m (L×W×D).

Five latrines of brick and concrete structure with a floor area of 6m^2 will be built, one in each living quarter. After the construction, the sewage receiving tanks and latrines will be cleared, disinfected and buried.

B. Alagou Main Diversion Canal Works

The temporary production and living quarter is located in gravel desert, where the mean annual evaporation is up to 3744mm. The domestic sewage can be collected in the temporary sewage receiving tank and evaporate naturally. The daily sewage discharge will be 10.1m^3/d in the construction quarter during peak period, and a sewage receiving tank will be built in the temporary production and living quarter. The tank is designed to accommodate 2-day sewage discharge and will have a design capacity of 20.2m^3 and a size of 5m×2m×2m (L×W×D) to facilitate design and construction.

Meanwhile, one environmental friendly lavatory with a floor area of 20m^2 will be provided in the temporary production and living quarter, and one simple lavatory with floor area of 6m^2 be provided in the concentrated construction site. Feces from the lavatories will be used as manure after being disinfected with lime. When the project is completed, the sewage receiving tanks and lavatories will be dismantled, be backfilled with the excavated earth after the concrete and gravel being delivered to the permanent dumping area, and be leveled and compacted.

C. Ertang Branch Canal Seepage Control Upgrading Works

The construction personnel for Ertang Branch Canal Seepage Control Upgrading Works will stay in the residential area nearby, so the domestic sewage produced will be collected and treated in a unified way in the residential area, no additional treatment measure will be taken.

Evaluation on the measures: The above measures can effectively mitigate the adverse environmental impact of domestic sewage in the construction period.

(2) Ambient air

Specific measures:

 Operators for the batching plant will be protected for health care, for example, wearing gauze masks and wind glasses;

 Cement, lime and other powder materials should be canned or bagged. Transportation in bulk is forbidden so as to prevent dust along the transportation route;

 Cover the piled materials with tarpaulin in rain and strong wind days;

 Strictly regulate the traveling route of the transportation machinery during the construction period;

 Often sprinkle water for curing during the construction period to reduce dust. Water 2-3 times per day or more often in strong wind event;

 Avoid earth excavation under strong wind weather.

Evaluation on the measures: The above measures can minimize the impact of atmospheric environment contamination on the construction personnel during the construction period.

(3) Acoustic environment

Specific measures:

 In accordance with the Noise Limits for Construction Site (GB12523-90), the working hours of the people working at the screening system, batching system and other highly noisy environment should be controlled as per the labor protection regulations and be offered with anti-noise articles.

 Use low-noise equipment as far as possible, and strengthen the maintenance of mechanical equipment.

Evaluation on the measures: The above measures can minimize the impact of noise on the construction personnel during the construction period.

(4) Solid waste

 Engineering spoil

General measures: Engineering spoil produced in construction is mainly of refused debris and earth. The best solution is to use refused debris and earth as filling materials or backfill

materials on the spot to reduce the amount of waste, and the remaining spoil will be piled at the planned dumping area.

 Domestic garbage

Special measures:

A. Taerlang Branch Canal Works

a. Provide five movable garbage collectors, one in each temporary construction living quarter, publicize the hygiene knowledge to the construction personnel, and nurture their habit of put garbage in garbage collector.

b. Rent one refuse truck every week during the construction period to transport the garbage to the wasteyard belonging to Turpan City Sanitation Bureau. The wasteyard lies at Daqiao Village, Putao Township, Turpan City and is 30km away from the project area in average.

B. Alagou Main Diversion Canal Works

Domestic garbage will be produced mainly in the temporary living quarter. The domestic garbage yield will be 0.17t daily, and the total domestic garbage yield during the whole construction period will be about 38.8t. One movable garbage collector will be arranged in the temporary production and living quarter, and one temporary garbage collecting tank at each main construction site. The domestic garbage will be cleared once every three days and be transported to Tuokexun County wasteyard.

C. Ertang Branch Canal Seepage Control Upgrading Works

The construction personnel for Ertang Branch Canal Seepage Control Upgrading Works will stay in the residential area nearby, so the domestic garbage produced will be collected and treated in a unified way in the residential area, no additional treatment measure will be taken.

Evaluation on the measures: The above measures can lower the impact of solid waste in construction on the surroundings to a degree within environmental endurance.

(5) Ecological environment

Specific measures:

 Strengthen the propaganda of the Environmental Protection Law and the Soil and Water Conservation Law, intensify the construction personnel’s sense of environmental protection, standardize their behavior in construction, and strictly prohibit them from rolling and damaging soil and vegetation at discretion.

 Strictly designate the traveling route of vehicles and other construction machinery and set warning signs on both sides of the construction access.

Evaluation on the measures: The above measures can effectively protect the ecological environment around the project area.

(6) Soil and water conservation measures

Special measures:

- Taerlang Branch Canal Works

In accordance with the existing status of soil erosion and water loss in the project area and the analysis on the soil erosion and water loss caused by the project construction, the soil erosion and water loss control area is divided into salient structures area, access road area, dumping area, and temporary production and living quarter according to the general project layout.

A. Salient structures area

Salient structures area includes canal works area and flood control works area.

a. Canal works area

The land to be disturbed in canal works area is 60.11hm^2. The canal works area covers water carrying canal, flood control culvert, and flood discharge aqueduct. When the water carrying canal is built, its water passing section will occupy 7.34hm^2 of land. According to the feasibility study report, first, the canal works area is arranged in a relatively concentrated streamline to avoid excessive dispersing of the production line, occupation of large amount of land resources, and soil and water loss caused by increased ground surface disturbance. Next, since the general relief of the project area is quite gentle, the filling and excavation for land leveling should be done nearby so as to minimize the earthwork and avoid soil and water loss. The progress of the structure crossing canal should coordinate with that of water carrying canal. In the design of the salient works, in-situ concrete slab or grouted rubble lining will be adopted for the flood passing section of the structure crossing canal to increase its anti-scouring capacity. Meanwhile, a 9-12m-long V-shaped diffusion area will be made on the downstream surface to reduce the scouring capacity of flow. In a word, the measures stated in the feasibility study report for the salient structures area conform to the requirements on soil and water conservation.

Engineering measures: When the construction of canal works is completed, the loosened deposit higher than the ground surface will be leveled according to the topographic conditions so as to prevent wind erosion on strong wind days.

Temporary engineering measures: Construction in strong wind day or raining day will be minimized. During the construction, it's forbidden to excavate and pile materials at discretion to minimize damage to the original ground. The excavated earth should be utilized as far as possible. The earth temporarily piled needs to be covered with dust-prevention net in strong wind day or raining day.

b. Flood control works area

The main structure in the flood control works area is flood control diversion dikes arranged along the canal. Each flood control diversion dike is arranged in herringbone, and its downstream side is connected with the flood control culvert or flood discharge aqueduct. The earth to backfill the flood control diversion dike will directly use the excavated earth along the canal, and the dike will occupy 78.52hm^2 of land. According the feasibility study report, it's required to coordinate the construction progress of flood control diversion dike with that of the water carrying canal, flood control culvert or flood discharge aqueduct,

arrange the works in a relatively concentrated streamline to avoid excessive dispersing of the production line, occupation of large amount of land resources, and soil and water loss caused by increased ground surface disturbance. Additionally, in the design of the salient works, grouted rubble protection will be employed for the water-passing surface of the flood control diversion dike to effectively protect the earth on the water-passing surface from scouring. To sum up, the measures stated in the feasibility study report for the salient structures area conform to the requirements on soil and water conservation.

Engineering measures: When the construction in the flood control works area is completed, the loosened deposit higher than the ground surface will be leveled so as to prevent wind erosion on strong wind days.

Vegetation measures: No vegetation measure is taken because there is neither water source nor soil suitable for plant growth in the area.

B. Access road area

The project has very convenient access conditions to the outside, and its onsite access road is a newly built one and is included in the salient structures area. This access road, occupying 13.69hm^2 of land, will be used for construction and as the maintenance road for canal after the completion of the project. According to the feasibility study report, the natural gradient will be adopted for the onsite access road based on the topographic variation. The construction road will be sprinkled with water during the construction period to avoid dust. The salient structures conform to the requirements of soil and water conservation.

C. Dumping area

In accordance with the general project layout, construction of salient works and construction land leveling, it's finally decided to locate the dumping area within the herringbone dike in the flood control works area to satisfy the demands of construction, and the dumping area will occupy 11.41hm^2 of land. It is safe, reliable, practical technically, and reasonable economically. In line with the characteristics and procedures of site construction, the large amount of waste earth produced from the cross-section of the canal in construction can be reused for the earth backfill of the diversion dyke. Therefore, some earth needs to be stored temporarily during the construction period. The temporary storage area will be 6.85hm^2. According to the feasibility study report, this scheme required supplementary design of measures for temporary spoil storage and surface protection for the purpose of soil and water conservation.

a. Engineering measures

The temporary dumping areas will be located within 2.5m away from each excavation face to pile up the excavated materials from the construction and production in a form of trapezoidal bench. The outer slope will be 1:1.5 with a height around 1.0m. The waste earth will be piled according to its amount and piling mode, and the land it occupies is mostly of Gobi. After the construction, the land surface will be protected through covering with gravel. For the purpose of soil and water conservation, an engineering measure of covering the surface of the piled earth with dust-prevention net temporarily in strong wind days will be adopted.

As for the permanent dumping area, the spoil will be piled in a concentrated way utilizing the specific arrangement of the project area, and the spoil surface will be covered with gravel when the construction is completed so as to reduce wind erosion.

b. Temporary engineering measures

Construction in strong wind day or raining day will be minimized. During the construction, it's forbidden to excavate and pile materials at discretion to minimize damage to the original ground. The excavated earth should be utilized as far as possible. The earth temporarily piled needs to be covered with dust-prevention net in strong wind day or raining day.

D. Temporary production and living quarter

The temporary production and living quarter includes temporary production area and temporary living area. The temporary production area covers the places for concrete batching system, aggregate processing system, equipment repairing workshop, rebar processing workshop, wood workshop, parking lot, construction equipment warehouse, consumption goods warehouse, cement storage, fuel storage, and so on. The temporary living area covers the places for office, dormitory, work shed, temporary piling and transfer areas, and so on and will occupy 0.165hm^2 of land.

The temporary production and living quarter will be watered to reduce the dust at the construction site. Since the original ground surface of the temporary production and living quarter is covered with gravel, it will be basically free of wind erosion through treatment after the construction. The engineering measures above mentioned are newly added for soil and water conservation.

 Alagou Main Diversion Canal Works

In accordance with the type of relief and existing status of soil erosion and water loss in the project area and the analysis on the soil erosion and water loss caused by the project construction, the soil erosion and water loss control area is divided into canal works area, flood protection dyke area, construction access area, temporary production and living quarter for construction, quarry area and dumping area.

A. Salient structures area (canal works area and flood protection dyke area)

a. Engineering measures

The excavated materials will be piled in a concentrated way on one side of the excavated section within the managed scope. The earth will be piled in trapezoidal bench. The slope ratio and height for earth piling for the canal are 1:1.5 and not over 1.4m, respectively, and those for the flood-prevention dyke are 1:1 and not over 3.0m, respectively. The temporary spoil piled will be covered with geomembrane during the construction period, and watering and other temporary protective measures will be taken for the disturbed ground surface in the construction area. The slash of temporary dumping area and the construction area will be leveled and covered with gravel.

b. Vegetation measures: Not applicable

c. Temporary engineering measures

Construction in strong wind day or raining day will be minimized.

Temporary earth piling will be made in a concentrated way, sprinkled with during the construction period and covered with geomembrane.

B. Construction access area

Temporary engineering measures: During the construction period, the temporary construction roads in the project area will be watered frequently on the pavement, and the construction vehicles are prohibited to roll their peripheral land.

C. Temporary production and living quarter for construction

The temporary production and living quarter includes temporary production area and temporary living area, mainly referring to material piling area, temporary housing, concrete batching plant, storage area, and so on. The quarter will be watered to reduce the dust at the construction site. The pollutants (refuse and fuel) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the dumping area. Since the original ground surface of the temporary production and living quarter is covered with gravel, it will be basically free of wind erosion through treatment after the construction. The engineering measures above mentioned are newly added for soil and water conservation.

D. Quarry area

a. Cobble quarry area

Cobble quarry area is in the riverbed, so it’s difficult to take engineering measures and vegetation measures. The collection of cobbles should minimize the disturbance to the riverbed, and it’s required to collect only the cobbles that are on the top of the riverbed and move from the upper reaches in flood season. No exposal of riverbed is the criterion for cobble collection. Since the piling of big cobbles on the riverbed can play a role of anti-scouring to some extent, attention should be paid on the protection of riverbed in cobble collection.

b. Concrete aggregate quarry area

Engineering measures: As for the concrete aggregate quarry area, it’s proposed to backfill the quarrying pit of the quarry with the nearby discards from the screening after the construction of the salient works, and level and compact the pit mechanically.

E. Dumping area

The temporary dumping areas will be located within 3m away from each excavation face to pile up the excavated materials from the construction and production in a form of trapezoidal bench. The waste earth will be piled according to its amount and piling mode, and the land it occupies is mostly of Gobi. After the construction, the land surface will be protected through covering with gravel. For the purpose of soil and water conservation, engineering measures of watering and covering the surface of the piled earth with dust-prevention net temporarily in strong wind days will be adopted.

The permanent spoil will be transported to the permanent dumping area and piled in a concentrated way when the construction is completed, and the spoil surface will be covered with gravel so as to reduce wind erosion.

- Ertang Branch Canal Seepage Control Upgrading Works

In accordance with the existing status of soil erosion and water loss in the project area and the analysis on the soil erosion and water loss caused by the project construction, the soil erosion and water loss control area is divided into 5 zones, i.e., salient structures area, quarry area, access road area, temporary dumping area, and temporary production area.

The main measures for soil and water conservation are as follows:

A. Salient structures construction area

During the construction period, the temporarily piled materials will be covered with color striped fabric, and watering and other temporary protective measures will be taken for the disturbed ground surface in the construction area. After the construction, the slash of temporary dumping area and the construction area will be leveled. Construction in strong wind day or raining day will be minimized.

It's forbidden to excavate and pile materials and harden the ground at discretion in construction to minimize damage to the original ground. Rational measures should be taken to protect the soil and water resources. The excavated earth should be utilized as far as possible, and temporary protective measures should be taken for the earth in the period of being piled before the utilization. It's prohibited to dump and pile the waste earth and other solid wastes at Gobi and other areas not for this purpose, and those wastes must be cleared and transported to the specifically designed storage area and piled in a concentrated way. Covering and retaining measures should also be taken for the temporary storage area. Effective measures should be taken to control and prevent landslide and other soil erosion disasters caused by the construction. The area should be cleared after the construction.

B. Quarry area

Cobble quarry area is in the riverbed, so it's difficult to take engineering measures and vegetation measures. The collection of cobbles should minimize the disturbance to the riverbed, and it's required to collect only the cobbles that are on the top of the riverbed and move from the upper reaches in flood season. No exposal of riverbed is the criterion for cobble collection.

C. Access road area

The salient works have very convenient access conditions. Natural gradient will be adopted for the onsite access road based on the topographic variation, and the land will be leveled. The salient structures conform to the requirements of soil and water conservation. The construction road will be sprinkled with water during the construction period to avoid dust.

D. Temporary dumping area

In accordance with the demands of canal works, the dumping areas will be located within 2.5m away from each excavation face to pile up the excavated materials from the

construction and production. The temporarily piled materials will be covered with color striped fabric and be watered. The waste earth will be piled according to its amount and piling mode, and the land it occupies is mostly of Gobi. After the construction, the land surface will be protected through covering with gravel.

E. Temporary production area

Temporary production and living quarter will be watered to reduce the dust at the construction site. The pollutants (refuse, fuel, etc.) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the dumping area. Since the original ground surface of the temporary production and living quarter is covered with gravel, it will be basically free of wind erosion through treatment after the construction.

Evaluation on the measures: The above measures can minimize the soil erosion and water loss caused by construction during the construction period.

(7) Public health

Specific measures:

 Request the local sanitation and antiepidemic authorities to specially assign person to instruct and supervise the sanitary clearance of the construction area;

 Organize and implement the health and antiepidemic measures before the mobilization of the construction personnel;

 Do a good job in treating the ordinary personal injuries and diseases;

 Strengthen publicization, dissemination and education of health knowledge, and instruct the construction personnel to form good living habits;

 Ensure the hygiene of food and drinking water at canteen and drinking water supply point and do a good job in sanitation, disinfection, epidemic prevention and immunization so as to eliminate the epidemic outbreak;

 Earnestly protect the safety of the construction personnel during the construction period to avoid industrial injury.

Evaluation on the measures: In case proper sanitary and epidemic prevention measures are taken, the public health of the construction personnel will not be affected.

4.2.3 .3 Mitigation measures during operation period

According to the environmental impact analysis on canal building (rehabilitation) works stated in Section 4.1, this type of projects will cause adverse environmental impacts mainly in the construction period, and they will not adversely impact the surroundings during the operation period. Consequently, no mitigation measure is considered during the operation period.

Summary of General Mitigation Measures against Environmental Impacts of Canal Building (Rehabilitation) Works

Table 4.2-12

Type	Period	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Canal Building (Rehabilitation) Works	Design stage		□ The designer should consider all the factors comprehensively, divide the permanent land use plan into more details according to the design of the surroundings, and utilize the land rationally. □ In the design, the temporary dumping areas for the construction period and the permanent dumping areas after the construction should be arranged reasonably based on the specific conditions of various canal sections, and flood-control tailing hold works and sewage-control tailing hold works should be arranged to control the spoil in a concentrated way and minimize the impact of spoil piling on environment. □ Soil and water conservation plan should be prepared well. The general layout should fully consider not only the type, mode and impacting degree of soil erosion and water loss caused by the project construction, but also the master plan of the management area for the operation period of the project. □ Great attention should be attached in design on the public health during the construction period. The dwelling conditions in the temporary living quarter should not be too simple, crude and crowded, and the area with good surroundings should be selected as the living quarter for the construction personnel to prevent the introduction and spreading of epidemic diseases. □ The construction of the works will cause great noise, so the designer should take reasonable sound insulation and noise reduction measures as required so as to mitigate the impact of construction noise on site construction personnel. □ Find out the opinions and comments on environmental problems and impacts of the public and all walks of life to be impacted through public participation before, during and after the project development so as to improve the design.	Designer Environment workgroup	Environmental management offices of Turpan City, Shanshan County, and Tuokexun County	—
	Construction period	Production wastewater	Production wastewater will be mainly from concrete batching and curing and cleaning and maintenance of transport vehicles and other machinery. Since the construction sites are dispersed, the wastewater from concrete batching and curing is difficult to collect and will be fully consumed through evaporation. Only minor repair and maintenance will be conducted for the mechanical equipment at the site, so the production wastewater is mainly from washing of the batching system which is small in quantity and will be fully consumed through natural evaporation and seepage. Therefore, no mitigation measure will be taken for the production wastewater.	Constructor	Xinjiang Environmental Protection Department, environmental protection bureaus of Turpan Prefecture, Turpan City, Shanshan County and Tuokexun	

Type	Period	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Ambient air	□ Operators for the batching plant will be protected for health care, for example, wearing gauze masks and wind glasses; □ Cement, lime and other powder materials should be canned or bagged. Transportation in bulk is forbidden so as to prevent dust along the transportation route; □ Cover the piled materials with tarpaulin in rain and strong wind days; □ Strictly regulate the traveling route of the transportation machinery during the construction period; □ Often sprinkle water for curing during the construction period to reduce dust. Water 2-3 times per day or more often in strong wind event; □ Avoid earth excavation under strong wind weather.		County	
		Acoustic environment	□ In accordance with the Noise Limits for Construction Site (GB12523-90), the working hours of the people working at the screening system, batching system and other highly noisy environment should be controlled as per the labor protection regulations and be offered with anti-noise articles. □ Use low-noise equipment as far as possible, and strengthen the maintenance of mechanical equipment. Evaluation on the measures: The above measures can minimize the impact of noise on the construction personnel during the construction period.			
		Engineering spoil	Engineering spoil produced in construction is mainly of refused debris and earth. The best solution is to use refused debris and earth as filling materials or backfill materials on the spot to reduce the amount of waste, and the remaining spoil will be piled at the planned dumping area.			
		Domestic garbage	□ Strengthen the propaganda of the Environmental Protection Law and the Soil and Water Conservation Law, intensify the construction personnel's sense of environmental protection, standardize their behavior in construction, and strictly prohibit them from rolling and damaging soil and vegetation at discretion. □ Strictly designate the traveling route of vehicles and other construction machinery and set warning signs on both sides of the construction access.			
		Public health	□ Request the local sanitation and antiepidemic authorities to specially assign person to instruct and supervise the sanitary clearance of the construction area; □ Organize and implement the health and antiepidemic measures before the mobilization of the construction personnel; □ Do a good job in treating the ordinary personal injuries and diseases; □ Strengthen publicization, dissemination and education of health knowledge, and instruct the construction personnel to form good living habits; □ Ensure the hygiene of food and drinking water at canteen and drinking water supply point and do a good job in sanitation, disinfection, epidemic prevention and immunization so as to eliminate the epidemic outbreak; □ Earnestly protect the safety of the construction personnel during the construction period to avoid industrial injury.			

Summary of Special Mitigation Measures against Environmental Impacts of Canal Building (Rehabilitation) Works during Construction Period

Table 4.2-13

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Turpan City	Taerlang Branch Canal Works	Domestic sewage	In accordance with the construction production layout and due to the short construction period of the project, limited domestic sewage discharge and strong evaporation in the project area, it's decided that the domestic sewage will be collected in the temporary sewage receiving tank and be consumed through natural evaporation and seepage. Five tanks are arranged, one for each living quarter. The tank is designed to accommodate 2-day sewage discharge and will have a design capacity of 25.5m^3 and a size of 4m×2.8m×2.5m (L×W×D). Five latrines of brick and concrete structure with a floor area of 6m^2 will be built, one in each living quarter. After the construction, the sewage receiving tanks and latrines will be cleared, disinfected and buried.	Constructor	Turpan City Environmental Protection Bureau, Turpan Prefecture Environmental Protection Bureau, Xinjiang Environmental Protection Department	
		Domestic garbage	□ Provide five movable garbage collectors, one in each temporary construction living quarter, publicize the hygiene knowledge to the construction personnel, and nurture their habit of put garbage in garbage collector. □ Rent one refuse truck every week during the construction period to transport the garbage to the wasteyard belonging to Turpan City Sanitation Bureau. The wasteyard lies at Daqiao Village, Putao Township, Turpan City and is 30km away from the project area in average.			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Soil and water conservation	□ Salient structures area: including canal works area and flood control works area. A. Canal works area The land to be disturbed in canal works area is 60.11hm^2. The canal works area covers water carrying canal, flood control culvert, and flood discharge aqueduct. When the water carrying canal is built, its water passing section will occupy 7.34hm^2 of land. According to the feasibility study report, first, the canal works area is arranged in a relatively concentrated streamline to avoid excessive dispersing of the production line, occupation of large amount of land resources, and soil and water loss caused by increased ground surface disturbance. Next, since the general relief of the project area is quite gentle, the filling and excavation for land leveling should be done nearby so as to minimize the earthwork and avoid soil and water loss. The progress of the structure crossing canal should coordinate with that of water carrying canal. In the design of the salient works, in-situ concrete slab or grouted rubble lining will be adopted for the flood passing section of the structure crossing canal to increase its anti-scouring capacity. Meanwhile, a 9-12m-long V-shaped diffusion area will be made on the downstream surface to reduce the scouring capacity of flow. In a word, the measures stated in the feasibility study report for the salient structures area conform to the requirements on soil and water conservation. a. Engineering measures: When the construction of canal works is completed, the loosened deposit higher than the ground surface will be leveled according to the topographic conditions so as to prevent wind erosion on strong wind days. b. Temporary engineering measures: Construction in strong wind day or raining day will be minimized. During the construction, it's forbidden to excavate and pile materials at discretion to minimize damage to the original ground. The excavated earth should be utilized as far as possible. The earth temporarily piled needs to be covered with dust-prevention net in strong wind day or raining day. B. Flood control works area The main structure in the flood control works area is flood control diversion dikes arranged along the canal. Each flood control diversion dike is arranged in herringbone, and its downstream side is connected with the flood control culvert or flood discharge aqueduct. The earth to backfill the flood control diversion dike will directly use the excavated earth along the canal, and the dike will occupy 78.52hm^2 of land. According the feasibility study report, it's required to coordinate the construction progress of flood control diversion dike with that of the water carrying canal, flood control culvert or flood discharge aqueduct, arrange the works in a relatively concentrated streamline to avoid excessive dispersing of the production line, occupation of large amount of land resources, and soil and water loss caused by increased ground surface disturbance. Additionally, in the design of the salient works, grouted rubble protection will be employed for the water-passing surface of the flood control diversion dike to effectively protect the earth on the water-passing surface from scouring. To sum up, the measures stated in the feasibility study report for the salient structures area conform to the requirements on soil and water conservation. a. Engineering measures: When the construction in the flood control works area is completed, the loosened deposit higher than the ground surface will be leveled so as to prevent wind erosion on strong wind days. b. Vegetation measures: No vegetation measure is taken because there is neither water source nor soil suitable for plant growth in the area.			
		Soil and water conservation	□ Access road area: The project has very convenient access conditions to the outside, and its onsite access road is a newly built one and is included in the salient structures area. This access road, occupying 13.69hm^2 of land, will be used for construction and as the maintenance road for canal after the completion of the project. According to the feasibility study report, the natural gradient will be adopted for the onsite access road based on the topographic variation. The construction road will be sprinkled with water during the construction period to avoid dust. The salient structures conform to the requirements of soil and water conservation. □ Dumping area: In accordance with the general project layout, construction of salient works and construction land leveling, it's finally decided to locate the dumping area within the herringbone dike in the flood control works area to satisfy the demands of construction, and the dumping area will occupy 11.41hm^2 of land. It is safe, reliable, practical technically, and reasonable economically. In line with the characteristics and procedures of site construction, the large amount of waste earth produced from the cross-section of the canal in construction can be reused for the earth backfill of the diversion dyke. Therefore, some earth needs to be stored temporarily during the construction period. The temporary storage area will be 6.85hm^2. According to the feasibility study report, this scheme required	Constructor	Water resources bureaus of Turpan City and Turpan Prefecture, Xinjiang Water Resources Department	Unit qualified for soil and water conservation monitoring

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Tuokexun County	Alagou Main Diversion Canal Works	Production wastewater	Alagou Main Diversion Canal Works will have one concrete aggregate quarry area located on the riverbed 1.0km downstream of the maintain outlet of the Alagou River. The concrete aggregate will be screened on the spot. One desilting tank will be built in the concrete aggregate quarry area with a capacity of 60m^3 and a size of 10m×3m×2m (L×W×D), designed to accommodate 3-day wastewater discharge. The wastewater will be collected in the temporary desilting tank, and be used for watering the construction access and spoil to reduce dust after deposition. Finally the desilting tank will be removed and transported to the permanent dumping area, and the spot will be backfilled with the excavated earth or stone.	Constructor	Environmental protection bureaus of Tuokexun County and Turpan Prefecture, Xinjiang Environmental Protection Department	
	Alagou Main Diversion Canal Works	Domestic sewage	The temporary production and living quarter is located in gravel desert, where the mean annual evaporation is up to 3744mm. The domestic sewage can be collected in the temporary sewage receiving tank and evaporate naturally. The daily sewage discharge will be 10.1m^3/d in the construction quarter during peak period, and a sewage receiving tank will be built in the temporary production and living quarter. The tank is designed to accommodate 2-day sewage discharge and will have a design capacity of 20.2m^3 and a size of 5m×2m×2m (L×W×D) to facilitate design and construction. Meanwhile, one environmental friendly lavatory with a floor area of 20m^2 will be provided in the temporary production and living quarter, and one simple lavatory with floor area of 6m^2 be provided in the concentrated construction site. Feces from the lavatories will be used as manure after being disinfected with lime. When the project is completed, the sewage receiving tanks and lavatories will be dismantled, be backfilled with the excavated earth after the concrete and gravel being delivered to the permanent dumping area, and be leveled and compacted.			
		Domestic garbage	Domestic garbage will be produced mainly in the temporary living quarter. The domestic garbage yield will be 0.17t daily, and the total domestic garbage yield during the whole construction period will be about 38.8t. One movable garbage collector will be arranged in the temporary production and living quarter, and one temporary garbage collecting tank at each main construction site. The domestic garbage will be cleared once every three days and be transported to Tuokexun County wasteyard.			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Tuokexun County		Soil and water conservation Soil and water conservation	□ Salient structures area (canal works area and flood protection dyke area) A. The excavated materials will be piled in a concentrated way on one side of the excavated section within the managed scope. The earth will be piled in trapezoidal bench. The slope ratio and height for earth piling for the canal are 1:1.5 and not over 1.4m, respectively, and those for the flood-prevention dyke are 1:1 and not over 3.0m, respectively. The temporary spoil piled will be covered with geomembrane during the construction period, and watering and other temporary protective measures will be taken for the disturbed ground surface in the construction area. The slash of temporary dumping area and the construction area will be leveled and covered with gravel. B. Vegetation measures: Not applicable C. Temporary engineering measures Construction in strong wind day or raining day will be minimized. Temporary earth piling will be made in a concentrated way, sprinkled with during the construction period and covered with geomembrane. □ Construction access area: Temporary engineering measures: During the construction period, the temporary construction roads in the project area will be watered frequently on the pavement, and the construction vehicles are prohibited to roll their peripheral land. □ Temporary production and living quarter for construction: The temporary production and living quarter includes temporary production area and temporary living area, mainly referring to material piling area, temporary housing, concrete batching plant, storage area, and so on. The quarter will be watered to reduce the dust at the construction site. The pollutants (refuse and fuel) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the dumping area. Since the original ground surface of the temporary production and living quarter is covered with gravel, it will be basically free of wind erosion through treatment after the construction. The engineering measures above mentioned are newly added for soil and water conservation. □ Quarry area A. Cobble quarry area: Cobble quarry area is in the riverbed, so it's difficult to take engineering measures and vegetation measures. The collection of cobbles should minimize the disturbance to the riverbed, and it's required to collect only the cobbles that are on the top of the riverbed and move from the upper reaches in flood season. No exposal of riverbed is the criterion for cobble collection. Since the piling of big cobbles on the riverbed can play a role of anti-scouring to some extent, attention should be paid on the protection of riverbed in cobble collection. B. Concrete aggregate quarry area: It's proposed to backfill the quarrying pit of the quarry with the nearby discards from the screening after the construction of the salient works, and level and compact the pit mechanically. □ Dumping area: The temporary dumping areas will be located within 3m away from each excavation face to pile up the excavated materials from the construction and production in a form of trapezoidal bench. The waste earth will be piled according to its amount and piling mode, and the land it occupies is mostly of Gobi. After the construction, the land surface will be protected through covering with gravel. For the purpose of soil and water conservation, engineering measures of watering and covering the surface of the piled earth with dust-prevention net temporarily in strong wind days will be adopted. The permanent spoil will be transported to the permanent dumping area and piled in a concentrated way when the construction is completed, and the spoil surface will be covered with gravel so as to reduce wind erosion.	Constructor	Water resources bureaus of Tuokexun County and Turpan Prefecture, Xinjiang Water Resources Department	Unit qualified for soil and water conservation monitoring

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Shanshan County	Ertang Branch Canal Seepage Control Upgrading Works	Domestic sewage	The construction personnel for Ertang Branch Canal Seepage Control Upgrading Works will stay in the residential area nearby, so the domestic sewage produced will be collected and treated in a unified way in the residential area, no additional treatment measure will be taken.	Constructor	Environmental protection bureaus of Shanshan County and Turpan Prefecture, Xinjiang Environmental Protection Department	
		Domestic garbage	The construction personnel for Ertang Branch Canal Seepage Control Upgrading Works will stay in the residential area nearby, so the domestic garbage produced will be collected and treated in a unified way in the residential area, no additional treatment measure will be taken.			
		Soil and water conservation	□ Salient structures area: During the construction period, the temporarily piled materials will be covered with color striped fabric, and watering and other temporary protective measures will be taken for the disturbed ground surface in the construction area. After the construction, the slash of temporary dumping area and the construction area will be leveled. Construction in strong wind day or raining day will be minimized. It's forbidden to excavate and pile materials and harden the ground at discretion in construction to minimize damage to the original ground. Rational measures should be taken to protect the soil and water resources. The excavated earth should be utilized as far as possible, and temporary protective measures should be taken for the earth in the period of being piled before the utilization. It's prohibited to dump and pile the waste earth and other solid wastes at Gobi and other areas not for this purpose, and those wastes must be cleared and transported to the specifically designed storage area and piled in a concentrated way. Covering and retaining measures should also be taken for the temporary storage area. Effective measures should be taken to control and prevent landslide and other soil erosion disasters caused by the construction. The area should be cleared after the construction. □ Quarry area: Cobble quarry area is in the riverbed, so it's difficult to take engineering measures and vegetation measures. The collection of cobbles should minimize the disturbance to the riverbed, and it's required to collect only the cobbles that are on the top of the riverbed and move from the upper reaches in flood season. No exposal of riverbed is the criterion for cobble collection. □ Access road area: The salient works have very convenient access conditions. Natural gradient will be adopted for the onsite access road based on the topographic variation, and the land will be leveled. The salient structures conform to the requirements of soil and water conservation. The construction road will be sprinkled with water during the construction period to avoid dust. □ Dumping area: In accordance with the demands of canal works, the dumping areas will be located within 2.5m away from each excavation face to pile up the excavated materials from the construction and production. The temporarily piled materials will be covered with color striped fabric and be watered. The waste earth will be piled according to its amount and piling mode, and the land it occupies is mostly of Gobi. After the construction, the land surface will be protected through covering with gravel. □ Temporary production and living quarter: It will be watered to reduce the dust at the construction site. The pollutants (refuse, fuel, etc.) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the dumping area. Since the original ground surface of the temporary production and living quarter is covered with gravel, it will be basically free of wind erosion through treatment after the construction.	Constructor	Water resources bureaus of Shanshan County and Turpan Prefecture, Xinjiang Water Resources Department	Unit qualified for soil and water conservation monitoring

4.2.3 Water saving irrigation works

4.2.3.1 Mitigation measures at design stage

Following measures should be taken at design stage to mitigate the environmental impact of project construction:

 The designer should consider all the factors comprehensively, divide the permanent land use plan into more details according to the design of the surroundings, and utilize the land rationally.

 In the design, the temporary dumping areas for the construction period and the permanent dumping areas after the construction should be arranged reasonably based on the specific conditions of various construction zones, and flood-control tailing hold works and sewage-control tailing hold works should be arranged to control the spoil in a concentrated way and minimize the impact of spoil piling on environment.

 Soil and water conservation plan should be prepared well. The general layout should fully consider not only the type, mode and impacting degree of soil erosion and water loss caused by the project construction, but also the master plan of the management area for the operation period of the project.

 Great attention should be attached in design on the public health during the construction period. The dwelling conditions in the temporary living quarter should not be too simple, crude and crowded, and the area with good surroundings should be selected as the living quarter for the construction personnel to prevent the introduction and spreading of epidemic diseases.

 The construction of the works will cause great noise, so the designer should take reasonable sound insulation and noise reduction measures as required so as to mitigate the impact of construction noise on site construction personnel.

 Find out the opinions and comments on environmental problems and impacts of the public and all walks of life to be impacted through public participation before, during and after the project development so as to improve the design.

4.2.3.2 Mitigation measures during construction period

(1) Water environment

 Production wastewater

Specific measures:

Production wastewater will be mainly from concrete batching and curing and cleaning and maintenance of transport vehicles and other machinery. Since the construction sites are dispersed, the wastewater from concrete batching and curing is difficult to collect and will be fully consumed through evaporation. Only minor repair and maintenance will be conducted for the mechanical equipment at the site, so the production wastewater is mainly from washing of the batching system which is small in quantity and will be fully consumed through natural evaporation and seepage. Therefore, no mitigation measure will be taken for the production wastewater.

- Domestic sewage

Special measures:

A. Turpan City Water-Saving Irrigation Works

a. The daily domestic sewage discharge will be 16.2m^3/d (2.31m^3/d by 7 living quarters) during peak construction period. In accordance with the construction production layout and due to the short construction period of the project, limited domestic sewage discharge and strong evaporation in the project area, it's decided that the domestic sewage will be collected in the temporary sewage receiving tank and be consumed through natural evaporation and seepage. Seven tanks are arranged, one for each living quarter. The tank is designed to accommodate 3-day sewage discharge and will have a design capacity of 6.94m^3 and a size of 2m×2m×2m (L×W×D).

b. Seven latrines of brick and concrete structure with a floor area of 6m^2 will be built, one in each living quarter. After the construction, the sewage receiving tanks and latrines will be cleared, disinfected and buried.

B. Tuokexun County Water-Saving Irrigation Works

a. The construction personnel will stay in the residents' houses around each construction zone, where the existing living facilities can fully meet the demands of the construction personnel.

b. Eight simple lavatories (6m^2 each) will be provided at the seven concentrated construction sites and the temporary production area. Feces from the lavatories will be used as manure after being disinfected with lime. When the project is completed, the sewage receiving tanks and lavatories will be dismantled, be backfilled with the excavated earth after the concrete and gravel bedding course being delivered to the permanent dumping area, and be leveled and compacted.

C. Shanshan County Water-Saving Irrigation Works

The construction personnel for Shanshan County Water-Saving Irrigation Works will stay in the residential area nearby, so the domestic sewage produced will be collected and treated in a unified way in the residential area, no additional treatment measure will be taken.

Evaluation on the measures: The above measures can effectively mitigate the adverse environmental impact of domestic sewage in the construction period.

(2) Ambient air

Specific measures:

- Construction personnel will be protected for health care, for example, wearing gauze masks and wind glasses;

- Cement, lime and other powder materials should be canned or bagged. Transportation in bulk is forbidden so as to prevent dust along the transportation route; cover the piled materials with tarpaulin in rain and strong wind days;

 strictly regulate the traveling route of the transportation machinery during the construction period; often sprinkle water for curing during the construction period to reduce dust. Water 2-3 times per day or more often in strong wind event;

 Avoid earth excavation and backfill under strong wind weather.

Evaluation on the measures: The above measures can minimize the impact of atmospheric environment contamination on the construction personnel during the construction period.

(3) Acoustic environment

Specific measures:

 Prepare the construction planning well to locate strong noise sources far away from the living quarter of construction personnel, and control the noise of excavators, mixing machines and other equipment within 55dB(A).

 In accordance with the Noise Limits for Construction Site (GB12523-90), the working hours of the people working with mixing machines, bulldozers, excavators and under other highly noisy environment should be controlled as per the labor protection regulations and be offered with anti-noise articles so as to alleviate injury to construction personnel's health caused by noise.

Evaluation on the measures: The above measures can minimize the impact of noise on the construction personnel during the construction period.

(4) Solid waste

 Engineering spoil

Special measures:

A. Turpan City Water-Saving Irrigation Works

Do a good job in design and construction planning, use the spoil produced in construction as filling materials or backfill materials on the spot as much as possible to reduce the amount of waste, and the remaining spoil will be transported to the permanent dumping area, which is located at Gobi close to Yaer Township project area and the desilting tank of Aidinghu Township project area and will be used to pile the spoil with the existing depression.

B. Tuokexun County Water-Saving Irrigation Works

The agricultural water-saving irrigation works involve much earth cut, mainly caused by desilting tank, pipe chases, control gates and anchorage blocks. The earth cut amounts to 507300m^3, of which 492,800m^3 to be used for backfill and 14500m^3 as refuse. Mostly of the earth from pipe chase excavation will be used for backfill. The pipework will produce 8600m^3 of spoil, which can be built into a pipe dyke along the pipeline. The dyke will be 0.6m wide on the bottom, 0.15m high and 1:1.3 in slope ratio. The spoil from pipework can be fully utilized on the spot. The anchorage blocks will be precast and cause 1500m^3 of spoil, which can be used to build the pipe dyke since the anchorage blocks are arranged along the pipeline. When the desilting tank is built, the spoils will be used to level the land around the desilting tank and then be compacted. The land leveling will be 5m wide, 2794m^2

in area, and 0.5m in thickness, using 1400m^3 of spoil, and the remaining 2800m^3 will be delivered to the permanent dumping area. The spoil from building of control gates is quite little, only 200m^3, and the way to treat it is similar to that for the desilting tank.

C. Shanshan County Water-Saving Irrigation Works

The solid waste from the construction covers refused earth, sand and stone excavated, and refused bricks. The refused earth produced in the earth excavation is quite little because the earth is used for backfill while being excavated in the process of pipeline laying and the rest is blocked up along the pipeline to build into a pipe dyke, thus excavation and backfill are balanced basically. When the rehabilitated pump wells, gate well valves and inspection wells are built, the earth, sand, stone, and refused bricks from the excavation can be used to level the land around the excavation site, then be compacted, and finally be covered with gravel on the surface. Since the surplus earth is of perennial cultivated soil, it can be evenly scattered to farmland again. The earth can be reused although it is waste.

 Domestic garbage

Special measures:

A. Turpan City Water-Saving Irrigation Works

a. Provide seven movable garbage collectors, one in each living quarter, publicize the hygiene knowledge to the construction personnel, and nurture their habit of putting garbage into garbage collector.

b. Rent one refuse truck every week during the construction period to collect, clear and transport the garbage in time, and treat the garbage together with that from the local residents.

B. Tuokexun County Water-Saving Irrigation Works

The peak domestic garbage yield will be 0.36t daily, and the total domestic garbage yield during the whole construction period will be about 106t. Since the construction personnel will stay in the residents' houses around each construction zone, the existing living facilities can be utilized. However, one movable garbage collector needs to be arranged at the seven main construction sites and the temporary production area separately. The domestic garbage will be transported to Tuokexun County wasteyard for treatment.

C. Shanshan County Water-Saving Irrigation Works

The construction personnel for Shanshan County Water-Saving Irrigation Works will stay in the residential area nearby, so the domestic garbage produced will be collected and treated in a unified way in the residential area, no additional treatment measure will be taken.

Evaluation on the measures: The above measures can lower the impact of solid waste in construction on the surroundings to a degree within environmental endurance.

(5) Ecological environment

Specific measures:

 Strengthen the propaganda of the Environmental Protection Law and the Soil and Water Conservation Law, intensify the construction personnel's sense of environmental protection, standardize their behavior in construction, and strictly prohibit them from rolling and damaging soil and vegetation at discretion;

 Strictly designate the traveling route of vehicles and other construction machinery, mark clearly the area of construction activities at the site, and set warning signs on both sides of the construction access.

Evaluation on the measures: The above measures can effectively protect the ecological environment around the project area.

(6) Soil and water conservation measures

Special measures:

 Turpan City Water-Saving Irrigation Works

A. Diversion gate, desilting tank, management room and gate valve well works area

It mainly includes diversion gate, diversion canal, desilting tank, concentrated surface water treatment station, pump room, management room, gate valve well and other structures, and occupies 10.88hm^2 of land, of which 0.0425hm^2 for the diversion gate and diversion canal, 1.18hm^2 for the desilting tank, 0.35m^2 for the management room and pump room, and 9.31hm^2 for the gate valve well.

All the construction of the diversion gate, desilting tank, management room and gate valve well will be concentrated during the period from October to November of 2009, so the strong wind season lasting from every March to April will be avoided. The earth excavation will be done with 1m^3 excavator, accompanied by 15t dump truck for transport. A means of consecutive excavation, loading and transport is adopted. The excavated earth for backfill will be directly transported by dump truck to the place to be backfilled. If the place cannot be backfilled for the moment, the backfilling material will be piled beside the place in a concentrated way and be subject to temporary watering and hardening treatment. The earth not for backfill will be directly transported to the permanent dumping area.

B. Pipeline works area

The pipeline works area includes the main diversion pipe and field pipeline network works and occupies 50.11hm^2 of land. The main diversion pipe is 7580m and occupies 2.57hm^2 of land in total, and the field pipeline totals 453.867km long and occupies 47.54hm^3 of land.

The excavated materials will be piled up in a concentrated way on one side of the excavated section within the managed scope. The earth will be piled in trapezoidal bench with a slope ratio of 1:1. The temporary piling height of the excavated materials for the main diversion pipe is controlled at 2.0m because it is in Gobi, and that for the field pipeline is controlled at 1.0m because it is in oasis farmland. The temporary spoil from the main diversion pipe can be watered and temporarily hardened with the water from canal, and that from the field pipeline can be compacted solidly with manpower for an earth layer of 5cm thick on the windward side. The slash of temporary dumping area and the construction area will be leveled after the construction.

C. Access road area

Access road area includes maintenance road (7.58km long) and temporary construction road (22km long) and occupies 13.20hm^2 of land, of which 2.27 hm^2 for the maintenance road and 10.93hm^2 for the temporary construction road.

The land for the maintenance road and temporary construction road will be leveled, and the earth produced therefrom should be stored concentratedly and be treated with corresponding temporary watering and protective measures. In accordance with the construction requirements, the earth from roadbed excavation should be transported to the place to be backfilled for roadbed, thus the soil erosion due to temporary earth piling can be reduced. Water sprinkling against dust will be carried out during the construction period.

D. Dumping area

In line with the characteristics and procedures of site construction, a large amount of spoil produced in the construction can be reused and needs to be stored temporaries. Therefore, a temporary dumping area needs to be built, mainly for the diversion gate, desilting tank, main diversion pipe, field pipeline and gate valve well works area, and it will occupy 99.38hm^2 of land.

a. Permanent dumping area

In accordance with the master plan of the project, two permanent dumping areas are arranged to meet the demands of production, located in Gobi close to Yaer Township project area and desilting tank in Aidinghu Township project area, respectively. The two areas will occupy 1.47hm^2 of land.

The permanent dumping area will mainly accommodate the spoil from the diversion gate and the desilting tank. The dumping area is situated 200m away from the diversion gate and desilting tank and is close to the original canal, so it’s convenient for water use and can be watered more during the construction period so as to lessen soil erosion. Cobbles and rock blocks with a diameter greater than 5cm will be picked out from the spoil pile nearby by manpower during the construction period and be transported to the permanent dumping area by 5t dump truck when the construction is completed to cover over the top and slope corners of the dumping area. The gravel coverage will be 10cm thick, and it will be spread and leveled with manpower and be compacted with 8-10t mechanically driven smooth wheel road roller.

b. Temporary dumping area

In line with the characteristics and procedures of site construction, a large amount of spoil produced in the construction can be reused and needs to be stored temporaries. Therefore, a temporary dumping area needs to be built, mainly for the diversion gate, desilting tank, main diversion pipe, field pipeline and gate valve well works area, and it will occupy 99.38hm^2 of land.

Temporary dumping area for diversion gate and desilting tank

The temporary dumping area for the diversion gate and desilting tank is located 50m away from the construction side and is close to the original canal, so it's convenient for water use and can be watered more during the construction period so as to lessen soil erosion.

Temporary dumping area for main diversion pipe

The temporary dumping area for the main surface water diversion pipe is arranged by the pipe. It is 0.5m away from the pipe duct and between the canal and the pipe, so its surface can be sprinkled with water pumped from the canal during the construction period so as to lessen soil erosion.

Temporary dumping area for gate valve well

The gate valve well works area is on the boundary of the existing farmland, and currently the farmland, roads and shelterbelt are arranged in order and reasonably and have the function of soil and water conservation to some extent. All the temporary dumping areas for the gate valve wells are located beside the corresponding gate valve well. The windward side of the temporary spoil pile will be compacted solidly with manpower for a thickness of 5cm during the construction period.

The temporary land occupied for the works do not have vegetation except the field pipeline network area, where the main vegetation is field weeds. The construction is scheduled from October to November, when the crops will have been reaped and the weeds will be withered and yellow. When excavating the pipe duct, top mellow soil of 30~50cm thick with grass roots and seeds will be took off and piled on the lowermost of the temporary spoil, and when backfilling the pipe duct after the pipes are installed, it will be put on the uppermost. Thus the vegetation will be resumed naturally in the next year.

Temporary dumping area for field pipeline network

The field pipeline network is in the existing farmland without exception, and currently the farmland, roads and shelterbelt are arranged in order and reasonably and have the function of soil and water conservation to some extent. All the temporary dumping areas for the field pipeline network are located along the network. The windward side of the temporary spoil pile will be compacted solidly with manpower for a thickness of 5cm during the construction period. The construction is scheduled from October to November, when the crops will have been reaped and the weeds will be withered and yellow. When excavating the pipe duct, top mellow soil of 30~50cm thick with grass roots and seeds will be took off and piled on the lowermost of the temporary spoil, and when backfilling the pipe duct after the pipes are installed, it will be put on the uppermost. Thus the vegetation will be resumed naturally in the next year.

E. Temporary production and living quarter

The temporary production and living quarter includes temporary production area and temporary living area. The temporary production area covers the places for concrete batching system, aggregate processing system, equipment repairing workshop, rebar processing workshop, wood workshop, parking lot, construction equipment warehouse, consumption goods warehouse, cement storage, fuel storage, and so on. The temporary living area covers the places for office, dormitory, work shed, temporary piling and transfer areas, and so on and will occupy 0.38hm^2 of land.

The temporary production and living quarter will be watered to reduce the dust at the construction site. The pollutants (refuse and fuel) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the dumping area. Since the original ground surface of the temporary production and living quarter is covered with gravel, it will be basically free of wind erosion through leveling of the temporarily occupied land (0.38 hm^2) after the construction. The engineering measures above mentioned are newly added for soil and water conservation.

 Tuokexun County Water-Saving Irrigation Works

A. Field pipeline control area

The pipeline control area covers the gate valve well and field pipeline network works. The excavated materials will be piled up in a concentrated way on one side of the pipe duct in trapezoidal bench with a slope ratio of 1:1 and a height controlled at 1.0m. The temporarily piled materials will be covered with geomembrane.

When the construction is completed, the construction slash of 227.45 hm^2 will be leveled.

B. Off-site works control area

The off-site works control area covers sedimentation tank, pump room and management room. The excavated materials will be piled up in a concentrated way on the outer side of the structure in trapezoidal bench with a slope ratio of 1:1.0 and a height controlled at 1.0m, and the temporary protective measure of compacting solidly with manpower will be adopted. The slash of temporary piling area (4.89hm^2) will be leveled after the construction.

C. Temporary construction road control area

Temporary construction roads will consist of the existing tractor roads and the newly built construction road. The newly built one will be 6km long and be along the off-site main diversion pipe. This scheme mainly aims at the temporary protection of the newly built construction road, namely, taking temporary protective measure of watering during the construction period and leveling the site (2.40hm^2) after the construction.

D. Temporary production and living control area

The temporary production and living quarter includes temporary production area and temporary living area. The temporary production area covers the places for concrete batching system, aggregate processing system, equipment repairing workshop, rebar processing workshop, wood workshop, parking lot, construction equipment warehouse, consumption goods warehouse, cement storage, fuel storage, and so on. The temporary living area covers the places for office, dormitory, work shed, temporary piling and transfer areas, and so on.

The temporary production and living quarter will be watered to reduce the dust at the construction site. The pollutants (refuse and fuel) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the dumping area. Since the original ground surface of the temporary production and living quarter is covered with gravel, the temporarily occupied land (0.70 hm^2) will be leveled after the construction.

E. Preventive management measures

To reduce the soil erosion in construction, management of various construction stages should be intensified besides the specific engineering measures.

a. The temporarily stored earth to be transferred and utilized should be piled into bench and compacted solidly on the surface to avoid wind erosion. In addition, the Constructor should arrange the construction procedures rationally to minimize the time of temporary storage of earth.

b. Plan the range of construction activities during the construction period, and arrange the existing traffic at the sections with quite strong wind erosion, specially assign person to strictly control and manage the traveling route of transport vehicles and heavy machinery to prevent damage to ground surface and vegetation and the soil erosion arising thereof.

c. Set up warning boards for vegetation protection at the passageway of service roads to remind the construction personnel and operators.

d. No construction in strong wind or rainstorm weather, especially the excavation and backfill of pipe ducts.

e. Strictly prohibit the pile and place the construction materials in disorder to prevent enlarging the damage to ecological environment.

 Shanshan County Water-Saving Irrigation Works

Its construction area consists of 9 construction zones, 15 subzones and 60 control areas for the control of soil erosion and water loss. In accordance with the existing status of soil erosion in the project area and the analysis on the soil erosion caused by the project construction, and due to the fact that the control areas and the corresponding construction method and content are the same for the various construction zones, the soil erosion control system is designed only for the four control areas of one subzone of one construction zone. The four control areas are the management room control area, pipeline control area, temporary construction road control area, and temporary production and living control area.

The major soil and water conservation measures are as below:

 Management room control area: The excavated materials will be piled up in a concentrated way on one side in trapezoidal bench with a slope ratio of 1:1 and a height controlled at 1.0m, and its windward side will be compacted solidly with manpower as a temporary measure. The slash of temporary piling area for the excavated materials will be leveled after the construction.

 Pipeline control area: The materials from pipeline excavation will be piled up in a concentrated way along one side of the pipeline in trapezoidal bench with a slope ratio of 1:1 and a height controlled at 1.0m, and its windward side will be compacted solidly with manpower as a temporary measure. The slash of temporary piling area for the excavated materials will be leveled after the construction.

 Temporary construction road control area: The construction roads are mainly in the farmland. They will be temporarily protected through watering during the construction period and can be directly used for re-cultivation when the construction is completed.

 Temporary production and living control area

The temporary production and living quarter includes temporary production area and temporary living area. The temporary production area covers the places for concrete batching system, aggregate processing system, equipment repairing workshop, rebar processing workshop, wood workshop, parking lot, construction equipment warehouse, consumption goods warehouse, cement storage, fuel storage, and so on. The temporary living area covers the places for office, dormitory, work shed, temporary piling and transfer areas, and so on.

The temporary production and living quarter will be watered to reduce the dust at the construction site. The pollutants (refuse and fuel) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the wasteyard. Since the original of the temporary production and living quarter is covered with gravel, the ground surface will be basically free of wind erosion through treatment of the temporarily occupied land after the construction. The engineering measures above mentioned are newly added for soil and water conservation.

(7) Public health

Specific measures:

 Request the local sanitation and antiepidemic authorities to specially assign person to instruct and supervise the sanitary clearance of the construction area;

 Organize and implement the health and antiepidemic measures before the mobilization of the construction personnel;

 Do a good job in treating the ordinary personal injuries and diseases;

 Strengthen publicization, dissemination and education of health knowledge, and instruct the construction personnel to form good living habits;

 Eliminate the epidemic outbreak;

 Earnestly protect the safety of the construction personnel during the construction period to avoid industrial injury.

Evaluation on the measures: In case proper sanitary and epidemic prevention measures are taken, the public health of the construction personnel will not be affected.

4.2.3.3 Mitigation measures during operation period

During operation period, the environmental impacts of water saving irrigation works will be mainly certain adverse environmental impacts caused by change of agro-chemical uses. The mitigation measures are summarized in table 4.1.1.4.

Summary of General Mitigation Measures against Environmental Impacts of Water Saving Irrigation Works

Table 4.2-14

Type	Period	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Water-Saving Irrigation Works	Design stage		□ The designer should consider all the factors comprehensively, divide the permanent land use plan into more details according to the design of the surroundings, and utilize the land rationally. □ In the design, the temporary dumping areas for the construction period and the permanent dumping areas after the construction should be arranged reasonably based on the specific conditions of various construction zones, and flood-control tailing hold works and sewage-control tailing hold works should be arranged to control the spoil in a concentrated way and minimize the impact of spoil piling on environment. □ Soil and water conservation plan should be prepared well. The general layout should fully consider not only the type, mode and impacting degree of soil erosion and water loss caused by the project construction, but also the master plan of the management area for the operation period of the project. □ Great attention should be attached in design on the public health during the construction period. The dwelling conditions in the temporary living quarter should not be too simple, crude and crowded, and the area with good surroundings should be selected as the living quarter for the construction personnel to prevent the introduction and spreading of epidemic diseases. □ The construction of the works will cause great noise, so the designer should take reasonable sound insulation and noise reduction measures as required so as to mitigate the impact of construction noise on site construction personnel. □ Find out the opinions and comments on environmental problems and impacts of the public and all walks of life to be impacted through public participation before, during and after the project development so as to improve the design.	Designer Environment workgroup	Environmental management offices of Turpan City, Shanshan County, and Tuokexun County	
	Construction period	Production wastewater	Production wastewater will be mainly from concrete batching and curing and cleaning and maintenance of transport vehicles and other machinery. Since the construction sites are dispersed, the wastewater from concrete batching and curing is difficult to collect and will be fully consumed through evaporation. Only minor repair and maintenance will be conducted for the mechanical equipment at the site, so the production wastewater is mainly from washing of the batching system which is small in quantity and will be fully consumed through natural evaporation and seepage. Therefore, no mitigation measure will be taken for the production wastewater.	Constructor	Xinjiang Environmental Protection Department, environmental protection bureaus of Turpan Prefecture, Turpan City, Shanshan County and Tuokexun	

Type	Period	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Ambient air	□ Construction personnel will be protected for health care, for example, wearing gauze masks and wind glasses; □ Cement, lime and other powder materials should be canned or bagged. Transportation in bulk is forbidden so as to prevent dust along the transportation route; cover the piled materials with tarpaulin in rain and strong wind days; □ Strictly regulate the traveling route of the transportation machinery during the construction period; often sprinkle water for curing during the construction period to reduce dust. Water 2-3 times per day or more often in strong wind event; □ Avoid earth excavation and backfill under strong wind weather.		County	
		Acoustic environment	□ Prepare the construction planning well to locate strong noise sources far away from the living quarter of construction personnel, and control the noise of excavators, mixing machines and other equipment within 55dB(A). □ In accordance with the Noise Limits for Construction Site (GB12523-90), the working hours of the people working with mixing machines, bulldozers, excavators and under other highly noisy environment should be controlled as per the labor protection regulations and be offered with anti-noise articles so as to alleviate injury to construction personnel's health caused by noise.			
		Ecological Environment	□ Strengthen the propaganda of the Environmental Protection Law and the Soil and Water Conservation Law, intensify the construction personnel's sense of environmental protection, standardize their behavior in construction, and strictly prohibit them from rolling and damaging soil and vegetation at discretion; □ Strictly designate the traveling route of vehicles and other construction machinery, mark clearly the area of construction activities at the site, and set warning signs on both sides of the construction access.			
		Public health	□ Request the local sanitation and antiepidemic authorities to specially assign person to instruct and supervise the sanitary clearance of the construction area; □ Organize and implement the health and antiepidemic measures before the mobilization of the construction personnel; □ Do a good job in treating the ordinary personal injuries and diseases; □ Strengthen publicization, dissemination and education of health knowledge, and instruct the construction personnel to form good living habits; □ Eliminate the epidemic outbreak; □ Earnestly protect the safety of the construction personnel during the construction period to avoid industrial injury.			

Summary of Special Mitigation Measures against Environmental Impacts of Water Saving Irrigation Works during Construction Period

Table 4.2-15

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Turpan City	Turpan City Water-Saving Irrigation Works	Domestic sewage	□ The daily domestic sewage discharge will be 16.2m^3/d (2.31m^3/d by 7 living quarters) during peak construction period. In accordance with the construction production layout and due to the short construction period of the project, limited domestic sewage discharge and strong evaporation in the project area, it's decided that the domestic sewage will be collected in the temporary sewage receiving tank and be consumed through natural evaporation and seepage. Seven tanks are arranged, one for each living quarter. The tank is designed to accommodate 3-day sewage discharge and will have a design capacity of 6.94m^3 and a size of 2m×2m×2m (L×W×D). □ Seven latrines of brick and concrete structure with a floor area of 6m^2 will be built, one in each living quarter. After the construction, the sewage receiving tanks and latrines will be cleared, disinfected and buried.	Constructor	Turpan City Environmental Protection Bureau, Turpan Prefecture Environmental Protection Bureau, Xinjiang Environmental Protection Department	
	Turpan City Water-Saving Irrigation Works	Engineering spoil	Do a good job in design and construction planning, use the spoil produced in construction as filling materials or backfill materials on the spot as much as possible to reduce the amount of waste, and the remaining spoil will be transported to the permanent dumping area, which is located at Gobi close to Yaer Township project area and the desilting tank of Aidinghu Township project area and will be used to pile the spoil with the existing depression.			
Turpan City		Domestic garbage	□ Provide seven movable garbage collectors, one in each living quarter, publicize the hygiene knowledge to the construction personnel, and nurture their habit of putting garbage into garbage collector. □ Rent one refuse truck every week during the construction period to collect, clear and transport the garbage in time, and treat the garbage together with that from the local residents.			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Soil and	□ Diversion gate, desilting tank, management room and gate valve well works area: It mainly includes diversion gate, diversion canal, desilting tank, concentrated surface water treatment station, pump room, management room, gate valve well and other structures, and occupies 10.88hm^2 of land, of which 0.0425hm^2 for the diversion gate and diversion canal, 1.18hm^2 for the desilting tank, 0.35m^2 for the management room and pump room, and 9.31hm^2 for the gate valve well. All the construction of the diversion gate, desilting tank, management room and gate valve well will be concentrated during the period from October to November of 2009, so the strong wind season lasting from every March to April will be avoided. The earth excavation will be done with 1m^3 excavator, accompanied by 15t dump truck for transport. A means of consecutive excavation, loading and transport is adopted. The excavated earth for backfill will be directly transported by dump truck to the place to be backfilled. If the place cannot be backfilled for the moment, the backfilling material will be piled beside the place in a concentrated way and be subject to temporary watering and hardening treatment. The earth not for backfill will be directly transported to the permanent dumping area. □ Pipeline works area: It includes the main diversion pipe and field pipeline network works and occupies 50.11hm^2 of land. The main diversion pipe is 7580m and occupies 2.57hm^2 of land in total, and the field pipeline totals 453.867km long and occupies 47.54hm^3 of land The excavated materials will be piled up in a concentrated way on one side of the excavated section within the managed scope. The earth will be piled in trapezoidal bench with a slope ratio of 1:1. The temporary piling height of the excavated materials for the main diversion pipe is controlled at 2.0m because it is in Gobi, and that for the field pipeline is controlled at 1.0m because it is in oasis farmland. The temporary spoil from the main diversion pipe can be watered and temporarily hardened with the water from canal, and that from the field pipeline can be compacted solidly with manpower for an earth layer of 5cm thick on the windward side. The slash of temporary dumping area and the construction area will be leveled after the construction. □ Access road area: Access road area includes maintenance road (7.58km long) and temporary construction road (22km long) and occupies 13.20hm^2 of land, of which 2.27 hm^2 for the maintenance road and 10.93hm^2 for the temporary construction road. The land for the maintenance road and emporary construction road will be leveled, and the arth produced therefrom should be stored oncentratedly and be treated with corresponding emporary watering and protective measures. In ccordance with the construction requirements, the arth from roadbed excavation should be ansported to the place to be backfilled for oadbed, thus the soil erosion due to temporary arth piling can be reduced. Water sprinkling gainst dust will be carried out during the onstruction period. □ Dumping area: In line with the characteristics and procedures of site construction, a large amount of spoil produced in the construction can be reused and needs to be stored temporaries. Therefore, a temporary dumping area needs to be built, mainly for the diversion gate, desilting tank, main diversion pipe, field pipeline and gate valve			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Tuokexun County	Tuokexun County Water-Saving Irrigation Works	Domestic sewage	□ The construction personnel will stay in the residents' houses around each construction zone, where the existing living facilities can fully meet the demands of the construction personnel. □ Eight simple lavatories (6m^2 each) will be provided at the seven concentrated construction sites and the temporary production area. Feces from the lavatories will be used as manure after being disinfected with lime. When the project is completed, the sewage receiving tanks and lavatories will be dismantled, be backfilled with the excavated earth after the concrete and gravel bedding course being delivered to the permanent dumping area, and be leveled and compacted.	Constructor	Water resources bureaus of Turpan City and Turpan Prefecture, Xinjiang Water Resources Department	Unit qualified for soil and water conservation monitoring
Tuokexun County	Tuokexun County Water-Saving Irrigation Works	Engineering spoil	The agricultural water-saving irrigation works involve much earth cut, mainly caused by desilting tank, pipe chases, control gates and anchorage blocks. The earth cut amounts to 507300m^3, of which 492,800m^3 to be used for backfill and 14500m^3 as refuse. Mostly of the earth from pipe chase excavation will be used for backfill. The pipework will produce 8600m^3 of spoil, which can be built into a pipe dyke along the pipeline. The dyke will be 0.6m wide on the bottom, 0.15m high and 1:1.3 in slope ratio. The spoil from pipework can be fully utilized on the spot. The anchorage blocks will be precast and cause 1500m^3 of spoil, which can be used to build the pipe dyke since the anchorage blocks are arranged along the pipeline. When the desilting tank is built, the spoils will be used to level the land around the desilting tank and then be compacted. The land leveling will be 5m wide, 2794m^2 in area, and 0.5m in thickness, using 1400m^3 of spoil, and the remaining 2800m^3 will be delivered to the permanent dumping area. The spoil from building of control gates is quite little, only 200m^3, and the way to treat it is similar to that for the desilting tank.			
Tuokexun County		Domestic garbage	The peak domestic garbage yield will be 0.36t daily, and the total domestic garbage yield during the whole construction period will be about 106t. Since the construction personnel will stay in the residents' houses around each construction zone, the existing living facilities can be utilized. However, one movable garbage collector needs to be arranged at the seven main construction sites and the temporary production area separately. The domestic garbage will be transported to Tuokexun County wasteyard for treatment.			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Soil and water conservation	□ Field pipeline control area: It covers the gate valve well and field pipeline network works. The excavated materials will be piled up in a concentrated way on one side of the pipe duct in trapezoidal bench with a slope ratio of 1:1 and a height controlled at 1.0m. The temporarily piled materials will be covered with geomembrane. When the construction is completed, the construction slash of 227.45 hm^2 will be leveled. □ Off-site works control area: It covers sedimentation tank, pump room and management room. The excavated materials will be piled up in a concentrated way on the outer side of the structure in trapezoidal bench with a slope ratio of 1:1.0 and a height controlled at 1.0m, and the temporary protective measure of compacting solidly with manpower will be adopted. The slash of temporary piling area (4.89hm^2) will be leveled after the construction. □ Temporary construction road control area: Temporary construction roads will consist of the existing tractor roads and the newly built construction road. The newly built one will be 6km long and be along the off-site main diversion pipe. This scheme mainly aims at the temporary protection of the newly built construction road, namely, taking temporary protective measure of watering during the construction period and leveling the site (2.40hm^2) after the construction. □ Temporary production and living control area: The temporary production and living quarter includes temporary production area and temporary living area. The temporary production area covers the places for concrete batching system, aggregate processing system, equipment repairing workshop, rebar processing workshop, wood workshop, parking lot, construction equipment warehouse, consumption goods warehouse, cement storage, fuel storage, and so on. The temporary living area covers the places for office, dormitory, work shed, temporary piling and transfer areas, and so on. The temporary production and living quarter will be watered to reduce the dust at the construction site. The pollutants (refuse and fuel) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the dumping area. Since the original ground surface of the temporary production and living quarter is covered with gravel, the temporarily occupied land (0.70 hm^2) will be leveled after the construction. □ Preventive management measures: To reduce the soil erosion in construction, management of various construction stages should be intensified besides the specific engineering measures: A. The temporarily stored earth to be transferred and utilized should be piled into bench and compacted solidly on the surface to avoid wind erosion. In addition, the Constructor should arrange the construction procedures rationally to minimize the time of temporary storage of earth. B. Plan the range of construction activities during the construction period, and arrange the existing traffic at the sections with quite strong wind erosion, specially assign person to strictly control and manage the traveling route of transport vehicles and heavy machinery to prevent damage to ground surface and vegetation and the soil erosion arising thereof. C. Set up warning boards for vegetation protection at the passageway of service roads to remind the construction personnel and operators. D. No construction in strong wind or	Constructor	Water resources bureaus of Turpan City and Turpan Prefecture, Xinjiang Water Resources Department	Unit qualified for soil and water conservation monitoring

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
Shanshan County	Shanshan County Water-Saving Irrigation Works	Domestic sewage	The construction personnel for Shanshan County Water-Saving Irrigation Works will stay in the residential area nearby, so the domestic sewage produced will be collected and treated in a unified way in the residential area, no additional treatment measure will be taken.	Constructor	Water resources bureaus of Turpan City and Turpan Prefecture, Xinjiang Water Resources Department	
		Engineering spoil	The solid waste from the construction covers refused earth, sand and stone excavated, and refused bricks. The refused earth produced in the earth excavation is quite little because the earth is used for backfill while being excavated in the process of pipeline laying and the rest is blocked up along the pipeline to build into a pipe dyke, thus excavation and backfill are balanced basically. When the rehabilitated pump wells, gate well valves and inspection wells are built, the earth, sand, stone, and refused bricks from the excavation can be used to level the land around the excavation site, then be compacted, and finally be covered with gravel on the surface. Since the surplus earth is of perennial cultivated soil, it can be evenly scattered to farmland again. The earth can be reused although it is waste.			
		Domestic garbage	The construction personnel for Shanshan County Water-Saving Irrigation Works will stay in the residential area nearby, so the domestic garbage produced will be collected and treated in a unified way in the residential area, no additional treatment measure will be taken.			

Location	Description	EI Factor	Mitigation Measures	Enforcement Unit	Supervision Unit	Monitoring Unit
		Soil and water conservation	□ Management room control area: The excavated materials will be piled up in a concentrated way on one side in trapezoidal bench with a slope ratio of 1:1 and a height controlled at 1.0m, and its windward side will be compacted solidly with manpower as a temporary measure. The slash of temporary piling area for the excavated materials will be leveled after the construction. □ Pipeline control area: The materials from pipeline excavation will be piled up in a concentrated way along one side of the pipeline in trapezoidal bench with a slope ratio of 1:1 and a height controlled at 1.0m, and its windward side will be compacted solidly with manpower as a temporary measure. The slash of temporary piling area for the excavated materials will be leveled after the construction. □ Temporary construction road control area: The construction roads are mainly in the farmland. They will be temporarily protected through watering during the construction period and can be directly used for re-cultivation when the construction is completed. □ Temporary production and living control area: The temporary production and living quarter includes temporary production area and temporary living area. The temporary production area covers the places for concrete batching system, aggregate processing system, equipment repairing workshop, rebar processing workshop, wood workshop, parking lot, construction equipment warehouse, consumption goods warehouse, cement storage, fuel storage, and so on. The temporary living area covers the places for office, dormitory, work shed, temporary piling and transfer areas, and so on. The temporary production and living quarter will be watered to reduce the dust at the construction site. The pollutants (refuse and fuel) will be cleared or buried after the construction, and the Constructor needs to remove all the surface structures and wastes and transport them to the wasteyard. Since the original of the temporary production and living quarter is covered with gravel, The ground surface will be basically free of wind erosion through treatment of the temporarily occupied land after the construction. The engineering measures above mentioned are newly added for soil and water conservation.	Constructor	Water resources bureaus of Turpan City and Turpan Prefecture, Xinjiang Water Resources Department	Unit qualified for soil and water conservation monitoring

4.2.4 Protection of Kareses

4.2.4.1 Mitigation measures during design stage

Following measures will be taken to mitigate the impacts on the environment during design stage:

① Engineering design should give an integrated consideration, further breakdown the permanent occupied land plan based on ambient environmental design and use the lands rationally.

② During design process, rationally make a layout of temporary disposal yard during construction period and permanent disposal yard after the completion of construction based on the specific conditions of buried channel, exposed channel and storage pool of karez so as to minimize the impacts of disposal stacks on the environment.

③ Engineering design should give high attention to the public health during construction period. Living room in the temporary living area should not be too unadorned and huddled. The area with a good ambient environment will be selected as living area for the construction personnel so as to put an end to the spreading of infectious disease.

④ Since the construction of buildings will cause a high noise, reasonable noise reduction measures shall be considered during the engineering design to limit the impacts of construction noise on the construction personnel.

⑤ From the perspective of protection of cultural relics, the design shall be done in a principle of “minimized disturbance” so as to “keep original appearance as much as possible” and maintain the historical information contained in the kareses.

⑥ Use public participation method to figure out the public that would be influenced by the project development, and to know the opinions and ideas of the public and all circles with regard to the environmental problems and environmental impacts before, during and after the project. The EIA personnel of the project will take various participatory methodologies upon different people, including bulletins and public notices by village committees, public notices on newspaper, dissemination of questionnaires, oral enquiry, expert workshops, etc.

4.2.4.2 Mitigation measures during construction stage

□1□water environment

□ wastewater from production

Specific measures:

A. Since construction sites will be arranged in a relative scattered way, it is not easy to collect together the dust and wastewater from concrete batching and concrete care. The main contents mainly consist of solid matters as mud, sands, rock debris. Except poor SS values, the wastewater would not occur a large quantity and basically have a big content of toxicant, the wastewater to be occurred will be naturally evaporated or seepage;

B. The application of construction material will conform to related requirements, particularly the treatment of grout. Before grout injection, water body and shaft wall shall be given partition protection to protect them from contamination by construction material;

C. Before consolidation with the shafts, buried channel top should be covered temporarily to prevent entrance of running oil, spilled oil, oil drop and oil leakage from construction machinery;

D. After the consolidation with the buried channels and shafts, all solid deposition accumulated along the channels such as sediment and rock debris shall be dredged out completely.

Evaluation: Applications of the aforesaid measures will effectively mitigate the unfavorable impacts of production wastewater on the water in kareses and ambient environment in the vicinity.

 domestic sewage

Specific measures:

A. Daily domestic sewage discharge peak will reach 1.91m^3/d during construction period. The construction production layout shows that only septic tank and natural evaporation and leakage can satisfy demands due to short-term construction period and limited domestic sewage discharge and local high evaporation. A temporary septic tank with a capacity based on 3-day discharge will be provided in living area. This tank is designed to have a capacity of 5.73m^3, sized 2m length by 2m width by 1.5m depth, concrete structure, 20cm thick bottom and 10cm thick cushion made of gravels. After flowing into the septic tank, domestic sewage will experience sedimentation, disinfection and evaporation; finally the residual solid deposition will be used in green work by local farmers. After the completion of construction, septic tank will be cleaned, disinfected and buried.

B. One brick-concrete waterless toilet in a building floor area of 6m^2 will be built in the living area, and cement masonry will be done for lining purpose. Feces to be occurred will be collected and used for green work. After the completion of construction, this waterless toilet will be cleaned, disinfected and buried.

Evaluation: Applications of the aforesaid measures will effectively mitigate the unfavorable impacts of domestic sewage on the environment.

2 Ambient air

Specific measures:

 give hygienic protection to the operators of batching plant, for instance, provision of respirator, goggles, etc.;

 powder like material, such as cement, lime, etc. should be transported by tank truck or in bags. Transportation in bulk must be forbidden. No dust dispersion may be allowed. Stacking material will be covered by awning cloth in case of rain and strong wind days;

 Traveling line of transportation vehicles should be set out strictly during construction period. Sprinkling shall be done along traveling line regularly to lay down dust;

 Sprinkle disposals occurred during construction period. Compact disposals tightly after the completion of construction.

Evaluation: Applications of the aforesaid measures will minimize the unfavorable impacts of air pollution on the construction personnel.

3Acoustic environment

Specific measures:

 Noises produced by drilling machine, excavator and batching machine should be controlled within 55dB (A) during construction;

 In accordance with the *Noise limits for Construction Site* (GB12523-90), working duration of construction personnel exposed to a high noise environment created by drilling machine and batching system will keep working everyday within the time specified by the labor law and equipped with the acoustic fixture;

 Adopt low-noise equipment as far as possible. Strengthen maintenance and care with machinery equipment.

Evaluation: Applications of the aforesaid measures will minimize the unfavorable impacts of noise on the construction personnel.

4Solid waste

Solid wastes in construction area feature scattering and difficult collection. Relevant measures will be taken as follows:

 One portable garbage collection station will be provided. Additionally, two garbage cans will be provided, one positioned at construction site of normal consolidation section and one at construction site of key consolidation section and exposed channel. Do a good job of dissemination of good habits of sanitation, get construction personnel cast garbage to collection stations or cans on their own accords;

 Hire one garbage cleaning car every week to collect and clean out garbage occurred, and transport together with the living garbage occurred by the local residents. The cost hereinto will come from project cost and not be a line in environmental cost;

Evaluation: Applications of the aforesaid measures will effectively limit the unfavorable impacts of solid wastes to be occurred during construction period on the ambient environment in the vicinity of kareses within a range affordable.

5Ecological environment

Specific measures:

 strengthen the dissemination of knowledge of laws in terms of environment protection and water and soil conservation. Improve the awareness of construction personnel on environmental protection. Strictly forbidden to roll out and destroy soil and vegetation in an unruly manner;

 strictly set out traveling line of vehicles and construction machinery. Mark out construction area and station warning signs at both sides of construction access roads.

Evaluation: Applications of the aforesaid measures will effectively protect the ambient ecological environment of kareses and their neighboring area.

 water and soil conservation measures

Do a good job of planning design with the WuDaoLin Karez so as to minimize the disturbance with the original landform; meanwhile, try best to reach a balance between excavation and backfilling, limit disposals and use disposals for land leveling.

With consideration of the status-quo of water and soil erosion in the proposed project area and in accordance with the analysis on the water and soil erosion that might be triggered by the launch of the proposed project, the water and soil conservation within the project area can be zoned as: main civil works construction area, temporary construction road area, project disposal yard area.

Main water and soil conservation measures:

A. main civil works construction area. Mucks to be occurred during earth or rock cutting of karez or karez dredging or boring will be cleaned out via shaft. Mucks will be stacked in a circular shape around shaft with a stacking height ranging from 0.5m to 1.5m, sloped in a gradient of 1.75, compacted tightly and covered. After the completion of construction, leveling will be done.

B. temporary construction road area. This area lies in Gobi made of coarse pebbles and gravels without vegetation. Before construction starts, slope cutting, ditch filling and other leveling measures will be done so as to achieve a balance as far as possible between excavation and backfill and avoid occurrence of disposals.

C. permanent disposal yard will be set besides the original hillock adjacent with the shaft. After the completion of construction, mucks will be stacked in a circular way around the edge of hillock to a height level with the hillock. Muck surfaces will be covered with gravels and compacted properly to limit weathering.

Evaluation: Applications of the aforesaid measures will effectively minimize the water and soil erosion to be probably caused by the project construction.

6public health

Specific measures:

 local sanitation and hygienic departments will be assigned specific person to guide and supervise the sanitation of construction area;

 sanitation and epidemic control will be done before mobilization of construction personnel;

 do a good job of treatment of normal injuries and disease of personnel;

 strengthen dissemination and popularization of hygienic knowledge. Help construction personnel have good living habits.

 put an end to the occurrence of epidemic disease;

 vigorously do a good job of personnel security during construction period to prevent occupational injuries. When carry out underground construction beneath comparatively thin overburden layer, adequate supports and monitoring activities should be done, specific person shall be assigned, and safety shall be guaranteed.

Evaluation: Applications of the aforesaid measures will effectively protect the health of construction personnel during construction period.

4.2.4.3 Mitigation measures during operation period

The analysis on the environmental impacts described in the Section 4.1 indicates that major unfavorable environmental impacts will occur during construction period, no unfavorable impacts on the ambient environment would occur during operation period, no mitigation measures will be therefore considered with the operation period.

4.2.5 Integrated Mitigation Measures

This project development is mainly aimed to get rid of over draft of underground water fundamentally through the constructions of farmland water works and scientific water resource management mode. The development of reservoirs and canal works will upgrade surface water utilization efficiency. The application of water conservation will lower down agricultural water consumption, increase industrial water consumption and improve economic value of unit water resource accordingly. The statistic and analysis on the status-quo of over draft of underground water within Turpan Prefecture and counties and cities indicate that only engineering measures would far beyond the realization of thoroughly holding back the further descending underground water table. In view of this, based on analysis on the reasons of over draft of underground water this project proposes “mechanical/electrical driven wells closing plan” and “Turpan Prefecture De-farming Plan” besides the engineering measures. The details are described below.

4.2.5.1 Turpan City

The WB funded water conservation project in Turpan City involves a total area of 60,000 mu (surface water drip irrigation area of 10,500 mu and mechanical/electric-driven well drip irrigation area of 49,500 mu) in the townships of YaEr, AiDingHu, QiaTeKaLe, ErBao, SanBao and QiQuanHu. The main crops to be irrigated are grapes, interplant of melon and cotton, and green house vegetable. Drip irrigation is employed.

Mechanical/electrical driven wells closing: there are 330 wells before the project. It is prospected that the achievement of water conservation due to project implementation will cut down 115 wells and only maintain 215 wells within the project area.

De-farming: It is planned in the project that Turpan City will de-farm 23,200 mu, and the farmland within the project area in Turpan City will be reduced by 23,200 mu, from 60,000 mu before the project to 36,800 mu after the project.

4.2.5.2 Shanshan County

The WB funded water conservation project in Shanshan County involves a total area of 50,000 mu (surface water drip irrigation area of 16,000 mu and mechanical/electric-driven well drip irrigation area of 34,000 mu) in the townships of QiKeTai, PiZhan, LuKeQin, LianMuQin, DaLangKan and TuYuGou. The main crops to be irrigated are grapes, cotton, cumin and vegetable. Drip irrigation is employed.

Mechanical/electrical driven wells closing: there are 181 wells before the project. It is prospected that the achievement of water conservation due to project implementation will cut down 51 wells and only maintain 126 wells within the project area.

De-farming: It is planned in the project that Shanshan County will de-farm 5500 mu, and the farmland within the project area in Shanshan County will be reduced from 50,000 mu before the project to 44,500 mu after the project.

4.2.5.3 Tuokesun County

The WB funded water conservation project in Tuokesun County involves a total area of 50,800 mu (surface water drip irrigation area of 24,700 mu and mechanical/electric-driven well drip irrigation area of 26,100 mu) in the townships of Xia, GuoLeBuYi, YiLaHu and BoSiTan. The main crops to be irrigated are jujube, cotton, cumin and vegetable. Drip irrigation is employed.

Mechanical/electrical driven wells closing: there are 152 wells before the project. It is prospected that the achievement of water conservation due to project implementation will cut down 61 wells and only maintain 91 wells within the project area.

De-farming: It is planned in the project that Tuokesun County will de-farm 5400 mu, and the farmland within the project area in Tuokesun County will be reduced from 50,800 mu before the project to 45,400 mu after the project.

Chapter 5 Environmental Management Institution of Project Component

5.1 General

In accordance with the definitions of management jurisdictions specified in the Environmental Protection Law of the People's Republic of China and Regulations on the Administration of Construction Projects Environmental Protection, all reservoir related EIA papers of Turpan Water Conservation Project shall be approved by the Environmental Protection Bureau of Xinjiang Uygur Autonomous Region, while the EIA papers in relation with water-saving irrigation components and newly-built canals and rehabilitation of existing canals shall be approved by the Turpan Prefecture Environmental Protection Bureau. The water and soil conservation program reports shall be exmined and approaved by Xinjiang Water Resources Bureau.

The environmental management institutions of the project will be the Xinjiang Environmental Protection Bureau, Xinjiang Water Resources Bureau, and the Environmental Protection Bureau and Water Resources Bureau of Turpan Prefecture. There responsibilite are raising environmental protection requirements based on the EIAs to be submitted, coordinating environmental management among various departments, and conducting final inspection and acceptance in a three-concurrence way upon environmental protection facilities. In view of the overall administrative institutional framework of the Project, PMOs at various levels will manage the implementation of the Project. Under the lead of governments of Turpan Prefecture and counties/cities concerned, with the collaboration of PMOs, the Project Owners (Turpan City Water Rsources, Shanshan County Water Resources Bureau and Tuokesun County Water Resources Bureau) will implement respective component of this Project. In order to ensure a smooth implementation of environmental management actions of this Project, PMOs, Project Owners, Contractors and Operators will assign a number of full-time or part-time environmental management personnel to carry out the environmental management program.

The PMO of Turpan Prefecture will be in charge of the planning and design of this Project, supervision and management of environmental protection throughout the Project, organization of skill training for all personnel to be engaged in environmental management within Prefecture region; The PMOs and water resources bureaus at city/county levels will be mainly responsible for executing specific project implementation program, following various technical standards and carrying out routine monitoring on the environmental management; Entrusted by the Project Owners, the Environmental Monitoring Stations at city/county levels will be responsible for the monitoring over the project area during the construction and operation periods of the Project; Environmental supervision engineers and water ans soil conservation monitiring engineers authorized by the Project Owners will be responsible for the environmental and water and soil conservation supervision during the implementation period of the Project.

The Project Owner is going to assign specific environmental management personnel to be in charge of environmental management during various stages of the Project; abiding by environmental protection laws and regulations and programs; inspecting finalization conditions of environmental protection measures; extending advanced technologies and good experience of environmental protection; organizing environmental technology training for

project personnel to upgrade their personnel quality. Since there would be a certain of differences with the contents of environmental management between construction period and operation period, one will be short-term, another will be long-term, in view of these, the Contractors and Operators will set up respective institutions when the Project entering into different periods so as to carry out their corresponding designated responsibilities thereupon. Through this way, once the construction period is finished, the corresponding management institution will be dismissed therewith, the management institution for the operation period will enter into force accordingly. Those institutions set up during different periods will be allowed to be functioning overlapped within a certain transition period. The institutional framework is shown in Fig. 5.1-1.

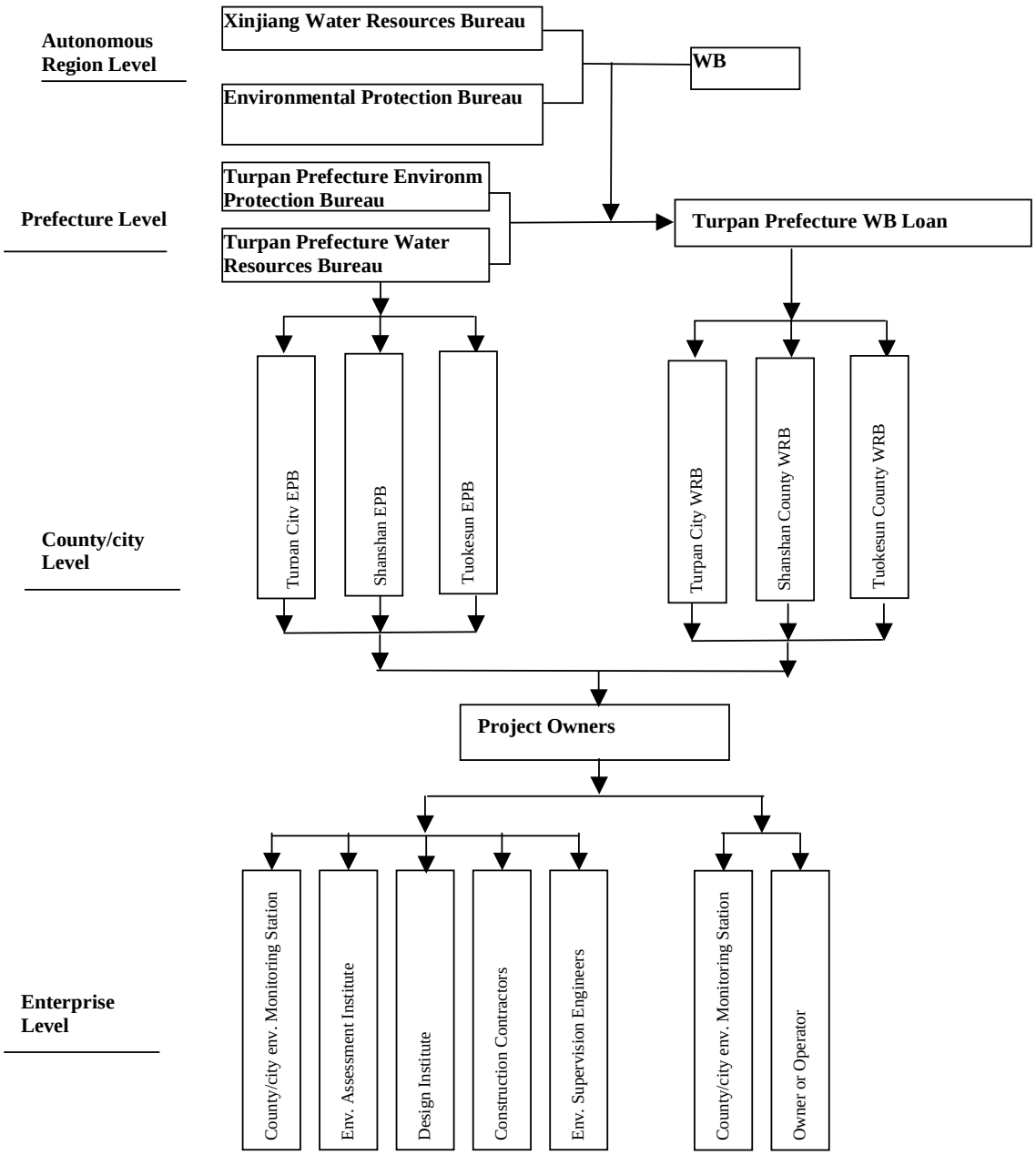

Fig. 5.1-1 Institutional Framework

5.2 Environmental Organization during Construction Period

5.2.1 Organization

From technical perspective: Turpan Prefecture PMO will involve 3 experts in the environmental management.

From PMO perspective: Prefecture PMO will assign one project environment management who will supervise the implementation of environmental management program and will be in charge of all Project environment-related issues. County/city PMOs will assign one project environment management respectively responsible for the implementation of environmental management program within respective command area and for the idea/experience exchanging with the Prefecture PMO.

From Contractors perspective: Each Contractor will assign one or two environmental coordinators who will responsible for monitoring over the implementation of environmental protections measures, figuring out a solution to environmental problem arising from local residents and communication with PMOs and environmental monitoring institution.

From Operators perspective: Each enterprise will set up an environmental management office. Such office will consist of two full-time environmental protection engineers. Enterprise's staff members will assist those two engineers to do a good job of environmental management during project operation period. The enterprise will be equipped with internet facilities and telephones to maintain normal communication with environmental management and monitoring institutions.

From environmental supervision and water and soil conservation supervision engineers perspective: Each Project Owner will employ one environmental supervision engineer and one water and soil conservation supervision engineer to field supervise environmental management during construction period.

5.2.2 Roles and Duties

A Technical environmental experts

Such experts will be the technical support for local PMOs. At the beginning 6 months of the Project, such experts will track the project implementation all along. During the sequential 4 years of project implementation period, such experts will provide services periodically on a basis of two weeks per quarter.

Such experts will make sure that all necessary conditions shall be available at the beginning of the Project so as to put environmental management rules into full and effective use in accordance with environmental laws and regulations as well as WB security and guard policies.

 Provide PMOs environmental managers, Contractors, Operators, environmental supervision engineers the necessary training.

 Provide PMOs, Project Owners, Contractors, Operators consulting services.

③ Assist enterprise's environmental management personnel to organize monitoring and measurement actions.

B PMOs: environmental managers

One environmental manager will be assigned in Prefecture PMO and PMOs of Turpan City, Shanshan County and Tuokesun County respectively. The environmental manager of Prefecture PMO will be a environmental management supervision expert responsible fore reporting to WB. The environmental managers of county/city PMOs will be responsible for supervision over the project in respective project area and reporting to Prefecture PMO. The environmental managers will also assist local land management institutions and resettlement institutions to make sure a smooth implementation of environmental management program without any obstacles as a result of land or resettlement issues. Environmental managers will have duties as follows:

① With the collaboration of assistants, provide environmental management managers the necessary training.

② With the collaboration of assistants, propose monitoring plan.

③ Communicate with environmental management managers and construction workers in ways that:

—Submit PMO and WB monthly the routing monitoring report;

—Submit special inconsistent case report in the case of occurrence of No.2 and No.3;

—Once a solution comes out, communicate with the personnel of construction contractor and operator orally to reach an agreed solution scheme;

—In case of occurrence of inconsistence, propose counter measures together with environmental management engineers and environmental management managers.

③ Take part in the meeting involving PMO environmental engineers, environmental management managers, construction contractors and operators.

④ Coordinate ideas exchanging and reporting between environmental management experts and WB.

C Project Owners: environmental manager coordinators (EMC)

Project Owners' EMCs will be responsible for environmental monitoring and reporting to county/city PMOs and governments the finalization of environmental protection by construction contractors and operators. The specific duties of EMCs will be as follows:

① At the beginning of the project, with the help of technical assistant, draft environmental protection implementation rules for construction contractors and operators. Construction contractors and operators will monitor the implementation of such rules. Collect guideline for project management design personnel.

② Assign to other institutions the monitoring tasks in need of special equipment, for instance atmosphere quality and water environmental quality.

③ Submit PMOs monthly monitoring report, implementation progress of project and feasibility study, and remedy measures. Report to PMO monthly the project monitoring progress and discuss project consistence.

④ Select proper experts and consultants from universities and institutions who can teach training methodologies and provide technical consulting services, as the case may be.

⑤ Carry out special topic study and public investigation with regard to special construction requirement or some changes deemed necessary according to the actual situation of the project.

⑥ Report to PMO environmental manager and environmental monitoring institution the countermeasures of normal cases and contingency measures for emergencies.

⑦ Make information public through meeting or local media.

D Environmental supervision engineers

Environmental supervision engineers will be in charge of construction activities and other related activities, including land requisition and resettlement, to make sure aforesaid activities in conformity with environmental protection requirement, environmental protection investment and environmental targets; in charge of field coordinating the relationship with land administration department, resettlement department and environmental monitoring and supervision department. The main duties of environmental and water and soil conservation supervision engineers will be as follows:

① Ensure all project permits, specifications and environmental management programs available before the commencement of the project.

② Verify the personnel of construction contractors and operators finalizing environmental protection and water and soil conservation measures in accordance with contract agreements.

③ Draft monthly criteria summary for construction contractors and operators based on monthly payment in accordance with their efforts and contributions to environmental protection activities.

④ Collection of environmental monitoring documents.

⑤ Identify the cases in need of specific topic study and special action. Exchange with EMC; take effective measures periodically.

⑥ Exchange with construction personnel aiming at explaining them environmental requirements locally; give proper suggestions to remedy measures, and propose remedy measures in view of the items inconsistent with the project concept designed; release the special and formal guideline to the construction contractors and operators in accordance with related requirements.

⑦ Exchange with construction contractors, operators and construction consultants to increase understanding to each other and know their options upon some special issues, such that a quick feedback can be given to construction management engineers in case of occurrence of some problems during construction; A construction suspension shall be made if a potential damage would apply to sensitive targets or the project existence is extremely inconsistent with project concerned environment.

⑧ Exchange with project construction supervision engineers and construction workers; draft routine weekly monitoring report; record inconsistent cases if such cases come out, and propose remedy measures together with project designer if necessary.

5.3 Environmental Management Institution during Operation Period

Project operators will establish specific environmental management office responsible for finalization of environmental management program during operation period. The specific duties of this environmental management office will be as follows:

(1) implementation of environmental protection measures of management items;

(2) coordination of environmental issues in relation with environmental monitoring administrative department and concerned with local residents;

(3) entrust county/city monitoring stations to carry out routine monitoring over wastes/pollutants discharged by project facilities and regional environmental quality;

(4) environmental risk contingency measures in case of an environmental accidence;

(5) report to environmental protection bureaus and PMOs at Prefecture, city and county levels the enterprise's environmental management information;

(6) recording, reorganization and archiving of enterprise's environmental management files.

5.4 Environmental Management Institution in Project Components

The environmental management institutions in project components are shown in Table 5.4-1.

Staffing of PMO Environmental Personnel

Table 5.4-1

Institutions	Environmental Manager	Environmental Expert
Turpan Prefecture PMO	1	3
Turpan City PMO	1	1
Shanshan County	1	1
Tuokexun County PMO	1	1
Total	4	6

Chapter 6 Implementation of Environmental Management Plan

6.1 Project Environmental Management

6.1.1 General Management

The PMO of Turpan Water Conservation Project loaned by WB will be led and authorized by the Government of Turpan Prefecture to be responsible in an overall way for the coordination and monitoring of environmental management. The PMOs at county/city levels will be responsible for the coordination and monitoring of environmental management of command area of respective project component. Each Project Owner with the help of environmental supervision engineer will be responsible for the implementation of environmental management program in his own project area. Each project component shall have one environmental supervision engineer least.

The specific duties of environmental protection management institution are that: Xinjiang Uygur Autonomous Region PMO (PPMO) will be responsible in an overall way for the project environmental protection management, organization and execution of feasibility study of the Project, drafting of project environmental protection program, coordination among responsible administrative departments and construction contractors in terms of environmental management, guidance of management measures for construction contractors; PMOs at county/city levels will be responsible for preparation and running of project in respective project area; Environmental protection manager of each PMO will be in charge of environmental protection program and environmental management during project design stage; Each Project Owner will be in charge of the implementation of environmental protection measures and environmental management during construction period and operation period. Environmental protection bureaus at various levels will monitor the implementation of environmental management program in respective project area.

Project Owners and Project Contractors will be the specific institutions to implement environmental management program. Their duties are stated in Table 6.1-1.

Main Duties of Project Implementation Institutions

Table 6.1-1

Institution	Main Duties
Owner	• receive monitoring on environmental protection from environmental protection departments and PMOs at various levels as well as from WB; • entrust environmental assessment institutions with proper qualifications to prepare EIA paper and environmental management program; • request design and bidding companies to include environmental management measures specified in the environmental management program into their designs, statements and specifications so as to get environmental protection laws, regulations, environmental protection measures and environmental protection program implemented; • maintain normal functioning of environmental protection facilities. Responsible environmental protection departments shall carry out inspections themselves. Set up environmental protection files. Report to PMOs and environmental protection management departments at various levels; • sign environmental monitoring agreements (contracts) with environmental monitoring departments. Finalize the implementation of environmental management program; • Provide proper fund for environmental protection inspection or spot inspection. During

	project implementation period, Contractors will play an important role in environmental management, pollution control, pollution prevention, pollution treatment measure implementation, etc.; • assign and finalize environmental supervisions and include environmental supervision program into contracts; • select the Contractor with adequate resources and proper qualifications, include environmental management program into contracts and ensure effective implementation of environmental management program.
Contractor	• request Contractors and construction supervision engineers to receive training on environmental protection and environmental management; • environmental impact mitigation measures shall be included in the Bids of Contractors, and shall be included in the construction contracts finally, which shall be one of contract requirements on Project Contractors; • request Contractors to self monitor environmental activities, and submit environmental performance log periodically. PMOs and construction monitoring groups will supervise and review those logs; • Contractors shall assign one full-time environmental person for each project component. Those full-time environmental personnel will receive necessary training according to the training plans so as to make them qualified with their jobs; • during construction period, Contractors shall communicate and discuss with local people, set up publication boards at each construction unit to get the people informed of detailed construction activities and time so as to facilitate the local people if they are going to appeal to construction activities or give some suggestions.

6.1.2 Management Monitoring

The environmental monitoring institutions for Turpan Water Conservation Project in Turpan Prefecture will be the Environmental Protection Bureau of Xinjiang Uygur Autonomous Region, Turpan Prefecture Environmental Protection Bureau and the environmental protection bureaus of city/county where the project components will be located. The administrative monitoring duties of those institution in different periods are shown in Table 6.1-2.

The administrative monitoring duties will be done by different institutions in different periods:

(1) Feasibility study period: Environmental Protection Bureau and Water Resources Bureau of Xinjiang Uygur Autonomous Region, Turpan Prefecture Environmental Protection Bureau, Turpan Prefecture Water Resources Bureau, environmental protection bureaus and water resources bureaus of city/county where the project components will be located.

Environmental Protection Bureau of Xinjiang Uygur Autonomous Region will guide Turpan Prefecture Environmental Protection Bureau and environmental protection bureaus of city/county where the project components will be located to abide by related laws and regulations, and be responsible for final acceptance of environmental protection facilities.

Xinjiang Water Resources Bureau guides the prefecture level water resources bureau and city/county level water resources bureaus to implement relevant laws and regulations, and take responsibilities to implement the project.

Turpan Prefecture Environmental Protection Bureau will be responsible for monitoring and management of implementation of environmental protection, organizing and

coordinating institutions serving the project environmental protection, monitoring implementation of environmental protection program, final acceptance of project environmental protection facilities, guiding local responsible environmental protection bureaus to carry out environmental monitoring management during project construction period and operation period.

Within the Turpan Prefecture Water Resources Bureau, water and soil conservation section shall be established to take responsibilities of supervising and managing water and soil conservation activities, organizing and coordinating work on and service to water and soil conservation under the project, organizing review and acceptance of the water and soil conservation facilities under the project, guiding supervision and management by the city/county water resources bureaus on water and soil erosion during project construction and operation periods.

(2) Design period: environmental protection office in the Turpan Prefecture WB Loan Project Management Office. Water Resources Bureau of Xinjiang Uygur Autonomous Region will do supervision at the initial design review of the Project.

(3) Construction period: Turpan Prefecture Environmental Protection Bureau. The environmental protection bureaus of city/county where the project components will be located will receive guidance from Turpan Prefecture Environmental Protection Bureau, monitor environmental action plan of construction contractors, abide by environmental management laws, regulations and codes; do a good job of coordination among departments with regard to environmental protection; be responsible for construction of project environmental protection facilities, final acceptance, running inspection and monitoring management.

(4) Construction period: Turpan Prefecture Environmental Protection Bureau, environmental protection bureaus and responsible engineering administrative departments of city/county where the project components will be located. The responsible engineering administrative departments of city/county where the project components will be located will be responsible for execution of environmental protection regulations and codes, drafting environmental protection rules and systems, knowing environmental situation of the project, putting forward workable environmental quality control targets, proposing treatment measures, reporting to environmental protection departments and responsible line administrative departments at upper levels and water resources departments, organizing the qualification testing with environmental protection personnel and training, and carrying out environmental protection technologies exchanging and scientific research.

(5) Construction period and operation period: Class A monitoring stations in the city/county where the project components will be located. Actual environmental supervision will be done by supervision companies in the in the city/county where the project components will be located. After the completion of one project component, an environmental management institution will be set up, and specific personnel will be assigned responsible for project environmental protection.

Project Environmental Monitoring Program Framework

Table 6.1-2

Period	Institutions	Monitoring Items	Aims
FS	Environmental Protection Bureau of	1. review EIA paper (tables); 2. review EMP	1. ensure overall environmental assessment contents, proper

	Xinjiang Uygur Autonomous Region Turpan Prefecture Environmental Protection Bureau WB Water Resources Bureau of Xinjiang Uygur Autonomous Region	3. review CEA 4. review FS report 5. review water and soil conservation scheme	selection of special topics and focuses outstanding; 2. ensure considerations and reflections of vital potential possible problems; 3. ensure specific workable implementation plan available for environmental impact mitigation measures.
Initial design period and construction period	Government of Xinjiang Uygur Autonomous Region Environmental Protection Bureau of Xinjiang Uygur Autonomous Region Water Resources Bureau of Xinjiang Uygur Autonomous Region Government of Turpan Prefecture Turpan Prefecture Environmental Protection Bureau Turpan Prefecture Cultural Relic Bureau	1. review initial design of environmental protection and EAP; 2. inspect reinstatement of temporarily occupied land, restoration of vegetation, environmental restoration; 3. inspect measures in terms of duct control, noise control and pollution control, determine construction time; 4. inspect emission of air pollutants; 5. inspect discharge and treatment of living sewage and waste engine oil; 6. restoration and treatment of borrow site and disposal site; 7. make sure if there is buried relic or not.	1. strictly carry out three-concurrence; 2.ensure those sites in conformity with environmental protection requirements; 3. reduce the impacts of construction on surrounding environment, abide by related environmental protection regulations and codes; 5. ensure water quality of inland rivers without pollution; 6. ensure sights and land resources without serious damages, avoid occurrence of land and soil erosion; 7. protect cultural relicts against damages.
Operation period	Turpan Prefecture Environmental Protection Bureau Environmental Protection Bureaus at county/city levels Water Resources Bureaus at county/city levels Public Security and Fire Fighting Departments at county/city levels	1. inspect EMP implementation during operation period; 2. inspect implementation of environmental monitoring plan; 3.identify sensitive points in need of taking further environmental protection measures (for possible environmental problems beyond expectation); 4. inspect whether or not the environmental quality at sensitive points is satisfied with related quality standards; 5. inspect implementation of water and soil conservation scheme; 6. inspect implementation of water and soil erosion monitoring plan; 7. strength monitoring, prevent occurrence of emergencies, launch a contingency plan for major emergencies, and get rid of risks in case of emergencies.	1. Finalize EMP and water and soil conservation scheme; 2. Finalize water and soil erosion monitoring plan; 3. Protect environment actually; 4. enhance environmental management and protect public health actually.

6.2 Tasks of EMP

There will be negative impacts on environment both during construction period and operation period, environmental protection measures corresponding to different periods shall therefore be taken to minimize various impacts to a receivable extent. In order to guarantee an effective role of environmental measures, environmental management and monitoring processes will be brought out.

WB PMO will track and report monitoring on the environmental measures besides its project management duty. Chapter 6 gives descriptions to general environmental measures and duties of related institutions. PMOs will track and report monitoring on the implementation of various measures. Summary of activities by environmental management institutions are shown in Table 6.2-1.

Summary of Activities by Environmental Management Institutions

Table 6.2-1

Plan	Activities	Duties			Remarks
		Management institution	Implementation institution	Monitoring institution	
Construction Preparation					
One year	Establish environmental management design team and do staffing.	PMO	Owner	PMO	Staffing, select offices, procure vehicle, raise operating fund
One year	Each CSE selects or assigns one environmental supervision engineer.	CSE	EMD	CSE	
One year	Each CSE implements environmental supervision training.	CSE	EMD	CSE	
One year	Prepare and implement training program targeting EMO and PMO environmental managers.	PMO	TA	PMO	Carry out some international training
One year	Prepare working program for EMO and environmental supervision engineer.	PMO	TA	PMO	Verify personnel and roles of EMD and environmental supervision engineer
One year	Prepare working documents: standards, field inspection tables, report formats of various activities.	PMO	EMD	PMO	Make proper adjustment with the documents and do further adjustment to meet field requirements
One year	Prepare detailed steps for EMD against inconsistent items shot by monitoring and report.	PMO	TA	PMO	
One year	Propose proper assessment for environmental elements and agreement negotiation.	PMO	TA helps EMD	PMO/WB	
One year	Prepare assignment contract for monitoring activity EMD (monitoring items in need of special equipment, for instance water quality and atmosphere).	PMO	EMD	Company	Make sure consistence among implementation , working plan and utilization of land
Construction Period					
Five years	Environmental supervision engineer and EMD discuss the documents and process with regard to project adjustment and improvement.	—	EMD/environmental supervision engineer	PMO	Adjust process properly to increase efficiency
Five years	Each contractor must assign one full-time person with a dedicated mind of environmental responsibility, who will work together with environmental supervision engineer and EMD.	Owner and construction contractor	construction contractor	PMO	Enterprise's permit
Five years	Each construction contractor shall organize his personnel studying general environmental knowledge and related measures.	Owner and construction contractor	construction contractor	EMD/environmental supervision	Introduction by EMD of field management and possible environmental problems
Five years	Organize the public to do ideas exchanging and provide supportive material	PMO	EMD	Owner	Create exchanging regulations and process. Broardcasting and TV can be used for this purpose
Operation Period					
	Verify the process of reporting environmental issues during operation period.		Owner	Prefecture environmental protection bureau	
	Verify the stack of solid wastes and make sure safe disposal.		Owner, Environmental Sanitation Administrative Department	Prefecture environmental protection bureau	

6.3 Contract Requirements on Environmental Management

During project implementation period, Contractors will play an important role in environmental management, pollution control and mitigation measures, following requirements are proposed for Contractors:

(1) select Contractors with adequate resources to ensure effective execution of environmental management program;

(2) It is requested that Contractors and construction supervision engineers should receive the training on environmental protection and environmental management organized by TA;

(3) During construction period, environmental impact mitigation measures shall be included in the Bids of Contractors, and will form a part of Construction Contracts as the Contract requirements on Project Contractors;

(4) It is requested that Contractors should monitor their environment-related activities, and submit environmental performance logs daily or weekly. PMOs and construction monitoring groups will supervise and review those logs;

(5) Contractors shall assign one full-time environmental person for each project component. Those full-time environmental personnel will receive necessary training according to the training plans so as to make them qualified with their jobs;

(6) during construction period, Contractors shall communicate and discuss with local people, set up publication boards at each construction unit to get the people informed of detailed construction activities and time so as to facilitate the local people if they are going to appeal to construction activities or give some suggestions;

(7) Contractors shall allocate a certain percent of Contract proceeds based on their annual budget as environmental management deposite. The environmental management deposite shall account to about 3% of the budget.

6.4 Information Exchange and Solutions to Inconsistencies

It is required by the environmental monitoring that related information should be made public once a month to environmental supervision engineers in the field, enterprise's environmental management manager and PMOs in ways that environmental monitoring engineers draft monitoring report and delivery reports to environmental supervision engineers in the field, enterprise's environmental management manager and PMOs' principals. In order to focus efforts of environmental management on important issues, the natures of inconsistencies are classified into 3 levels as below:

Level 1: This kind of inconsistencies is defined as the cases inconsistent with original requirements, which are believed to give no impact in the near future on vital resources. The neglect of recurrence of such inconsistencies will lead to the inconsistencies of level 2. Necessary measures are that: proper cooperation and routine communication can handle the inconsistencies of level 1 rightly. For instance, after timely discussions with construction contractors and operator personnel, remedy measures can be put forward. While, formal

communication way is weekly routine report from environmental supervision engineer to environmental management manager and residential construction manager.

Level 2: This kind of inconsistencies is defined as the cases not causing obvious losses with and irreversible impacts on sensible and vital resources yet. But those inconsistencies shall be remedied and treated in the field to put an end to the aforesaid unfortunate losses or impacts. The neglect of recurrence of such inconsistencies will lead to the inconsistencies of level 3. Necessary measures are that: Once the occurrence of inconsistencies of level 2, such inconsistencies shall be report immediately on the same day by the enterprise's environmental management manager to PMO environmental manager and residential construction manager so as to reach remedy measure. Normally, remedy measures will be put forward within one week after occurrence of inconsistencies.

Level 3: This kind of inconsistencies are defined as the cases causing damages to especially concerned sensitive targets or foreseeable damages coming in the near future. Special activities forbidden internationally are classified as level 3. Necessary measures are that: once such inconsistencies come out, environmental management manager shall report without any delay to PMO environmental manager and residential construction manager to reach a remedy measure. Normally, remedy measures will be put forward within three days after occurrence of inconsistencies, unless otherwise specified. If necessary, enterprise's environmental management manager can request construction manager to suspend some special projects to protect resources before application of remedy measures.

6.5 Training—Necessary Capacity Building and Measures Building

6.5.1 Training Requirement

Environmental capacity building will focus on environmental management personnel and environmental supervision engineers. Training on them will be a part of Project's TA. Training courses will be provided to construction contractors and workers during project implementation. Before project construction starts, all construction contractors and operators and construction supervision engineers will be required to take part in compulsive training in terms of environment, health and security.

6.5.2 Training Contents

(1) environmental management personnel and environmental supervision engineers

The training for them will be organized by Turpan Prefecture PMO. Before 1 year of launch of the Project, Turpan City will give training in a concentrated way to environmental managers of PMOs at county/city levels, environmental manager coordinator of project component, environmental supervision engineers as well as the personnel concerned. Specific training courses will be done by environmental experts. Detailed training contents are shown in Table 6.5-1.

(2) Contractors and construction workers

The training for them will be done on the site by the PMOs at county/city levels, project component Owners before project construction starts. Specific training courses can be done by environmental management experts or enterprise's environmental mangers who already received training. Detailed training contents are shown in Table 6.5-2.

Training for Environmental Managers, Environmental Supervision Engineers, Water Conservation Supervision Engineers

Table 6.5-1

Topics	Training Contents	Day
Operation capacity (environmental managers, environmental supervision engineers and water conservation supervision engineers)	Quickly browse and identify hotkey functions of Word, Excel and PowerPoint; Learn WB security and guard policies; Enhance learning. For the environmental protection detailed rules prepared for construction contractors, after technical consultant prepares well environmental protection list, each list shall include monitoring instructions. Learn project environmental impacts and environmental items in need of monitoring.	4 days
Inconsistence monitoring (environmental managers, environmental supervision engineers and water conservation supervision engineers)	The training on field monitoring process includes organization, exchanging, roles, duties, decision-making process, report and standard observation process.	1day
Contingency team (environmental managers, environmental supervision engineers and water conservation supervision engineers)	General knowledge of dangerous material on site; Potential leakage and spill; Impacts of such leakage and spill on environment and human being; Contingency plan including priority; Location and utilization of contingency facilities; Facilities for communication and reporting.	1/2 day
Emergency rescue and medical relief (environmental managers, environmental supervision engineers and water conservation supervision engineers)	Process for asking for medical relief in case of emergencies and non-emergencies, and process for asking for other related medical relief (toll telephone and medical consulting).	1/2 day
Management of dangerous material and wastes, including treatment of explosive wastes and medical relief (environmental managers, environmental supervision engineers)	Correct utilization and storage; Correct utilization and storage include charging of fuel, calculation of charging quantity and maintaining effective utilization of equipment; Correct treatment of storage tank; Storage of dangerous wastes; Management of leased land and cut-over land; Management of non-dangerous wastes; Medical services for the ones exposing to dangerous wastes; Contingency plan.	1/2 day
Health and safety inspection, application process (environmental managers, environmental supervision engineers and water conservation supervision engineers)	Issues of health and security; Requirements on health and security; How to implement health and security inspections; Report and find a solution.	1day
Traffic security (environmental managers, environmental supervision engineers and water conservation supervision engineers)	Traffic rules; Safe driving training; Fuel charging; Contingency plan.	1/2 day
Monitoring and analysis on water quality (environmental managers, environmental supervision engineers and water conservation supervision engineers)	Utilization of equipment includes standard, testing, methods, sample transfer, control of data quality, monitoring and reporting requirements.	1/2 day

Training for Construction Personnel

Table 6.5-2

Topics	Training Contents	Duration
General environmental knowledge necessary for construction workers	Introduction of environmental impact factors and environmental protection measures; Introduction of particular sensitive region and sensitive issues within construction area and the region neighbouring construction area; Roles and duties of environmental management design engineers, environmental supervision engineer, and construction supervision engineer. Key points of report of environmental issues; Management of wastes in construction camp area and construction site; Measures of control of pollution in construction site; Cultural relic; Penalty for behaviours against rules, regulations and laws.	Half-day learning at each construction site
Normal health and security of construction workers	Disease spread channels and protection methods, prevent HIV/AIDS and STD; Forbid alcohol and drug; Process for asking for medical relief in case of emergencies and non-emergencies, and process for asking for other related medical relief (STD inspection and medical consulting); General knowledge of health and security includes some basic processes, traffic security, safe use of electric power, blasting, fire disaster, dangerous wastes management; Personnel preventive equipment; Penalty for behaviours against rules, regulations and laws.	Half-day learning at each construction site

(3) Operators

Training for Environmental Management Personnel

Table 6.5-3

Targets	Training Contents	Duration
Environmental management personnel	WB project management procedure Archiving, public, exchanging and reporting mechanism of environmental information; Contingency plan for environmental risks; Health and security inspections and application process.	1 day of learning at Turpan
	Study tour for advanced workmanship and environmental management.	Study tour for good municipal projects in China
Environmental personnel	Utilization of equipment includes standard, testing, methods, sample transfer, control of data quality, monitoring and reporting requirements; Contingency plan for environmental risks: potential leakage and spill, impacts of such leakage and spill on environment and human being, contingency plan including priority, location and utilization of contingency facilities.	2 days of learning at Turpan

6.5.3 Budget of Personnel Training

The budget for project capacity building is shown in Table 6.5-4.

Training Program for Environmental Protection Personnel of Project Components

Table 6.5-4

Period	Categories	Number (person)	Time	Cost (1000 Yuan)
Construction	Environmental managers	4	Year 2009	80
	Project manager coordinators	10	Before project implementation	100
	Environmental supervision engineer	13	Before operation	130
	Water and Soil Conservation Supervision Engineer	12	Before Operation	120

	Sub-total			440
Operation	Environmental management personnel	3	Before functioning of enterprise	60
	Personnel dealing with environmental risk emergencies	3	Before functioning of enterprise	30
	Sub-total			90
Total				400

6.6 Compensations for Land Requisition and Resettlement

(1) In accordance with Chinese national and local policies of resettlement/relocation and related compensation methods, rational compensations shall be made with the villagers whose land will be requisitioned and whose housings will be relocated. Solicit relocatees for their opinions in a serious manner. Guarantee working and living conditions of the relocatees should not be lower than their present level;

(2) Pipeline and roads shall be built in sections. Excavations and backfilling shall be done as quickly as possible. Particularly the public facilities adjacent to schools shall be provided with temporary path complete with traffic signs for warning purpose. When traffic peak, traffic policeman shall do traffic grooming and dispatching to prevent traffic jam. The transportation of material shall be done during non-peak period as much as possible to reduce traffic flow in downtown area.

(3) Improve the knowledge and awareness of management and construction personnel with regard to protection of cultural relic. Since earth and rock cut will be huge, adequate concerns shall be given. Once the traces of cultural and ancient relic or ancient grave are shot, local cultural relic protection department shall be informed immediately, and the construction site shall be protected in a timely manner. No construction may be carried out until proper treatment is done by the cultural relic protection department;

(4) When heavy vibration has to be made in the vicinity of residential area (for instance, bridge piers tight compaction, vibratory roller running), the old residential houses adjacent to construction site shall be given proper monitoring to prevent possible accidents. Necessary remedy measures shall be taken with those houses that would significantly influence vibration actions.

6.7 Ethnic Constitutes

The total population in the project area is 600,610, including agricultural population of 432,051, accounting for 71.9% of the total. Included in the total population, Uygur people total 423,212, accounting for 70.46% of the total; Han people total 137,745, accounting for 22.93%; the ethnic group people total 39,653, accounting for 6.6% of the total.

6.8 Restoration of Temporarily Occupied Land

During construction period, Contractors are obligated to do ecological restoration in a timely manner with the temporarily occupied land that the occupation is finished. All temporarily occupied land shall be reinstated before the end of all construction activities.

Chapter 7 Environmental Monitoring Plan

7.1 Aims

Environmental monitoring covers both construction period and operation period, aimed at obtaining in an overall and timely way the pollution, ecological protection and water/soil losses situation of proposed project; knowing the variation extent and incidence of environmental quality due to project development in the region where the project will be located; knowing dynamic situation of environmental quality during operation period. The related data can be feedback to the line responsible administrative department so as to provide scientific basis for project environmental management.

7.2 Environmental Monitoring Institutions

Project Contractors or Operators will assign hydrological bureaus, environmental monitoring stations or water conservation monitoring centers at Prefecture or county/city where the project will be located to carry out environmental monitoring during construction period and operation period. Those intuitions assigned have past certifications, possessed complete equipment and rich technical resources, and can be capable of executing environmental monitoring.

In view of environmental impact forecasting results, the sensitive points subject to pollution shall be included in monitoring points. Pollution situation shall be monitored in a follow-on way during construction period and operation period. Monitoring actions will give more efforts on noise, ambient environment and surface water environment which will impose heavier impacts on the environment. Monitoring elements will be determined based on project pollution characteristic elements. Monitoring analysis methodologies will be in accordance with ***Technical Specifications of Environmental Monitoring*** and ***Technical Specifications of Water and Soil Conservation Monitoring*** published by the **Ministry of Environmental Protection of the People's Republic of China**. The standards to be applied to the environmental assessment will adopt the national standards specified in the EIAs of each project component.

Detailed key procedures necessary for and to be followed by effective monitoring over the construction sites and construction actions are summarized in Table 7.2-1.

7.3 Detailed Requirements on Environmental Monitoring

Detailed environmental program and related budget for each project component are shown in Tables 7.3-1 through 7.3-9.

Monitoring during Operation Period and Construction Period

Table 7.2-1

Plan	Activities	Duties			Remarks
		Implement ation	Supervision	Financin g	
construction period					
1st year (1-2 months)	Draft environmental management program suitalbe for construction site	Constructi on contractor	EMC/ PIU / EPB	Owner	Draft such program within one month after award of the Contract and finish the program within two months after award of the Contract, submit to EMC for review and approval.
constructi on period	Construction contractors and operators set out construction boundary for each project area, and obtain approval.	Owner	EMC/ PIU / EPB	-	Construction contractors and operators shall prepare maps before project construction starts.
1st year (1-3 months)	Draft pollution control program (air pollution and noise)	Owner	EMC/ PIU / EPB/ Water Resources Bureau of Xinjiang Uygur Autonomous Region	Owner	After discussions with related organizations and local residents, EMC does review and approval.
constructi on period	Monitoring over atmosphere, noise and water	Special parts			
constructi on period	Such pollution control program shall describe the finalization of all pollution control measures proposed by EMP. Construction contractors are requested to carry out all suspension measures and do inspections over all construction sites and facilities.	Constructi on contractor	EMC/ PIU / EPB	-	CSEE. Have a look at construction site and facilities everyday, carry out inspections EMC two months
constructi on period	Construction contractors shall fill in monthly report sheet to report their environmental protection measures.	Constructi on contractor	EMC/ PIU / EPB	-	Payment to PIU/PMO is subject to CSE's suggestions
constructi on period	In view of the variations in processes and pollution levels classified, observe those variations and report inconsistencies.	Constructi on contractor	EMC/ PIU / EPB	-	Level 1: EMC ; level 2 : EMC and PIU Level 3: EMC, PIU, PMO
constructi on period	Decide if the payment made with the construction contractors shall be delayed or refused.	Owner	EMC/ PIU / EPB	-	
constructi on period	Ensure land requisition satisfied with construction demands	Owner	POIU and resettlement bureau		
constructi on period	Daily, weekly and monthly reports	Constructi on contractor	EMC/ PIU / EPB	-	Weekly field report, SRS monthly report
constructi on period	seasonal report	Constructi on contractor	PIU	-	Subject to the requests raised by the related project institutions
constructi on period	Semi-year report	Constructi on contractor	EMC/ PIU / EPB	-	Subject to the requests raised by the related project institutions
complete during constructio n period	Restoration of temporarily occupied land and demobilization of all construction material and equipment.	Constructi on contractor	EMC/ PIU / EPB	Owner	
operation period					
	Before completion of construction, reinstate temporarily occupied land	Owner	EPB/ Water Resources Bureau of Xinjiang Uygur Autonomous Region	-	
	Sum up the experience of this project and apply to other similar projects in the future	EPB/ Water Resources			Standardize procedures Take part in the training organized by related institutions

Plan	Activities	Duties			Remarks
		Implementation	Supervision	Financing	
		Bureau of Xinjiang Uygur Autonomous Region			Exhibit project achievements and benefits

Attachment Table 7.3-1-1 Technical Specifications for Environmental Monitoring of the Meiyaogou Reservoir Project During Construction Period

Time	Monitoring Targets	Monitoring Points	Monitoring Items	Monitoring Frequency	Unit Price (Yuan/monitoring)	Annual Cost(Yuan/Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring Institution	Applicable Standards and Codes
Construction Period	Water Environment									
	Living Water for construction personnel	Water intake for living area for construction personnel	pH, DO, mineralization, chloride, COD_{Mn}, BOD_5, SS, Ammonia Nitrogen, volatile phenol, Water-soluble Ionic Iron, Total Manganese Content, total copper content, total zinc content, total phosphor content, fluorid, total arsenic content, total cadmium content, hexavalent chromium, petroleum group, fecal coliform bacteria colony, etc. 20 items totally	Monitoring will go through whole construction period. Sampling will be done in rich water, normal water and dry totally three periods. Sampling twice in each period at an interval of 5 days least.	1245	3735.00	6847.50	15867.5	Turpan Prefecture Environmental Monitoring Station	Surface Water Environmental Quality Standard (GB3838-2002) Technical Specifications Of Environmental Monitoring
	Waste water from aggregates batching system	One monitoring point will be set at the inlet and outlet of waste water treatment facilities respectively	pH, SS	Monitoring twice per quarter during construction period	410	1640.00	3006.67			
	Waste water from machinery repairing system	inlet and outlet of machinery repairing waste water treatment system	SS, petroleum group	Monitoring twice per quarter during construction period	410	1640.00	3006.67			

	Domestic sewage	Inlet and outlet of domestic sewage treatment system in living area	CODcr, BOD_5, fecal coliform bacteria colony, total phosphor content, total nitrogen content, anionic surfactant	Monitoring twice per quarter during construction period	410	1640.00	3006.67			
	Ambient air									
	Air quality at construction concentrated area	One monitoring point at dam construction area	TSP	Monitoring once per quarter during construction period, sampling every day at 09:00, 14:00, 19：00 respectively	180.00	720.00	1320.00	1320.00	Turpan Prefecture Environmental Monitoring Station	Surface Water Environmental Quality Standard (GB3838-2002) Technical Specifications of Environmental Monitoring
	Acoustic Environment									
		One monitoring point at dam construction area	(equivalent noise sideband A) Leq	Monitoring one day per quarter during construction period, sampling at 10：00, 14：00, 22：00 respectively	140.00	560.00	1026.67	4106.67	Turpan Prefecture Environmental Monitoring Station	Acoustic Environmental Quality Standard Technical Specifications of Environmental Monitoring
	Sensitive point	One monitoring point at Meiyaogou Village located along the access road	(equivalent noise sideband A) Leq	Monitoring one day per quarter during construction period, sampling at 10：00, 14：00, 22：00 respectively	140.00	1680.00	3080.00			
Construction Period	Water and Soil Conservation									
	Monitored Area	Monitoring Methdologies	Monitoring Contents	Monitoring Time and Frequency	Annual Cost (Yuan/Pear)	Monitoring Time (Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes
	Main Civil Works Area	penetration method for surveying wind erosion (penetrating one steel drill)	Wind-erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season	129760	2.5	324400	324,400	With water and soil conservation monitoring qualification certificate	Technical Specifications of Water and Soil Conservation Monitoring (SL277-2002)

		Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment; Plant percent	Once before construction, once per year during construction period and once after completion of construction						
	Quarry/borrow Area	penetration method for surveying wind erosion (penetrating one steel drill)	Wind-erosion amount of disturbed ground surface, wind-erosion amount of original landform	8~10 monitorings per year during construction period; once per month during strong wind season						
		Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment; quarry/borrow quantity	Once before construction, once per year during construction period and once after completion of construction						
	Disposal Yard	penetration method for surveying wind erosion (penetrating one steel drill)	Wind-erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
		Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment;	Once before construction, once per year during construction period and once after completion of construction						
Total Cost of Environmental Monitoring During Construction Period								345,700	——	——

Attachment Table 7.3-1-2

Technical Specifications for Environmental Monitorin of the Meiyaogou Reservoir Project

During Operation Period

	Monitoring Targets	Monitoring Points	Monitoring Items	Monitoring Frequency	Unit Price (Yuan/monitoring)	Annual Cost(Yuan/Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes	Rema
	Water Environment										
	River Water Quality	Cross sections cut at the end of reservoir backwater and reservoir water supply culvert pipe	pH, DO, CODMn, BOD5, Ammonia Nitrogen, total phosphor content, total nitrogen content, fluorid, hexavalent chromium, sulfate, chloride, iron, Hg, lead, fecal coliform bacteria colony, etc.	Sampling will be done in rich water, normal water and dry totally three periods each year. Sampling twice in each period at an interval of 5 days least.	900	2700	8100	16830	Turpan Prefecture EnvironmentalMonitoring Station	Surface Water Environmental Quality Standard (GB3838-2002), Standards for Wastewater Discharge (GB8978-1996) Technical Specifications Of Environmental Monitoring	Monito time li for operat perio afte proje comple monito shall done succes thre year
	Hydrological observation		Inflow, outflow, water temperature	3 monitorings per day. Monitoring frequency can be more close during flood period	—	2500	7500				
	Quality of domestic sewage from project management area	Inlet and outlet of treatment system for domestic sewage from project management area	COD_{cr} ,BOD_5, fecal coliform bacteria colony, total phosphor content, total nitrogen content, anionic surfactant	Once per year	410	410	1230				

Attachment Table 7.3-2-1 Technical Specifications for Environmental Monitoring of the Ertanggou Reservoir Project During Construction Period

Time	Monitoring Targets	Monitoring Points	Monitoring Items	Monitoring Frequency	Unit Price (Yuan/monitoring)	Annual Cost (Yuan/Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring Institution	Applicable Standards and Codes
Construction Period	**Water Environment**									
	Living Water for construction personnel	Water intake for living area for construction personnel	pH, DO, mineralization, chloride, COD_{Mn}, BOD_5, SS, Ammonia Nitrogen, volatile phenol, Water-soluble Ionic Iron, Total Manganese Content, total copper content, total zinc content, total phosphor content, fluorid, total arsenic content, total cadmium content, hexavalent chromium, petroleum group, fecal coliform bacteria colony, etc. 20 items totally	Monitoring will go through whole construction period. Sampling will be done in rich water, normal water and dry totally three periods. Sampling twice in each period at an interval of 5 days least.	1400	5200	13000	28600	Turpan Prefecture Environmental Monitoring Station	Surface Water Environmental Quality Standard (GB3838-2002) Standards for Wastewater Discharge (GB8978-1996) Technical Specifications Of Environmental Monitoring
	Waste water from aggregates batching system	One monitoring point will be set at the inlet and outlet of waste water treatment facilities respectively	pH， SS	Monitoring twice per quarter during construction period	520	2080	5200			
	Waste water from machinery repairing system	inlet and outlet of machinery repairing waste water treatment system	SS, petroleum group	Monitoring twice per quarter during construction period	520	2080	5200			
	Domestic sewage	Inlet and outlet of domestic sewage treatment system in living area	CODcr, BOD_5, fecal coliform bacteria colony, total phosphor content, total nitrogen content, anionic surfactant	Monitoring twice per quarter during construction period	520	2080	5200			
Construction Period	Water and Soil Conservation									
	Monitored Area	Monitoring Methodologies	Monitoring Contents	Monitoring Time and Frequency	Annual Cost (Yuan/Pear)	Monitoring Time (Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes
	Complex works: Complex structures	penetration method for surveying wind erosion(penetrating one steel drill)	responsibility command area, measures and effect of prevention and treatment	8~10 monitorings per year during construction period; once per month during strong wind season	226100	3	678300	678300	Conservation monitoring qualification	Technical Specifications of Water and Soil Conservation

			Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment	Once before construction, once per year during construction period						Monitoring (SL277-2002)
		Management station	Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment	Once before construction, once per year during construction period						
	Access Road	Permanent road	penetration method for surveying wind erosion(penetrating one steel drill)	Wind erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
			Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment	Once before construction, once per year during construction period						
					Once after project completion						
	Quarry/borrow area	C_{1-2} sand and gravel quarry site slope	penetration method for surveying wind erosion(penetrating one steel drill)	Wind erosion amount of disturbed ground surface, wind erosion amount of original landform	8~10 monitorings per year during construction period; once per month during strong wind season						
			Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment; quarry /borrow quantity	Once before construction, once per year during construction period						
					Once after project completion						
		C_3 concrete aggregates quarry site	penetration method for surveying wind erosion(penetrating one steel drill)	Wind erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
			Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment; quarry /borrow quantity	Once before construction, once per year during construction period and once after project completion						
	Disposal yard		penetration method for surveying wind erosion(penetrating one steel drill)	Wind erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
			Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment; temporary stacking quantity	once per year during construction period						

	Line works	penetration method for surveying wind erosion(penetrating one steel drill)	Wind-erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
		Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment	Once before construction, once per year during construction period						
Total Cost of Environmental Monitoring During Construction Period								706,900	——	——

Note: The cost of reservoir bottom dredging and stubbing in an amount of 100,000 Yuan is included in the compensation for reservoir land requisition and resettlement and not list in the total cost of EMP again.

Attachment Table 7.3-2-2

Technical Specifications for Environmental Monitoring of the Ertanggou Reservoir Project During Operation Period

Time	Monitoring Targets	Monitoring Points	Monitoring Items	Monitoring Frequency	Unit Price (Yuan/monitoring)	Annual Cost(Yuan/Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes
Operation Period	River water quality	Cross sections cut at the end of reservoir backwater and reservoir water supply culvert pipe	pH, DO, COD_{Mn}, BOD_5, Ammonia Nitrogen, total phosphor content, total nitrogen content, fluorid, hexavalent chromium, sulfate, chloride, iron, Hg, lead, fecal coliform bacteria colony, etc.	Sampling will be done in rich water, normal water and dry totally three periods each year. Sampling twice in each period at an interval of 5 days least.	900	2700	8100	16830	Turpan Prefecture Environmental Monitoring Station	Surface Water Environmental Quality Standard (GB3838-2002) Standards for Wastewater Discharge (GB8978-1996) Technical Specifications of Environmental Monitoring
	Hydrological observation		Inflow, outflow, water temperature	3 monitorings per day. Monitoring frequency can be more close during flood period	—	2500	7500			
	Quality of domestic sewage from project management area	Inlet and outlet of treatment system for domestic sewage from project management area	CODcr, BOD_5, fecal coliform bacteria colony, total phosphor content, total nitrogen content, anionic surfactant	after project completion, monitoring shall be done in successive three years. Once per year.	410	410	1230			

Attachment Table 7.3-3-1 Technical Specifications for Environmental Monitoring of the A'LaGou Reservoir Project During Construction Period

Time	Monitoring Targets	Monitoring Points	Monitoring Items	Monitoring Frequency	Unit Price (Yuan/ monitoring)	Annual Cost (Yuan/Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring Institution	Applicable Standards and Codes
Water Environmental										
	Living water for construction personnel	Water intake for living area for construction persoonel	pH, DO, mineralization, chloride, COD_{Mn}, BOD_5, SS, Ammonia Nitrogen, volatile phenol, Water-soluble Ionic Iron, Total Manganese Content, total copper content, total zinc content, total phosphor content, fluorid, total arsenic content, total cadmium content, hexavalent chromium, petroleum group, fecal coliform bacteria colony, etc. 20 items totally	Monitoring will go through whole construction period. Sampling will be done in rich water, normal water and dry totally three periods. Sampling twice in each period at an interval of 5 days least.	1350	4050	16200	38280	Turpan Prefecture Environmental Monitoring Station	Surface Water Environmental Quality Standard (GB3838-2002) Standards for Wastewater Discharge (GB8978-1996) Technical Specifications Of Environmental Monitoring
	Waste water from aggregates batching system	One monitoring point will be set at the inlet and outlet of waste water treatment facilities respectively	pH,SS	Monitoring twice per quarter during construction period	460	1840	7360			
	Waste water from machinery repairing system	inlet and outlet of machinery repairing waste water treatment system	SS, petroleum group	Monitoring twice per quarter during construction period	460	1840	7360			
	Domestic sewage	Inlet and outlet of domestic sewage treatment system in living area	CODcr, BOD_5, fecal coliform bacteria colony, total phosphor content, total nitrogen content, anionic surfactant	Monitoring twice per quarter during construction period	460	1840	7360			

Water and Soil Conservation										
Monitored Area		Monitoring Methodologies	Monitoring Contents	Monitoring Time and Frequency	Annual Cost (Yuan/Pear)	Monitoring Time (Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes
Main civil works area	Management station	penetration method for surveying wind erosion (penetrating one steel drill)	Wind erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season	138,133.33	4.5	621600	621,600	With water and soil conservation monitoring qualification certificate	Technical Specifications of Water and Soil Conservation Monitoring (SL277-2002)
		Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment	Once before construction, once per year during construction period						
	Access road to reservoir	penetration method for surveying wind erosion (penetrating one steel drill)	Wind erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
		Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment	Once before construction, once per year during construction period and once after project completion						
Quarry /borrw sites	Yu'ErGou sand and gravel quarry site slope	penetration method for surveying wind erosion (penetrating two steel drills)	Wind erosion amount of disturbed ground surface, wind erosion amount of original landform	8~10 monitorings per year during construction period; once per month during strong wind season						
		Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment; quarry /borrow quantity	Once before construction, once per year during construction period and once after project completion						

		sand and gravel quarry site at downstream riverbed/ river beach	penetration method for surveying wind erosion (penetrating one steel drill)	Wind erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
			Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment; quarry /borrow quantity	Once before construction, once per year during construction period and once after project completion						
	Stacking yard		penetration method for surveying wind erosion (penetrating one steel drill)	Wind erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
			Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment; temporary stacking quantity	Once per year during construction period						
	Construction temporary road		penetration method for surveying wind erosion (penetrating one steel drill)	Wind erosion amount of disturbed ground surface	8~10 monitorings per year during construction period; once per month during strong wind season						
			Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment	Once before construction, once per year during construction period and once after project completion						

	Living area for construction personnel	penetration method for surveying wind erosion (penetrating two steel drills)	Wind erosion amount of disturbed ground surface, wind erosion amount of original landform	8~10 monitorings per year during construction period; once per month during strong wind season						
		Survey and monitoring (whole area)	responsibility command area, measures and effect of prevention and treatment	Once before construction, once per year during construction period and once after project completion						
Total Cost of Environmental Monitoring During Construction Period								659,900	——	——

Note: A'LaGou reservoir project is designed to have a construction period of 48 months.

Attachment Table 7.3-3-2 Technical Specifications for Environmental Monitoring over the Alagou Reservoir Project During Operation Period

Time	Monitoring Targets	Monitoring Points	Monitoring Items	Monitoring Frequency	Unit Price (Yuan / monitoring)	Annual Cost(Yuan/Year)	Cost per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes	Remakrs
	Water Environmental										
	River water quality	Cross sections cut at the end of reservoir backwater and reservoir water supply culvert pipe	pH, DO, COD_{Mn}, BOD_5, Ammonia Nitrogen, total phosphor content, total nitrogen content, fluorid, hexavalent chromium, sulfate, chloride, iron, Hg, lead, fecal coliform bacteria colony, etc.	Sampling will be done in rich water, normal water and dry totally three periods each year. Sampling twice in each period at an interval of 5 days least.	900	2700	8100	16830	Turpan Prefecture Environmental Monitoring Station	Surface Water Environmental Quality Standard (GB3838-2002) Standards for Waste water Discharge (GB8978-1996) Technical Specification For Environmental Monitoring	Monitoring time limit for operation period: after project completion, monitoring shall be done in successive three years.
	Hydrological observation		Inflow, outflow, water temperature	3 monitorings per day. Monitoring frequency can be more close during flood period	—	2500	7500				
	Quality of domestic sewage from project management area	Inlet and outlet of treatment system for domestic sewage from project management area	CODcr, BOD_5, fecal coliform bacteria colony, total phosphor content, total nitrogen content, anionic surfactant	Once per year	410	410	1230				

Attachment Table 7.3-4

Turpan City Water-Saving Irrigaiton Project Technical Specifications for Water/Soil Conservation Monitoring

Project Name	Monitoring Area	Monitoring Methodologies	Monitoring Items	Monitoring Time and Frequency	AnnualCost (Yuan)	Monitoring Period (Year)	Cost Per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes
Turpan City Water-saving Irrigation Project	On-farm pipeline area	Field investigation	Current landform, topography, vegetation status	Once during construction preparation	85050	2	17010 0	17010 0	With water and soil conservation monitoring qualification certificate	Technical Specifications of Water and Soil Conservation Monitoring (SL277-2002)
		Field investigati	Disturbed landform, scope and extent of destroyed vegetation	Once a month						
		Position observati	Water/soil erosion amount	Once a month, additional one after strong wind						
		Reference land unit	Growing status of plant within treated region	Once in May and September respectively every year						
	Project area beyond farm land	Field investigati on	Current landform, topography, vegetation status	Once during construction preparation						
		Field investigati	Disturbed landform, scope and extent of destroyed vegetation	Once a month						
		position observati	Water/soil erosion amount	Once a month, additional one after strong wind						
		Reference land unit	Growing status of plant within treated region	Once in May and September respectively every year						
	Construction road area	Field investigati	Current landform, topography, vegetation status	Once during construction preparation						
		Field investigati	Disturbed landform, scope and extent of destroyed vegetation	Once a month						
		position observati	Water/soil erosion amount	Once a month, additional one after strong wind						
		Reference land	Growing status of plant within treated region	Once in May and September respectively every year						
	Disposal yard	Field investigati	Current landform, topography, vegetation status	Once during construction preparation						
		Field investigati	Disturbed landform, scope and extent of destroyed vegetation	Once a month						
		position observati	Water/soil erosion amount	Once a month, additional one after strong wind						

Attachment Table 7.3-5 Shanshan County Water-saving Irrigation Project Technical Specifications for Water/Soil Conservation Monitoring

Project Name	Monitoring Area	Monitoring Methodologies	Monitoring Items	Monitoring Time and Frequency	Annual Cost (Yuan)	Monitoring Period (Year)	Cost Per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes
ShanshanCounty	Pipeline area	Field investigation	Current landform, topography, vegetation status	Once during construction preparation	122900	2	245800	245800	With water and soil	Water and Soil Conservation

		Field investigati	Disturbed landform, scope and extent of	Once a month during construction period						
		position observatio n	Water/soil erosion amount	Once a month during construction period and natural recovery period respectively, additional one after strong wind						
	Temporary construction and living area	Field investigati on	Current landform, topography, vegetation status	Once during construction preparation						
		Field investigati	Disturbed landform, scope and extent of	Once a month during construction period						
		position observatio n	Water/soil erosion amount	Once a month during construction period and natural recovery period respectively, additional one after strong wind						
	Construction road area	Field investigati on	Current landform, topography, vegetation status	Once during construction preparation						
		Field investigati	Disturbed landform, scope and extent of	Once a month during construction period						
		position observatio n	Water/soil erosion amount	Once a month during construction period and natural recovery period respectively, additional one after strong wind						

Attachment Table 7.3-6 Tuokesun County Water-saving Irrigation Project

Technical Specifications for Water/Soil Conservation Monitoring

Project Name	Monitoring Area	Monitoring Methodologies	Monitoring Items	Monitoring Time and Frequency	AnnualCost (Yuan)	Monitoring Period (Yea	Cost Per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes
Tuokesun Water-Saving Irrigation Project	On-farm pipeline area	Current landform, topography, vegetation	Field investigati	Once during construction preparation	74400	2	148800	148800	With water and soil conservation monitoring qualification certificate	Technical Specifications of Water and Soil Conservation Monitoring (SL277-2002)
		Disturbed landform, scope and extent of destroyed vegetation	Field investigation	Once a month						
		Water/soil erosion amount	position observati	Once a month, additional one after strong wind						
		Growing status of plant within treated region	Reference land unit	Once in May and September respectively every year						
	Project area beyond site	Current landform, topography, vegetation	Field investigati	Once during construction preparation						
		Disturbed landform, scope and extent of destroyed vegetation	Field investigation	Once a month						
		Water/soil erosion amount	position observati	Once a month, additional one after strong wind						
		Growing status of plant within treated region	Reference land unit	Once in May and September respectively every year						
	Construction road	Current landform, topography, vegetation status	Field investigation	Once during construction preparation						

		Disturbed landform, scope and extent of	Field investigati	Once a month						
		Water/soil erosion amount	position observati on	Once a month, additional one after strong wind						
		Growing status of plant within treated region	Referenc e land unit	Once in May and September respectively every year						
	Tempo rary constr uction and living area	Current landform, topography, vegetation status	Field investigati on	Once during construction preparation						
		Disturbed landform, scope and extent of destroyed vegetation	Field investigati on	Once a month						
		Water/soil erosion amount	position observati	Once a month, additional one after strong wind						

Attachment Table 7.3-7 Turpan City Canal Lining Project

Technical Specifications for Water/Soil Conservation Monitoring

Project Name	Monito ring Area	Monitorin g Methodol ogies	Monitoring Items	Monitoring Time and Frequency	Ann ual Cos t (Yu an)	Mo nito ring Per iod (Ye ar)	Cost Per Peri od (Yua n)	Tota l Cos t (Yu an)	Monitoring institution	Appli cable Stan dards and Code s
urpan City Canal Lining project	Tempo rary dispos al yard	Field investigati on	Current landform, topography, vegetation status	Once during construction preparation□another once after completion of construction	172 700	1	172 700	172 700	With water and soil conservation monitoring qualification certificate	Tech nical Speci ficati ons of Wate r and Soil Cons ervati on Monit oring (SL2 77-2002)
		Field investigati on	Disturbed landform, scope and extent of destroyed vegetation	Once during construction preparation□another once after completion of construction						
		position observati	Water/soil erosion amount	Once in March and April respectively, additional one after						
	Traffic road constr uction area	Field investigati	Current landform, topography, vegetation status	Once during construction preparation□another once after						
		Field investigati on	Disturbed landform, scope and extent of destroyed vegetation	Once during construction preparation□another once after completion of construction						
		position observati	Water/soil erosion amount	Once in March and April respectively, additional one after						
	Dispos al yard	Field investigati	Current landform, topography, vegetation status	Once during construction preparation□another once after						
		Field investigati on	Disturbed landform, scope and extent of destroyed vegetation	Once during construction preparation□another once after completion of construction						
		position observati	Water/soil erosion amount	Once in March and April respectively, additional one after						

Attachment Table 7.3-8 Shanshan County Ertang Branch Water Conservation Project

Technical Specifications for Water/Soil Conservation Monitoring

Project Name	Monitoring Area	Monitoring Methodologies	Monitoring Items	Monitoring Time and Frequency	Annual Cost (Yuan)	Monitoring Period (Year)	Cost Per Period (Yuan)	Total Cost (Yuan)	Monitoring institution	Applicable Standards and Codes

Shanshan County ErTang Branch Canal Lining Project	Main civil works	Field investigation	Current landform, topography, vegetation	Once during construction preparation and	63000	2	126000	126000	With water and soil conservation monitoring qualification certificate	Technical Specifications of Water and Soil Conservation Monitoring (SL277-2002)
		Field investigation	Disturbed landform, scope and	Once a month during						
		position observation	Water/soil erosion amount	Once a month during construction period and						
	Traffic road construction area	Field investigation	Current landform, topography, vegetation status	Once during construction preparation and construction						
		Field investigation	Disturbed landform, scope and extent of	Once a month during construction						
		position observation	Water/soil erosion amount	Once a month during construction period and						
	Disposal yard	Field investigation	Current landform, topography, vegetation status	Once during construction preparation and construction						
		Field investigation	Disturbed landform, scope and extent of	Once a month during construction						
		position observation	Water/soil erosion amount	Once a month during						

Attachment Table 7.3-9 Tuokesun County Alagou Main Diversion Canal Water Conservation Project

Technical Specifications for Water/Soil Conservation Monitoring

Project Name	Monitoring Area	Monitoring Methodologies	Monitoring Items	Monitoring Time and Frequency	AnnualCost (Yuan)	Monitoring Period	Cost Per Period (Yua	Total Cost (Yuan)	Monitoring institution	Applicable Standards and
Tuokesun County A'LaGou Main Diversion Canal project	Canal works area	Current landform, topography, vegetation	Field investig	Once during construction preparation	76800	2	153500	153500	With water and soil conservation monitoring qualification certificate	Technical Specifications of Water and Soil Conservation Monitoring (SL277-2002)
		Disturbed landform, scope and extent of destroyed	Field investig	Once a month						
		Water/soil erosion amount	position observa	Once a month, additional one after strong wind						
		Growing status of plant within treated region	Reference land unit	Once in May and September respectively every year						
	Flood control dike area	Current landform, topography, vegetation	Field investig	Once during construction preparation						
		Disturbed landform, scope and extent of destroyed	Field investig	Once a month						
		Water/soil erosion amount	position observa	Once a month, additional one after strong wind						
		Growing status of plant within treated region	Reference land unit	Once in May and September respectively every year						

	Construction road area	Current landform, topography, vegetation	Field investig	Once during construction preparation						
		Disturbed landform, scope and extent of destroyed	Field investig	Once a month						
		Water/soil erosion amount	position observa	Once a month, additional one after strong wind						
		Growing status of plant within treated region	Referen ce land unit	Once in May and September respectively every year						
	Disposal yard	Current landform, topography, vegetation	Field investig	Once during construction preparation						
		Disturbed landform, scope and extent of destroyed	Field investig	Once a month						
		Water/soil erosion amount	position observa	Once a month, additional one after strong wind						

Chapter 8 Investigation for Acceptance of Environmental Protection Measures

8.1 Water Environment Protection Measures

There are statement and conclusion of final acceptance with regard to dredging and stubbing with three reservoirs.

Investigate the measures, effects and investment in relation to the water environment protection upon living sewage by means of data collection and field survey and in combination with the data supported by the monitoring for as-build acceptance.

Such investigations will focus on workmanship and capacity of water treatment facilities equipped in living area for handling sewage herein, discharge destination, as well as investment and operation cost of those facilities.

8.2 Atmosphere Environment Protection Measures

Investigate the measures in terms of treatment, prevention and management of minimization of dust, exhaust gas made by construction machinery and vehicle as well as their impacts on construction personnel (for Meiyaogou Reservoir Project, investigation shall include the impact of this project on Meiyaogou villagers and teachers and students in Meiyaogou School). The investigations will include treatment size, treatment facilities and operation/management/maintenance of facilities.

8.3 Acoustic Environmental Protection Measures

Investigate the conditions and effects of implementation of acoustic environment protection measures through visiting construction personnel (for Meiyaogou Reservoir Project, need to investigate and visit Meiyaogou villagers and teachers and students in Meiyaogou School) and checking with the data related. Investigations will include: whether or not the construction equipment is in conformity with environmental protection requirements; is the control of noise during construction period strengthened, are noise reduction measures taken with high-noise contraction equipment, is the high-noise operation scheduled as much as possible in daytime; is the repairing management of high-noise equipment enhanced, ensure normal operation reduce the noise caused by abnormal operation of equipment; is the repairing management of vehicle enhanced, control vehicle noise; what kind of measures shall be taken during construction period of Meiyaogou Reservoir Project so as to protect Meiyaogou villagers and teachers and students in Meiyaogou School.

8.4 Solid Wastes Treatment Measures

Investigate the location, size and receiving capacity of disposal yard containing waste soil and rock mucks, and identify the works to be launch and measures to be taken after treatment of disposal yard. Such measures will include provision of drainage ditches/channels, type and optimization of utilization of restored cut-over land. Figure out number of garbage treatment facilities and running conditions.

8.5 Ecological Protection Measures

8.5.1 Treatment of Water and Soil Erosion

8.5.1.1 Treatment Measures during Construction Period

During construction period, investigate soil/rock volumes to be used, stacking places, actual use of disposal yards and guard conditions. Those investigations will make clear that number of disposal yards, actual volume of mucks, utilization rate; actually occupied area of planned disposal yards, volume of mucks and stacking height; construction of retaining wall of disposal yard, length and height of retaining wall, provision and layout of drainage ditches around and drainage facilities.

Investigate and explore quarry/borrow sites, type of application of the land before disturbing, ecological restoration measures and the effect after restoration, provision of temporary roads for construction use, arrangement of drainage ditches on the slope of quarry/borrow sites.

8.5.1.2 Water and Soil Conservation Measures after the Completion of Construction

After the completion of construction, investigate restoration of temporarily occupied land. Investigate the type of utilization, vegetation area, vegetation rate of cut-over land after restoration including temporary roads for construction use, both sides of newly built roads, exposed ground surface with vegetation destroyed due to temporarily occupied by construction, temporary living area and office area, and disposal yards. Make sure the implementation of engineering measures and plant recovery measures in conformity with environmental assessment and project design. Investigate water and soil conservation situation after application of the measures in terms of engineering, plant and management.

8.5.2 Protection Measures for Terrestrial Ecology

Investigate restoration of temporarily occupied land and green projects in reservoir area and living area.

Aquatic Ecology

Investigate the measures and their implementation with regard to guarantee basic ecological discharge.

8.6 Impacts on Public Health and Protection Measures

Investigate environmental hygienic management, epidemic control and the like in construction area during construction period.

Investigate environmental hygienic situation in project construction area and reservoir area in terms of establishment of medical care institution, provision of medical care facilities, archiving of health file of construction personnel, periodic inspection for construction personnel; breaking-out of infection disease including disease virus, population infected, epidemic-stricken area, control of epidemic situation; purification of drinking water, disinfection; as well as other measures for the purposes of protecting public health.

Based on investigation results and in combination with EIA requirements, give judgment to the implementation of those public health protection measures, assess the status of public health during construction period, and analyze the effects of those measures.

During operation period, investigate environmental hygienic situation in project reservoir area and the measures to be taken to protect public health over there.

8.7 Other Environmental Protection Measures

8.7.1 Environmental Protection Measures for Resettlement Reception Area

Investigate the locations of resettlement, reception area for living, reception area for production and general conditions of environment; population of relocatees, resettlement mode, resettlement situation; dismantlement of specific facilities, restoration of those facilities; finalization and effects of environmental protection measures to be applied to relocation and reception area.

8.7.2 Impacts on Cultural and Ancient Relics

Investigate valuable cultural and ancient relics within project construction area, permanently occupied area and project-concerned area. Investigate the finalization of environmental protection measures specified in the EIA documents and EIA approval documents.

8.8 Risk Resistance Measures

During construction period and operation period, investigate environmental risks, make sure if there have been risk accidents; Investigate cases, reasons and causes of environmental risk accidents and sequential impacts on environment; investigate risk resistance measures and preparation of contingency measures, national/local/industrial risk resistance measures and finalization of contingency measures by concerned sides, provision of necessary contingency facilities and training for contingency teams; investigate caution and prevention of emergency risk accidents and establishment of management institutions.

Chapter 9 Cost Estimation and Fund Source of Environmental Management

9.1 Allocation of Budget

EMP will concern many intuitions, fund sources will therefore be different. Most environmental protection activities will be engineering measures. In view of this, engineering measures will be provided by project contraction contractors and operators and list in project cost. The lines of the cost will be classified in list in their competitive bids.

EMP budget will be mainly used for the environmental management during construction period and operation period, including: environmental monitoring, environmental supervision, personnel training, and environmental management institution functioning and risk resistance for some projects. EMC activities will be included in the budget for PMO, PIUs international project management, monitoring over water quality/air/noise, the same as CSEE and EFSI. CSEE's monitoring and supervision activities will be the part of budget for building and supervision. Project Owners will bear monitoring cost. If routine monitoring of local environmental protection institutions will be done concurrently with that of this project, the data coming from routine monitoring executed by local environmental protection institutions can be used.

9.2 Fund Sources and EMP Budget

The summary of environmental management cost for all project components during construction period sees Table 9.2-1.

Table 9.2-1 Summary Of Environmental Management Cost For All Project Components During Construction Period

project Code	Project Name	Annual Cost during Construction period (10^4 Yuan)					Personnel Environmental Protection Training (10^4 Yuan)	Construction Duration (Year)	Annual Cost for Monitoring Water/soil Conservation (10^4 Yuan)	Monitoring Period (Year)	Total Cost during Construction Period (10^4 Yuan)
		EMD			Environmental Monitoring	Environmental Supervision					
		Salary	Official	Traffic							
TLF1	Meiyaogou Reservoir project	10	5	1.8	1.16	16	5	1.83	12.98	2.5	99.60
TLF2	Turpan City Water-saving Irrigation Project	4	1	0.8	0	6	3	0.42	8.505	2	24.97
TLF3	Ta'ErTang Branch Canal Project	4	1	0.8	0	6	3	0.83	17.27	1	30.06
TLF4	WuDaoLin Karez	4	1	0.8	0	6	2	2	0	0	25.60
SS1	Shanshan County Er'TangGou	10	4	2.29	1.14	16	5	2.5	22.61	3	156.41
SS2	Shanshan County Water-saving Irrigation	4	1	1.2	0	6	3	0.42	12.29	2	32.70
SS3	Er'tang Branch Canal Lining	4	1	1.36	0	6	3	0.5	6.3	2	21.78
TKX1	Tuokesun County A'LaGou	10	4	2.67	0.96	16	5	4	13.81	4.5	201.67
TKX2	Tuokesun County Water-saving Irrigation	4	1	1	0	6	3	1.34	4.96	3	33.96
TKX3	A'LaGou Main Diversion Canal	4	1	1	0	6	3	0.75	15.35	1	27.35
	Total	58	20	13.72	3.26	90	35	14.59	114.075	21	654.1

Chapter 10 EMP's Information Management

10.1 EMP

10.1.1 Environmental Management System

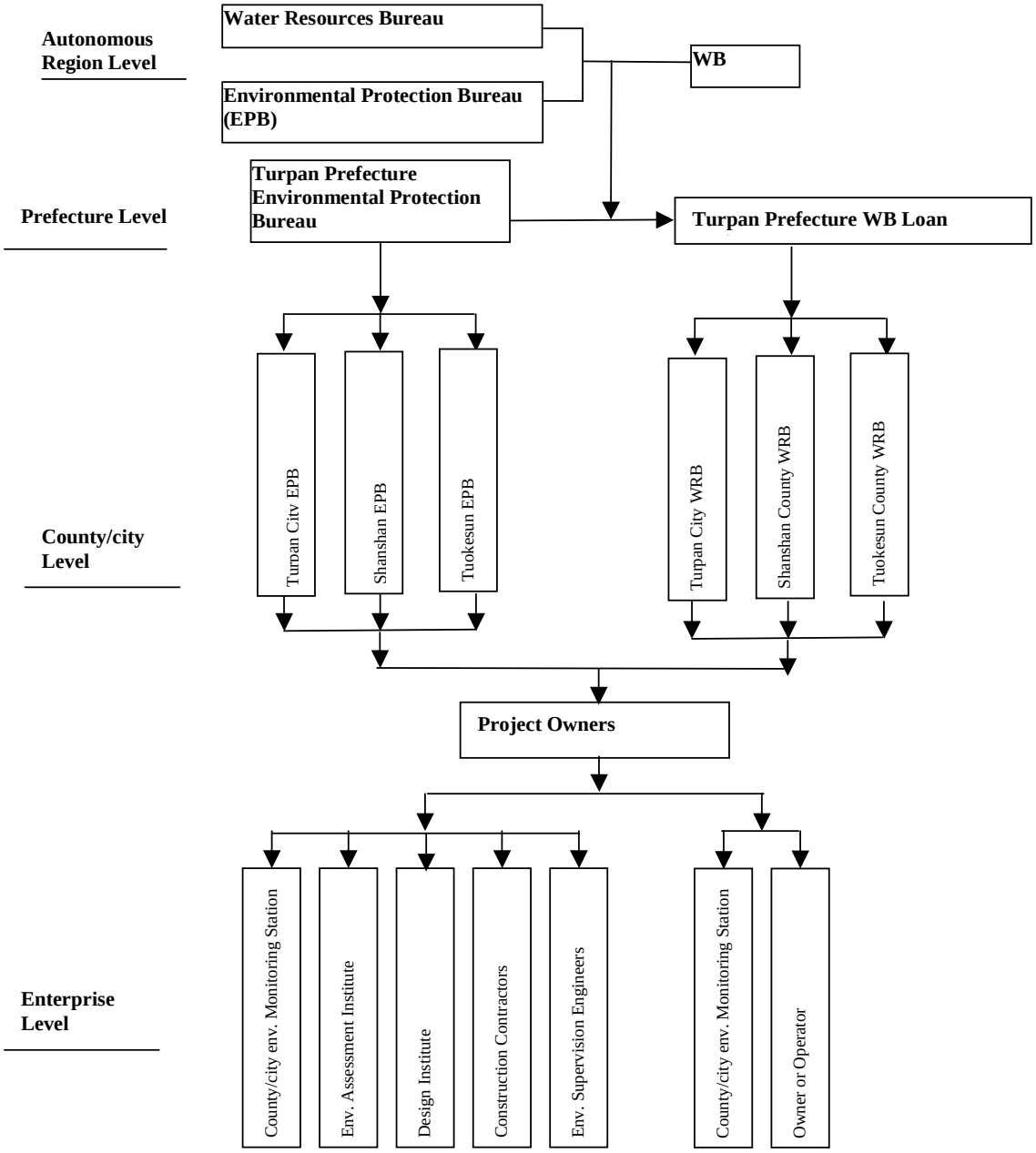

Fig. 10.1 Environmental Management System Framework

Environmental Management System Institutions

Table 10.1-1

Nature	Name	Duties
Management institution	Turpan Prefecture PMO	Project management institution
	Turpan Prefecture environmental management office	Project environmental management institution
Supervision institution	WB	Supervision and inspection over the implementation of EMP
	Xinjiang Uygur Autonomous Region EPB, Turpan prefecture EPB, EPBs of two counties and one city	Governmental administrative supervision and management institution
Implementation institution	Contractor	Implementation institution to finalize environmental protection measures during construction period
Consulting institution	Environmental experts group	Assigned by project environmental management institution, implement environmental review, consulting and technical assistance
	Environmental supervision engineer	Assigned by project environmental management institution, supervise and manage Contractors environmentally
	Project supervision engineer	Establish a channel for transferring the correspondences between environmental supervision engineer and contractors
	Environmental Monitoring institution	Assigned by project environmental management institution, carry out environmental monitoring

10.1.2 Environmental Management Tasks during Different Stages

(1) Feasibility Study

The environmental management activities during project feasibility study stage are the environmental assessment on the proposed project including EIA report and EMP.

(2) Design

The environmental management activities during project design stage are to review the final design report of the project so as to ensure involving in the final design of the project the various environmental protection measures (environmental protection measures to be done in project design, construction period and operation period, respectively) specified in the environmental assessment.

(3) Bidding

The environmental management activities during project bidding stage are to ensure the involvement of the environmental protection measures specified in the environmental assessment in the project construction contract.

(4) Construction

The environmental management activities during project bidding stage are to implement environmental protection measures and monitoring program particularly for construction period specified in the environmental assessment.

Contractors will be responsible for the implementation of environmental protection measures. Environmental supervision engineer will do supervision and management upon the construction activities carried out by contractors on the site.

(5) Operation

The environmental management activities during project operation stage are to implement environmental protection measures and monitoring program particularly for operation period specified in the environmental assessment.

10.2 Information Exchanging

It is requested by the environmental management that necessary information exchanging should be done between PMOs, Project Owners, Contractors and operations among all project institutions, besides, related information should be reported to the outside (related partners and the public).

Inside information exchanging can be done in many ways of meeting, internal briefing, etc. , but formal conference will be made once a month least. All information exchanges will be recorded and archived. External information exchanging can be done at an interval of half year or one year. The information exchanged with cooperation partners shall form a minute and be archived.

10.3 Recording Mechanism

A complete recording mechanism will be established to ensure an effective functioning of environmental management system and reserve the records in following aspects:

(1) Requirements specified in related laws and regulations;

(2) Permits;

(3) Environmental elements and related environmental impacts;

(4) Training;

(5) Inspection, verification and maintenance;

(6) Monitoring data;

(7) Effectiveness of correction measures and prevent measures;

(8) Information from related partners;

(9) Review;

(10) Assessment.

Additionally, various records aforesaid will be given necessary controls, including identification of records, collection, catalogue, archiving, storage, management, maintenance, research, storage limit, disposal, etc.

10.4 Reporting Mechanism

Contractors, Operators, monitoring institutes, environmental supervision engineers and PMOs will record and report to related departments in a timely manner the project progress, EMP implementation, environmental monitoring results. Reporting contents include 6 parts as follows:

(1) Environmental supervision engineers will record EMP implementation progress monthly, timely submit to the Project Owners and PMOs at county/city level the weekly report and monthly report. Such weekly and monthly reports should include environmental protection measure implementation progress, environmental monitoring progress and monitoring data available.

(2) Contractors and Operations will record in details the EMP implementation progress on a quarter basis and submit to PMOs the seasonal reports, meanwhile make a copy of seasonal reports to the County/City Environmental Protection Bureaus.

(3) After the completion of monitoring assignment, monitoring institutions will submit in a timely manner the monitoring report to the Contractors (Operators) and environmental supervision engineers.

(4) PMOs at county/city level will submit in a timely manner to the Prefecture PMOs the project progress report, meanwhile, make a copy of those reports to the Prefecture Environmental Protection Bureau. The project progress report prepared by each PMO (for instance, monthly report, seasonal report and annual report, etc.) should include EMP progress, such as EMP implementation progress and implementation effect, particularly the environmental monitoring results.

(5) In case of occurrence of some faults breaking environmental protection, environmental supervision engineers and PMOs will report to local environmental protection administrative departments, and to the upper level step by step if necessary.

(6) The annual EMP implementation report should be submitted to the WB before March 31 every year. The EMP implementation report can include the contents as follows:

- implementation of training program;
- project progress, for instance, river treatment, wastes disposal yard, waste water treatment plant and pipeline routing progress, etc.;
- project environmental protection measures implementation, implementation progress, environmental monitoring implementation progress and main monitoring results;
- are there any public appeals. If there are, record main contents of appeals, solutions and satisfaction of the public;
- the EMP implementation program of next year.

Annexes

Annex 1 Project concerned environmental standards

Annex 1-1 Ambient Air Quality Evaluation Standard

Environmental quality standard Code and Description	Pollutants	Data Acquisition Time	Concentration Limit /mg·m^{-3}		
			Class I	Class II	Class III
GB3095-1996 Ambient Air Quality Standard	Nitrogen dioxide	Annual Mean	0.04	0.08	
		Daily Mean	0.08	0.12	
		1h Mean	0.12	0.24	

Note: The reference data of nitrogen dioxide is determined in accordance with the *Circular Concerning the Modification of Ambient Air Quality Standard* issued by the Ministry of Environmental Protection of the People's Republic of China in Year 2000.

Standard for Evaluation Quality of Agricultural Irrigation Water

Annex 1-2

Environmental Quality Code	Items	Crops	
		Dry land	Vegetables
Standards For Irrigation Water Quality, GB5084-2005	5-day biochemical oxygen demand（mg/L）	100	40a，15b
	chemical oxygen demand（mg/L）	200	100a，60b
	suspension（mg/L）	100	60a，15b
	anionic surfactant（mg/L）	8	5
	Water temperature（℃）	35	
	PH	5.5～8.5	
	total salt content（mg/L）	1000a (non saline - alkali soil land), 2000b (saline - alkali soil land)	
	chloride（mg/L）	350	
	sulfide（mg/L）	1	
	total Hg（mg/L）	0.001	
	cadmium（mg/L）	0.01	
	total arsenic（mg/L）	0.1	0.05
	hexavalent chromium（mg/L）	0.1	
	lead（mg/L）	0.2	
	fecal coliform bacteria colony（bacteria/100mL）	4000	2000a，1000b
	ascaris suum egg（eggs/L）	2	2a，1b

Note:
a: processed, cooked and peeled vegetable;
b: fresh vegetable, fruit, melon and herbage fruit;
c: The limit of total salt content in the agricultural irrigation water may be properly extended in the area where irrigation facilities have been provided to some extent, or drainage and underground water runoff conditions can be ensured to some extent, or there are water resources to some extent capable of flushing the salt in soil.

Acoustic Environment Quality Evaluation Standard

Annex 1-3

Environmental Quality Code	Items	Daytime/dB(A)	Nighttime/dB(A)
GB3096-2008 Environmental Quality Standard For Noise	0	50	40
	1	55	45
	2	60	50
	3	65	55
	4	70	55

Annex 1-4 Water Environment Quality Evaluation Standards

Environmental Quality Code	Parameters for Water Quality	Classification Standard（mg/L）				
		Class I	Class II	Class III	Class IV	Class V
GB3838-2002 Environmental Quality Standards For Surface Water	Water temperature (□)	Ambient water temperature variation caused by man forces shall be limited as below: Weekly average maximum temperature rise≤ 1 Weekly average maximum temperature drop≤ 2				
	pH □	6-9				
	DO ）	Saturation rate 90%（or 7.5）	6	5	3	2
	CODMn ）	2	4	6	10	15
	chemical oxygen demand（COD）	15	15	20	30	40
	5-day oxygen demand（BOD5）	3	3	4	6	10
	NH3-N □	0.15	0.5	1.0	1.5	2.0
	Total phosphor（P based）□	0.02(lake, reservoir 0.01)	0.1(lake, reservoir 0.025)	0.2(lake, reservoir 0.05)	0.3(lake, reservoir 0.1)	0.4(lake, reservoir 0.2)
	Total nitrogen（lake and reservoir based on N）□	0.2	0.5	1.0	1.5	2.0
	Cu □	0.01	1.0	1.0	1.0	1.0
	Zinc □	0.05	1.0	1.0	2.0	2.0
	Fluoride (based on F-) □	1.0	1.0	1.0	1.5	1.5
	Selenium □	0.01	0.01	0.01	0.02	0.02
	Arsenic □	0.05	0.05	0.05	0.1	0.1
	Hg□	0.00005	0.00005	0.0001	0.001	0.001
	Cadmium□	0.001	0.005	0.005	0.005	0.01
	Hexavalent chromium□	0.01	0.05	0.05	0.05	0.1
	Lead □	0.01	0.01	0.05	0.05	0.1
	Cyanide □	0.005	0.05	0.2	0.2	0.2
	volatile phenol□	0.002	0.002	0.005	0.01	0.1
	Petroleum group□	0.05	0.05	0.05	0.5	1.0
	anionic surfactant□	0.2	0.2	0.2	0.3	0.3
	sulfide□	0.05	0.1	0.2	0.5	1.0
	fecal coliform bacteria colony（bacteria /L）□	200	2000	10000	20000	40000

Standard for Evaluation on Integrated Emission of Air Pollutants

Annex 1-5

Environmental Quality Code	Pollutants	Item and Limit /mg·m^3
		monitoring concentration threshold of fugitive emission
GB16297-1996 Integrated Emission Standard Of Air Pollutants	Grain	maximum concentration point outside of the unit border 1.0

Integrated Wastewater Discharge Standard(Unit： mg/L, except for pH)

Annex 1-6

Evaluation Elements / Code		pH	SS	COD	BOD_5	NH_3-N	phosphate	Pb	Mn	Cu	Zn	As	Cd	Petroleum group	volatile phenol
Integrated wastewater discharge standard, GB8978-1996	Class I	6～9	70	60	20	15	0.5	1.0	2.0	0.5	2.0	0.5	0.1	5	0.5
	Class II		150	120	30	25	1.0		2.0	1.0	5.0			10	0.5
	Class III		400	—	300	—	—		5.0	2.0	5.0			20	2.0

Noise Control Evaluation Standards

Annex 1-7

Environmental Quality Code	Classification		Daytime dB(A)	Nighttime dB(A)
Standard of Noise at Boundary of Industrial Enterprises, GB12348-90	1		55	45
	2		60	50
	3		65	55
	4		70	55
Noise limits for Construction Site, GB12523-90	construction stage	Main Noise Sources	Daytime dB(A)	Nighttime dB(A)
	Earth and rock cuts	bulldozer, excavator, shovel loader	75	55
	Pile	Pile driver	85	Construction forbidden
	Structure	Concrete batching machine, vibrator, electric saw, etc.	70	55
	Decoration	Crane, hoist machine	65	55

Annex 2 Environmental Management Specification for Project Contractors

During construction period, environmental protection will be the main task of Contractors. It is specified in the *Conditions of Contract for Construction* issued by the Federation Internationale des Ingenieurs-Conseils International Federation of Consulting Engineers that: during the execution and completion of the Works and the remedying of any defects, the Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations. The Contractor of WuDaoLin Karez Project is required to have a certain experience in cultural relic restoration. The construction shall follow a principle of “minimized disturbance” so as to “keep original appearance as much as possible” .

1. Air pollution control measures

- construction in a neat way will be done during construction period. Dust pollution control measures will be put forward in accordance with the constriction plan, such as provision of baffles, spraying water, timely clearance of unwanted soil, covering the carriage of transportation trucks before leaving the site and minimizing offloading during wind blowing time.

- stack powder alike material in a concentrated way, take covering and sheltering measures, and reduce the occurrence of dust.

- inspect working locations periodically, monitor TSP at sensitive points, and release correction orders within limited period once superscale is shot.

- give a fine administratively and economically to the faults breaking operation rules or problems that can’t be corrected timely.

2. Water pollution control measures

- forbid random discharge of production and living waste water without any treatment. Waste water deposition tanks should be provided at construction sites to treat the waste water simply and reuse it for spraying purpose or concrete batching, etc.

- strengthen management at construction site, prevent soil/rock cut and construction material entering into the river body in the vicinity of stacking yards.

3. Noise control measures

- advanced low-noise construction workmanship instead of high-noise construction workmanship.

- limit the speed of bulldozer, excavator, loading vehicle when driving into construction sites, enhance care and maintenance of construction machinery and transportation vehicle.

- schedule construction period and construction time reasonably to avoid negative impacts of high noise one surrounding residents.

- run equipment in accordance with instructive manuals to minimize bumping noise.

- when passing through sensitive locations as schools and residential region, soundproof barrier will be set up around construction sites; when carry out construction in the vicinity of schools, the construction time will be determined after coordination with the school so as to minimize the disturbance over the school's teaching activities.

- monitor the noise level at sensitive points, and mitigation measures will be proposed with the points where the noise exceeds specified level.

4. Ecological environment pollution control measures

- all requisition actions for the lands and forests that have to be occupied during project construction period must be finished before the initiation of the project. Those requisition actions must be in conformity with WB security and guard policies of OP 4.12 and 4.20. Once the basic farmland is occupied, complementary farmland must be provided equally. All arbors and trees growing in the occupied area should be trans-planted or planted for supplementary purpose at the places else.

- For construction temporarily occupied land, the overburden soil on the cultivated land should be bulled aside during construction period, and recovered back after the completion of construction.

- enhance construction personnel's knowledge, call for well organized construction and protect wild animal and plant within construction area.

5. Solid waste pollution control measures

- architectural rubbish and disposed cuts should be handled in accordance with local regulations required by related departments. Living garbage will be collected and buried at designated burying yard by the environmental sanitation administrative department.

- solid wastes and waste fuel occurring at the construction site will be stacked at the designated yard. After the completion of the construction, solid wastes will be transported to the burying yard; waste fuel will be collected and handled together with fuel leakage from construction machinery.

- architectural rubbish and disposed cuts should be handled in a timely manner to shorten on-site stacking time.

6. Social environmental protection measures

- In accordance with Chinese national and local policies of resettlement/relocation and related compensation methods, rational compensations shall be made with the villagers whose land will be requisitioned. Solicit relocatees for their opinions in a serious manner.

- Pipeline and roads shall be built in sections. Excavations and backfilling shall be done as quick as possible. Particularly the public facilities adjacent to schools shall be provided with temporary path complete with traffic signs for warning purpose.

- Improve the knowledge and awareness of management and construction personnel with regard to protection of cultural relic. Since earth and rock cut will be huge, adequate concerns shall be given. Once the traces of cultural and ancient relic or ancient grave are shot, local cultural relic protection department shall be informed immediately, and the construction site shall be protected in a timely manner. No construction may be carried out until proper treatment is done by the cultural relic protection department;

7 Environmental monitoring measures

In accordance with project monitoring plan, request assigned environmental monitoring stations and qualified water and soil conservation monitoring unit at county/city levels carrying out monitoring over the main environmental impacts and environmental quality and soil and water conservation status based on the monitoring frequency and monitoring point arrangement.

Record in details the environmental monitoring progress and monitoring results, include them in the monthly and seasonal monitoring reports, submit reports to the local PMOs and make a copy to the local environmental protection bureaus.

8. Environmental and water and soil conservation supervision measures

Environmental and water and soil conservation supervision is one of newly proposed requirements by environmental protection. Environmental supervision should be done through whole project period as to guarantee a smooth execution of environmental protection and effective performance of environmental protection measures during project construction period. In order to ensure the completion of environmental protection and soil and water conservation measures on schedule and guarantee the quality of environmental project, the supervision engineers should be the Owner assigned persons who have relevant qualification certificates. In view of the construction schedule featuring a dissectioned and staged characters, it is initially considered that there will be 13 full-time environmental supervision engineers. Environmental management personnel can be staffed if necessary and taken by the personnel of other departments on a part-time basis, the specific staff members will be determined as the case may be.

8.1 Working way of environmental and water and soil conservation monitoring

- The environmental and water and soil conservation supervision will be a part of engineering supervision and managed by in a unified way by the supervision management office under the project command centre. The supervision engineers will take part in monthly routine meeting organized by the project chief supervision engineer and report him the weekly and monthly supervision reports.

- Organize periodically environmental and water and soil conservation supervision working meetings, amid the meetings, discuss recent environmental and water and soil conservation supervision work, find a solution to the problems and propose working program of next stage.

- Each supervision management branch office will organize monthly routine meeting periodically.

 establish a complete environmental protection management system onsite. An environmental protection leading group will be formed in each PMO responsible for environmental protection leading actions. The institutions of this system will extend to construction teams and groups with duties and responsible persons clearly specified.

8.2 Scope of environmental and water and soil conservation supervision

 environmental supervision during project preparation period:

Review the environmental protection clauses described in the Project Construction Scheduling Plan prepared by the Construction Contractors, inspect whether or not the environmental protection system to be established by the Construction Contractors is rational, review and approve the Application for Unit Project Initiation, give engineering supervision to the pollutants treatment projects and supervise execution.

 environmental and soil and water conservation supervision during project construction period:

In accordance with the Key Environmental Protection Targets considered and designed with each project lot, disseminate environmental protection to the Construction Contractors, point out to them the environmental pollution sensitive points. Based on the main pollutants that would occur during construction period, propose detailed environmental protection measures, review the Project Construction Environmental Protection Scheme prepared by the Construction Contractors, inspect whether or not the environmental protection system is functioning normally, inspect finalization of environmental protection measures and supervise execution of water and soil conservation measures. Supervise the implementation of the Environmental Monitoring Program as well as the monitoring results.

③ environmental supervision during project operation period:

Review the Report of Summary of Project Construction Environmental Protection Actions drafted by the Construction Contractors, re-organize as-built documents of environmental protection, final accept project environmental protection, and prepare the Report of Summary of Environmental Supervision, Report on Water and Soil Conservation Supervision, etc.

8.3 Duties of environmental supervision

 Supervision engineers shall strictly fulfill their duties, fundamentally perform their duties of supervision and management, effectively maintain the implementation of various environmental protection measure going together with various construction workmanship, and ensure an effective implementation of environmental protection and water and soill conservation actions.

 Do a good job of dissemination of environmental protection law and regulations, upgrade the environmental protection awareness of the project construction crew to get them protect the environment well in an voluntary manner.

- Bring forward staged environmental and water and soil conservation supervision acceptance plan, conduct environmental and water and soil conservation supervision acceptance with the unit project, keep a complete environmental protection procedures and data after the completion of the project.

- Before award of a Contract, the clauses of environmental protection shall be included in the project contract. Review the environmental protection contents described in the construction scheduling design proposed by the Bidders. Request the Bidders including specific environmental protection section in their bids .

④ Record in details the implementation of the project EMP, draft weekly and monthly reports, submit to local PMOs and environmental protection bureaus.

Annex 3 Environmental Management Specification for Project Operators

The environmental management during operation period will include following aspects:

I. Technical and management measures during operation

- set up a responsibility system in terms of running, management and operation of treatment facilities;
- give training to management and operation personnel, form a file of technique verification. No unqualified person may be on the post;
- employ experienced technicians to be responsible for management activities;
- strengthen maintenance and management of facilities. Key equipment shall have stand-by equipment;
- visit the residents in the vicinity of the project, listen to their opinions, get them informed of environmental information, and coordinate the relationship with nearby residents.

II. Environmental monitoring measures

Follow arrangements in the project monitoring program and require assigned environmental monitoring stations and qualified water and soil conservation monitoring unit at county/city levels carrying out monitoring over the main environmental impacts, environmental quality and water and soil erosion status based on the frequency and site arrangement in the monitoring programs.

Record in details the environmental and water and soil conservation monitoring progress and monitoring results, include them in the monthly and seasonal monitoring reports, submit the reports to the local PMOs and copy them to the local environmental protection bureaus.

Annex 4 Summary of EMP of Project Component

Annex Table 4-1 Turpan City Meiyaogou Reservoir EMP Summary

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
design stage								
—	During the design stage of Meiyaogou Reservoir Project, dam site alternatives selection, determination of quarry/borrow sites and disposal yard and construction scheduling etc will take into account as far as possible the environmental protection requirement so as to achieve the maximum project benefits at the cost of minimized disturbance and change with the environment. The preparation of EIA will carry out the secondary public participation to solicit for public opinions and suggestions with regard to the impacts of the project that would influence the public, further improve the design of main civil works and the design of environmental protection measures, transfer the public opinions and suggestions to the related line responsible administrative departments and supervision departments, and feedback the public the information of solution scheme.	Design institute environmental working group	Turpan City Environmental Management office	—	—	—	—	RMB730
construction stage								
water pollution mitigation measures								RMB6

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Construction waste water	① the waste water from aggregates processing system will be treated by means of coagulating sedimentation method. The waste water from aggregates processing plant will be discharged to waste water regulation tank, high suspension-content wastewater will be pumped to fine sand recovery treatment system which can collect back 80% of fine sand with particles larger than 0.035mm, the wastewater after filtering and screening will go to sediment tank for primary sedimentation, the supernatant liquor after added with flocculant will go to sediment tank for secondary sedimentation. After flocculation and sedimentation, the supernatant liquor can be used for sprinkling construction site and watering vegetation.	Construction Contractors	Turpan City EPB Turpan Prefecture EPB Xinjiang Uygur Autonomous Region EPB	pH, SS, diescharge	monitor twice per quarter during construction period	One monitoring point will be set at the inlet and outlet of waste water treatment facilities respectively	Turpan Prefecture Environmental Monitoring Station	362.4
	② A rectangular tank will be built at the place to which oil-content water after washing machinery is collected and drained. Grease trap material will be provided at the inlet of the tank. The oil-content waste water will flow into the tank by gravity after crossing through grease trap material. Once the tank is full, floating oil will be collected. After staying for 12 hours, wastewater can be used for sprinkling purpose. Such tank has a simple construction without machinery repairing problem, only necessary for regular cleaning and replacement of grease trap material, cleaning of tank itself and collection of floating oil. After completion of construction, tank bottom will be cleaned thoroughly, deposition will be transported to burying yard, and the tank will then be backfilled.			SS, petroleum group	monitor twice per quarter during construction period	Inlet and outlet of machinery repairing waste water treatment system		

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
	③ conventional explosive will exert larger impacts to water quality. In order to minimize the negative impact of nitrate explosive on water quality, environmental friendly explosive as emulsion explosive or water gel explosive is recommended.			—	—	—	—	
	④ Waste water leaking from concrete batching system will flow along the ground surface showing a flake form. After evaporation and infiltration, waste water will coagulate and harden the ground surface. After construction completion, those flakes should be cut out.			—	—	—	—	
Domestic sewage	Septic tank will be built in temporary living area to treat domestic sewage. All domestic sewage will be collected by routed pipeline and discharged into septic tanks, sterilized and disinfected therein. One septic tank to be built within the temporary living area will have a 20cm thick bottom, 20cm thick walls, made of C20 concrete. Tank bottom will have a 10cm thick cushion made of sand and gravel. Waterless toilets will be built within temporary living area. Such toilets will be a brick concrete construction with dry feces accumulation tank considered only. After treatment, dry feces will be used as fertilizer. After the construction completion, waterless toilets that will not be used ever will be rooted out, disinfected and backfilled. Environmental toilets will be built within complex works area and other construction sites depending on the number of population.			pH, DO, mineralization, chloride, COD_{Mn}, BOD_5, SS, Ammonia Nitrogen, volatile phenol, Water-soluble Ionic Iron, Total Manganese Content, total copper content, total zinc content, total phosphor content, fluorid, total arsenic content, total cadmium content, hexavalent chromium, petroleum group, fecal coliform bacteria colony, etc. 20 items totally	Monitoring will go through whole construction period. Sampling will be done in rich water, normal water and dry totally three periods. Sampling twice in each period at an interval of 5 days least.	Water intake for living area for construction personnel	Turpan Prefecture Environmental Monitoring Station	

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Rotten plants within reservoir area	Reservoir bottom dredging and stubbing measures — residual mass of buildings will be bulled by bulldozer. Architectural mucks will be transported to permanent disposal yard; — floating debris within reservoir will be cleaned by man power; — all timbers will be cut and transported outside or trans-planted to other places;	Construction contractors	Project supervision institute	—	—	—	—	
Ambient air pollution mitigation measures								
Dust	— Road sprinkler will be provided at construction area to lay dust; — Dust masks will be delivered to construction personnel;	Construction contractors	Xinjiang Uygur Autonomous Region EPB	TSP	monitor once per quarter during construction period, sampling every day at 09:00, 14:00, 19：00 respectively	One monitoring point at dam construction area	Turpan Prefecture Environmental Monitoring Station	

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Exhaust gas	— construction contractors should adopt construction machinery and vehicle in conformity with related national hygienic standards; — vehicle will be equipped with exhaust purifier to ensure exhaust emission reaching codes specified; — follow the Standard of Vehicles Scrappage. The vehicles running at a high fuel consuming rate but achieving low efficiency and heavy exhaust emission shall be replaced with new ones; — enhance the caring and maintenance with the fuel consuming machinery equipment; — for the exhaust occurred in the tunnel construction, axial flow fans and air purifiers will be installed to ventilate air and lay down dust.			—	—	—	—	
impacts on acoustic environment								
Construction noise	— deliver to construction personnel the ear plug, ear muffs, noise control products made of cotton and noise helmet; — equipment producing high vibration noise will be equipped with a base to reduce vibration; — schedule construction time rationally to avoid as much as possible the nighttime constriction (from 22:00 to 9:00 next day).	Construction contractors	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Turpan City EPB	(equivalent noise sideband A) Leq	One monitoring point at dam construction area	Monitoring one day per quarter during construction period, sampling at 10：00, 14：00, 22：00 respectively	Turpan Prefecture Environmental Monitoring Station	

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Traffic noise	— strengthen caring with access roads and maintenance with vehicles to reduce noise sources; — vehicles to be used should be conformity with the *Limits Of Noise Emitted By Stationary Road Vehicles* (GB16170-1996) and *Allowable Noise Limits For Motor Vehicle* (GB1495-79). Low-noise vehicles should be used the best; — protection measures for environmental sensitive points: take traffic control ways and disposal measures at sensitive road section. Warning signs shall be set up at the entrances of the Meiyaogou Village to limit the passing speed within 20 km/h and no loud tooting may be allowed.			(equivalent noise sideband A) Leq	One monitoring point at Meiyaogou Village located along the access road	Monitoring one day per quarter during construction period, sampling at 10：00, 14：00, 22：00 respectively		
solid waste pollution mitigation measures								
Living garbage	— portable garbage collection stations and garbage cans will be provided in temporary living area and the area where construction activities are concentrated; — spray insects killing aerosol or the like to prevent the breeding of mosquito and fly; — provide garbage truck to transport living garbage to the garbage burying yard in Shanshan County.	Construction contractors	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Turpan City EPB	—	—	—	—	
Ecological environment protection measures								
Protection of Terrestrial plant	Clarify the boundary construction occupied land, forbid construction personnel and vehicles entering into unoccupied area. After construction completion, all temporary construction facilities and living facilities shall be dismantled. The cut-over land due to constructions, such as construction site, quarry/borrow sites, etc. should be leveled.	Construction contractors	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Turpan City EPB	—	—	—	—	

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Protection of Terrestrial animal	— enhance the propaganda and dissemination of knowledge and awareness of ecological protection among the construction personnel and local residents during construction period; — establish an ecological destruction fine system; — clarify the scope of construction area, set up piles to give boundary, forbid construction personnel and vehicles entering into unoccupied area; — no fire works may be allowed in non construction area; — do a good job of method, quantity, time of blasting, minimize the blasting at nighttime, morning, dusk and mid noon; — strengthen environmental protection, monitoring and management, set up environmental protection and monitoring institutions, assign full-time environmental protection personnel, enhance the awareness of construction personnel of environmental protection, forbid illegal hunter of wild animal and tackle the illegal behaviors according to the law.			—	—	—	—	
Water and soil conservation measures								

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Mitigate the impacts of water and soil erosion due to project development	**（1）complex works** — the slopes of dam abutment will be rock surfaces after excavation. Slope gradient will keep slope stable; — keep construction beyond strong wind day or rainy day; — during dam filling, downstream dam toe will be protected by cement masonry made retaining wall; — no Radom excavation, stacking and road surface hardening may be allowed during construction; — bring into full use of excavated material during construction, and temporary protection shall be given to the stacks of excavated material to be used; — cleaning will be done after the completion of construction.	Construction contractors	Xinjiang Uygur Autonomous Region WRB Turpan Prefecture WRB Turpan City WRB	Erosion density	8~10 monitorings per year , additional one after strong wind during monitoring period. Key monitoring period is strong wind prevailing period during months from March to June, once per month during this period.	Set up one monitoring point	With water and soil conservation monitoring qualification certificate	
	（2）access roads — sprinkling; — land leveling.		Xinjiang Uygur Autonomous Region WRB Turpan Prefecture WRB Turpan City WRB					

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
	(3) quarry/borrow sites — don't carry out excavation during flood period. Excavations at the quarry/borrow sites should be zoned. Once the excavation at upstream site is finished, the cut-over area should be leveled. Excavation gradient shall keep slope stable. Before the excavation with the quarry/borrow site on the left bank, the foot of the excavated slope shall be built with a mucks retaining sill made of soil bags. After the completion of excavation, the site shall be leveled and covered by pebbles. — Before exploring aggregate material at quarry site, a muck retaining sill should be built at the foot of excavation face. The rock material excavated shall be stacked inside the sill. After the completion of excavation, the site shall be leveled and submerged after reservoir impoundment.			Erosion density		Set up one monitoring point		
	(4) transmission line — excavated material will be covered by color-strip fabric; — Restore the occupied land after the completion of excavation.							
	(5) living area for construction and production personnel — sprinkling; — land leveling and covered by pebbles.							

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
	6guard area for disposal yard — retaining wall made of mucks bags will be built around disposal yard to block mucks. In case of strong wind or rain during construction period, mucks will be covered by color-strip fabric. After the completion of construction, disposal yard will be leveled and covered by original overburden soil. — permanent disposal yard will be designed to contain stacks of mucks with a stacking thickness of 3m. Before doing stacking, cement masonry made retaining wall will be built around the yard to block mucks. In case of strong wind or rainstorm during construction period, mucks will be covered by color-strip fabric.			Erosion density		Set up one monitoring point		
	7permanent living area — management station will be given land leveling after the completion of construction; — Green work will be done at vacant area. Plant shrubs, such as H. persicum, Calligonum mongolicum and Astragalus adsurgens Pall.							
Public health protection measures								
Infection sources	— clean the construction sites of temporary living area and management area after the completion of civil works; — disinfect drinking water; — harmless treatment with garbage, feces and wastewater; — delivery periodically the epidemic control medicine and rat-killing drug to cut infection sources and spreading channels.	Construction contractors	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Turpan City EPB	—	—	—	—	

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Epidemic control of infectious disease	— do spot inspections with construction personnel before mobilization to the site; — do quarantine inspection with all staff members in the dining room; — establish health file for all contraction personnel; — set up disease control and prevention centre.			—	—	—	—	
Risk resistance measures								

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Transportation, storage and application of hazardous products	— The transportation of hazardous products shall be in accordance with the related regulations issued by the Ministry of Public Security of P.R.C., Transportation specifications should be put forward to specify transportation line, vehicles, schedule, escort personnel, delivery, acceptance, etc.; — The storage of hazardous products shall be in accordance with the current rules in force. It is request that the construction contractors should report the daily application amount of hazardous products, the supplier will determine daily delivery amount accordingly, such that long time storage of hazardous products on site would be effectively avoided; — The application of hazardous products shall be in accordance with related codes. The operators shall have received related training and possess on-post certificates in conformity with the safe management requirements; — The vehicles transporting the hazardous products should not be sun drenched. Proper transportation time and rational temperature control measures should be taken; — Strength traffic security management and upgrade the skills of drivers; — In case of occurrence of leakage of hazardous products into river, such accidents must be reported at once, water quality monitoring shall be done accordingly to know pollution source diffusion law and incidence. Inform of the government at the downstream reaches the occurrence of such	Construction contractors	Project supervision institute	—	—	—	—	207

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Contamination to the soil as a result of waste water from extinguishing action	— enhance the knowledge of fire fighter of fire security, improve their fire awareness; — establish a safe production and management system and strength the knowledge of management personnel of safe production; — drainage ditches shall be provided around fuel warehouse. A concrete tank with a capacity of 1.5 times of the maximum fire fighting water consumption will be provided at the end of the ditch to collect wastewater from a fire fighting. Forbid discharge fire fighting water in a random way.							
Cultural relic protection measures								
Construction excavation, etc	Once the traces of cultural and ancient relic or ancient grave are shot, local cultural relic protection department shall be informed immediately, and the construction site shall be protected in a timely manner. No construction may be carried out until proper treatment is done by the cultural relic protection department. All cost to be occurred will come from the main civil works lot.	Construction contractors	Project supervision institute					
Operation period								
Impact on Water Environment During Operation Period								
Domestic sewage from management area	WSZ series underground type of domestic sewage treatment plant will be provided in the reservoir management area.	Water saving irrigation project Turpan City PMO	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Turpan City EPB	COD_{cr}, BOD_5, fecal coliform bacteria colony, total phosphor content, total nitrogen content, anionic surfactant, sewage discharge	after project completion, monitoring shall be done once a year in successive three years.	Inlet and outlet of treatment system for domestic sewage from project management area	Turpan Prefecture Environmental Monitoring Station	

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Management area garbage	Provide garbage can, collect garbage at designated stationed place, clean out periodically, and transport garbage collected to Turpan City burying yard			—	—	—	—	
Dam retaining	Conduct a long-term observations with the river water quality and accumulate data series			pH, DO, CODMn, BOD5, Ammonia Nitrogen, total phosphor content, total nitrogen content, fluorid, hexavalent chromium, sulfate, chloride, iron, Hg, lead, fecal coliform bacteria colony, etc.	Sampling twice will be done in rich water, normal water and dry totally three periods. Sampling in each period at an interval of 5 days least.	Cross sections cut at the end of reservoir backwater and reservoir water supply culvert pipe	Turpan Prefecture Environmental Monitoring Station, Turpan City Hydrological Bureau	
	Conduct a long-term hydrological observations and accumulate data series			Inflow, outflow, water temperature	3 monitorings per day. Monitoring frequency can be more close during flood period			

Impact Source	Environmental Protection Measures	Implementation Institution	Supervision Institution	Monitoring Element	Monitoring Frequency	Monitoring Points	Monitoring Institute	Emp Cost (10^3 Yuan)
Dam-break risk	**Internal Contingency Measures：** ① take contingency measures to low down reservoir water level, for instance: use spillway and outlet works to discharge water; ② evacuate at once the construction and management personnel at dam body and nearby the dam to ensure personnel safety; **External Contingency Measures:** ① Initiate GIS technology to conduct an analysis on the downstream area that would be submerged as a result of dam break. The results of analysis will be used to determine the incidence of the dam break accident; ② Inform of the local government of the downstream area, evacuate the residents to be influenced and limit the damage and nuisance to the downstream residents and their properties as a result of dam break; ③ Make sure the quantity, location and performance of rescue material, and launch a procedure of delivery of application; ④ Guarantee a smooth traffic inside and outside ; ⑤ Initiate contingency communication and transportation systems in case of an accident.		Turpan Prefecture WRB Turpan City WRB	—	—	—	—	

Annex 4-2 Shanshan County Ertanggou Reservoir Project EMP Summary

ımental protection measures	Implementation Institute	Supervision Institute	Monitoring Element	Monitoring frequency	Mo
ring the design stage of Ertanggou Reservoir Project, dam site alternatives selection, determination of uarry/borrow sites and disposal yard, construction scheduling, resettlement and location for relocatees, tc will take into account as far as possible the environmental protection requirement so as to achieve the ıaximum project benefits at the cost of minimized disturbance and change with the environment. e preparation of EIA will carry out the secondary public participation to solicit for public opinions and uggestions with regard to the impacts of the project that would influence the public, further improve the esign of main civil works and the design of environmental protection measures, transfer the public pinions and suggestions to the related line responsible administrative departments and supervision epartments, and feedback the public the information of solution scheme.	Design institute environmental working group	Shanshan County environmental Management office	—	—	—
measures					
e waste water from aggregates processing system will be treated by means of coagulating sedimentation ıethod. After flocculation and sedimentation, the supernatant liquor can be used for sprinkling onstruction site and watering vegetation.	Construction contractor	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Shanshan County EPB	pH,SS	monitor twice per quarter during construction period	One mon point set a inlet outle wast treat facili resp
ectangular tank will be built at the place to which oil-content water after washing machinery is collected nd drained. Grease trap material will be provided at the inlet of the tank. The oil-content waste water will ow into the tank by gravity after crossing through grease trap material. Once the tank is full, floating oil ill be collected. Wastewater after treatment can be used for sprinkling purpose. After completion of onstruction, tank bottom will be cleaned thoroughly, deposition will be transported to burying yard, and ıe tank will then be backfilled.			SS, petroleum group	monitor twice per quarter during construction period	Inlet outle mac repa wast treat syst
vironmental friendly explosive as emulsion explosive or water gel explosive is recommended.			—	—	
ste water leaking from concrete batching system will flow along the ground surface showing a flake form. fter evaporation and infiltration, waste water will coagulate and harden the ground surface. After onstruction completion, those flakes should be removed.			—	—	

ıмental protection measures	Implementation Institute	Supervision Institute	Monitoring Element	Monitoring frequency	Mc p
)tic tank will be built in temporary living area to treat domestic sewage. All domestic sewage will be ollected by routed pipeline and discharged into septic tanks, sterilized and disinfected therein. terless toilets and environmental toilets will be built within temporary living area. ɛr the construction completion, waterless toilets that will not be used ever will be rooted out, disinfected nd backfilled. Environmental toilets will be built within complex works area and other construction sites epending on the number of population.			pH, DO, mineralization, chloride, CODMn, BOD5, SS, Ammonia Nitrogen, volatile phenol, Water-soluble Ionic Iron, Total Manganese Content, total copper content, total zinc content, total phosphor content, fluorid, total arsenic content, total cadmium content, hexavalent chromium, petroleum group, fecal coliform bacteria colony	Monitoring will go through whole construction period. Sampling will be done in rich water, normal water and dry totally three periods. Sampling twice in each period at an interval of 5 days least.	Wate for li for cons pers
'oir bottom dredging and stubbing measures ： ion and epidemic control;)ut timbers;)ut buildings; ıg of specific item.	Construction contractor	Project supervision institute			
Ambient air pollution mitigation measures					
;prinkler will be provided at construction area to lay dust; ıasks will be delivered to construction personnel;	Construction contractor	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Shanshan County EPB			
uction contractors should adopt construction machinery and vehicle in conformity with related national ic standards; ɛ will be equipped with exhaust purifier to ensure exhaust emission reaching codes specified; the Standard of Vehicles Scrappage. The vehicles running at a high fuel consuming rate but achieving ciency and heavy exhaust emission shall be replaced with new ones; ce the caring and maintenance with the fuel consuming machinery equipment; exhaust occurred in the tunnel construction, axial flow fans and air purifiers will be installed to ventilate lay down dust.					
impacts on acoustic environment					
to construction personnel the ear plug, ear muffs, noise control products made of cotton and noise ; ıent producing high vibration noise will be equipped with a base to reduce vibration; ıle construction time rationally to avoid as much as possible the nighttime constriction (from 22:00 to 9:00 ıy).	Construction contractor	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Shanshan County EPB			
hen caring with access roads and maintenance with vehicles to reduce noise sources; s to be used should be conformity with the Limits Of Noise Emitted By Stationary Road Vehicles 170-1996) and Allowable Noise Limits For Motor Vehicle (GB1495-79). Low-noise vehicles should be ıe best;					
itigation measures					

ımental protection measures	Implementation Institute	Supervision Institute	Monitoring Element	Monitoring frequency	Mc ı
e garbage collection stations and garbage cans will be provided in temporary living area and the area construction activities are concentrated; nsects killing aerosol or the like to prevent the breeding of mosquito and fly; ɨ garbage truck to transport living garbage to the garbage burying yard in Shanshan County.					
Ecological environment protection measures					
the boundary construction occupied land, forbid construction personnel and vehicles entering into ıpied area. After construction completion, all temporary construction facilities and living facilities shall be ıtled. The cut-over land, such as construction site, quarry/borrow sites, etc. should be leveled.	Construction contractor	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Shanshan County EPB			
ɔe the propaganda and dissemination of knowledge and awareness of ecological protection among the ıction personnel and local residents during construction period; sh an ecological destruction fine system; ɨhe scope of construction area, set up piles to give boundary, forbid construction personnel and vehicles g into unoccupied area; works may be allowed in non construction area; ɔod job of method, quantity, time of blasting, minimize the blasting at nighttime, morning, dusk and mid hen environmental protection, monitoring and management, set up environmental protection and ring institutions, assign full-time environmental protection personnel, enhance the awareness of ıction personnel of environmental protection, forbid illegal hunter of wild animal and tackle the illegal ors according to the law.					
ɑtion measures					

ımental protection measures	Implementation Institute	Supervision Institute	Monitoring Element	Monitoring frequency	Mc ı
Main civil works guard area ıplex works omplex buildings: construct a retaining wall at the downstream dam toe to prevent rock and soil rolling ıto downstream river course; ɜservoir management station: strip overburden layer before construction, stack stripped soil at a corner f the site in a concentrated way; retain soil by soil bags around; cover soil by means of color-strip fabric ı case of strong wind day or rainstorm; ess road ermanent road: maintain the road by soil bags laid at both sides of backfilled road pavement. After the ompletion of construction, dismantle bags, use soil for planting purpose; ɜmporary road: do sprinkling, maintain the road by soil bags laid at both sides of road pavement; after the ompletion of construction, dismantle roads, level occupied land. ırry/borrow site guard area ontrol exploring depth uild retaining sill ackfill with excavation mucks ınd leveling over with aggregates ısmission line guard area tack excavation material in a concentrated way, retain the material by soil bags; over material temporarily by means of color-strip fabric in case of strong wind or rainstorm; ınd leveling after the completion of construction; ıporary production and living area ɜtain the area by means of soil bags laid around forming a muck retaining sill; -level the cut-over land after the completion of construction. ıporary stacking yard uild muck retaining wall made of soil bags around the yard before stacking; uring construction cover material temporarily by means of color-strip fabric in case of strong wind or ainstorm; fter all stacking material is taken away, ut-over land 字料全部用完后，‧‧堆料迹地‧行整治，采取覆盖粗石‧的方法； 共工程防治区 ıeasures：防洪堤修建基‧‧挖‧程中，将回填土‧‧堆放在基‧‧挖一‧，采用袋装土 ‧‧及彩条布覆盖measures； ɜmeasures：完成后‧占地‧行‧地平整； ɻmeasures：尽量‧短土石方‧‧堆放‧‧，尽量避免大‧或雨天施工；	Construction contractor	Xinjiang Uygur Autonomous Region WRB Turpan Prefecture WRB Shanshan County WRB Xinjiang Uygur Autonomous Region WRB Turpan Prefecture Shanshan County WRB	Erosion density	8~10 monitorings per year , additional one after strong wind during monitoring period. Key monitoring period is strong wind prevailing period during months from March to June, once per month during this period.	one com work area one acce proje area 2 po quar site C1-2 C3) one trans line guar one temp dispo slop surfa
e stacking yard, and cover the yard with coarse blocks. control project guard area emporary measure: during the excavation of flood control dike foundation, stack fills at one side of xcavated foundation, retain fills with soil bags, and cover them with color-strip fabric; ngineering measure: land leveling after the completion of construction; ther measure: shorten the time of temporary stacking of rock and soil cuts and avoid as much as ossible the construction during strong wind and rainy days. **ɔific facilities rehabilitation area** ıcate hydrological station trip overburden layer, stack stripped soil in a concentrated way; retain soil by soil bags around; cover soil y means of color-strip fabric in case of strong wind day or rainstorm; fter the completion of construction, recover the occupied land with original overburden layer soil. Green ork will be done at vacant area. Plant shrubs, such as H. persicum, Calligonum mongolicum and stragalus adsurgens Pall. A complete set of irrigation system will be provided. ıcation area for hasty road ɔefore restoration, maintain the hasty road by soil bags laid at both sides of road pavement;					

ımental protection measures	Implementation Institute	Supervision Institute	Monitoring Element	Monitoring frequency	Mc ı
ttlement area					
duction development area					
onvert the slope land with a gradient varying from 20° to 25° into sloped terrace. Convert the slope land ıith a gradient less than 20° into horizontal terrace. Drainage and irrigation facilities will be provided round terraces;					
ıe development of vacant hills and slopes shall be done in a cluster way along contour line to form errace land; cut-off works, reservoir works and drainage works on a small scale will be built will be built bove the terrace land or along the boundary of farmland;					
contour farming and inter cropping will be done to widen surface coverage and add cropping coverage. ıcated area of residential zone					
uild water and soil conservation engineering measures including cement masonry retaining wall, slope rotection and cut-off ditches;					
ı measures					
lean the construction sites of temporary living area and management area after the completion of civil ıorks;	Construction contractor	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Shanshan County EPB			
isinfect drinking water;					
armless treatment with garbage, feces and wastewater;					
elivery periodically the epidemic control medicine and rat-killing drug to cut infection sources and preading channels.					
o spot inspections with construction personnel before mobilization to the site;					
o quarantine inspection with all staff members in the dining room;					
stablish health file for all contraction personnel;					
et up disease control and prevention centre.					
es					
he transportation of hazardous products shall be in accordance with the related regulations issued by the linistry of Public Security of P.R.C., Transportation specifications should be put forward to specify ansportation line, vehicles, schedule, escort personnel, delivery, acceptance, etc.;	Construction contractor	Project supervision institute			
he storage of hazardous products shall be in accordance with the current rules in force. It is request that ıe construction contractors should report the daily application amount of hazardous products, the supplier ill determine daily delivery amount accordingly, such that long time storage of hazardous products on ite would be effectively avoided;					
he application of hazardous products shall be in accordance with related codes. The operators shall ave received related training and possess on-post certificates in conformity with the safe management equirements;					
he vehicles transporting the hazardous products should not be sun drenched. Proper transportation time nd rational temperature control measures should be taken;					
trength traffic security management and upgrade the skills of drivers;					
ı case of occurrence of leakage of hazardous products into river, such accidents must be reported at nce, water quality monitoring shall be done accordingly to know pollution source diffusion law and ıcidence. Inform of the government at the downstream reaches the occurrence of such accidents, revent the damages of leaked explosive and combustible products jeopardizing the public security, public eath and growth of agricultural products at the downstream area. Such accidents must be reported to the epartments at the upper level;					
ı case of occurrence of fuel leakage or blasting accidents, immediately evacuate local people, prevent re disaster of combustible products probably caused by person. Meanwhile, groom the traffic jam and ver course blocked as a result of blasting. Lead the vehicles to other roads;					
ı case of accidents, special team will be assigned to identify the nature of the accidents, evaluate the ccidents and consequences, figure out the intensity of pollution to the water, provide reference of ecision making for command department and found a good basis for the treatment later on;					
ssign specific person to take care of and operate high dangerous products as explosive. Set out a angerous zone within 100m around the explosive warehouse and establish a guard line. In case of a lasting work, all persons unrelated to the blasting work shall be evacuated beyond the 100m to the lasting point, no entrance may be allowed.					

ımental protection measures	Implementation Institute	Supervision Institute	Monitoring Element	Monitoring frequency	Mo p
nhance the knowledge of fire fighter of fire security, improve their fire awareness; stablish a safe production and management system and strength the knowledge of management ersonnel of safe production; rainage ditches shall be provided around fuel warehouse. A concrete tank with a capacity of 1.5 times of ıe maximum fire fighting water consumption will be provided at the end of the ditch to collect wastewater om a fire fighting. Forbid discharge fire fighting water in a random way.					
nment during Operation Period					
eries underground type of domestic sewage treatment plant will be provided in the reservoir ement area.	Water-saving project Shanshan County PMO	Xinjiang Uygur Autonomous Region EPB Turpan Prefecture EPB Shanshan County EPB	COD_{cr} ,BOD_5, fecal coliform bacteria colony, total phosphor content, total nitrogen content, anionic surfactant	after project completion, monitoring shall be done once a year in successive three years.	In o tre sys dc sew p man
ɛ garbage can, collect garbage at designated stationed place, clean out periodically, and transport e collected to Turpan City burying yard			—	—	—
ct a long-term observations with the river water quality and accumulate data series			pH, DO, CODMn, BOD5, Ammonia Nitrogen, total phosphor content, total nitrogen content, fluorid, hexavalent chromium, sulfate, chloride, iron, Hg, lead, fecal coliform bacteria colony, etc.	Sampling twice will be done in rich water, normal water and dry totally three periods. Sampling in each period at an interval of 5 days least.	Cros secti at th rese back and wate culve
ct a long-term hydrological observations and accumulate data series			Inflow, outflow, water temperature	3 monitorings per day. Monitoring frequency can be more close during flood period	

Annex Table 4-3. Abstract of Project Environmental Management Plan for the Construction of Alagou Reservoir in Tuokexun County

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Design Period							
1.	⌘ In the process from the selection of dam site, material ground and dump ground to engineering organization and design in the design phase for the construction of Alagou Reservoir, all the possible measures of environmental protection are considered for the minimum disturbance against the environment and the maximum benefit from the project. ⌘ In the EIA preparation, the 2nd round of public participation was done to solicit the opinions and proposals of the impacted people for the improvement of the designs of the main engineering body and environmental protection measures. The public opinions and proposals were submitted to the upper authorities and the supervision	Design Institute Environmental Working Group	Tuokexun County Environmental Management Office				RMB 93.00

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
	agency. Then, the problem-solving scheme was feedback to the public.						
Construction Period							
Environmental Mitigation Measures against Water Pollution in the Construction Period							RMB 800.45
Wastewater from Construction	⌘ The wastewater from sand/gravel process will be treated with flocculation and sedimentation. The treated water can be used for watering vegetation, dust depression and so on.	Contractor	Provincial Department of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection; Tuokexun County Bureau of Environmental Protection	pH,SS	2 monitoring per 3 months in the construction period	Inlets and outlets of wastewater treatment facilities	

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
	⌘ The structures for the treatment of oily wastewater will be composed mainly of sedimentation pool and water tank. ⌘ A rectangular pool will be constructed near a machine repair station to collect oily wastewater. Oil removal material will be arranged at the entrance of the pool. The oily wastewater flows into the pool through the oil removal material by gravity. When the pool is filled up, the floating oil is collected. The treated water can be used for dust depression. After the completion of the construction, the sedimentation pool will be cleared and backfilled flat.			SS, petroleum	2 monitoring per 3 months in the construction period	Inlets and outlets of oily wastewater treatment facilities	

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
	⌘ In order to mitigate the impacts of nitro-explosives on water quality, it is proposed to use emulsion based explosives, water/binder explosives or other environment-sound explosives.						
	⌘ After evaporation and infiltration, the suspended solids in the wastewater from the sand/gravel washing system and concrete preparation system will spread over the ground in form of crust. It should be cleared after the completion of the construction.						

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Domestic Sewage	⌘ Septic tank will be built in the temporary living quarter for the treatment of domestic sewage. The domestic sewage will be collected into the septic tank for regular disinfection. ⌘ Dry toilets and environment-sound toilets will be built at the temporary living quarter. ⌘ After the completion of the construction, the dry toilets will be cleared, disinfected and buried.			pH, DO, degree of mineralization, chloride, COD_{Mn}, BOD_5, SS, ammonia nitrogen, volatile phenol, soluble iron, total manganese, total copper, total zinc, total phosphorus, fluoride, total arsenic, total cadmium, hexavalent chrome, petroleum, coliform group etc	Monitoring at high-water, stage, moderate flow stage and low-water stage, respectively, throughout the construction period. 2 sampling in each stage at intervals over 5 days.	At water intake for living quarter	
Vegetation Garbage in the Reservoir Area	Measures of reservoir bed clearance: ⌘ clearance for health and epidemic prevention; ⌘ clearance of trees; and ⌘ clearance of engineering waste	Contractor	Supervision agency				
Environmental Mitigation Measures against Air Pollution in the Construction Period							
Dust	⌘ The engineering site is equipped with water-spraying vehicle(s) ⌘ The Engineering staff is access to dustproof headpiece.	Contractor	Provincial Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection; Tuokexun County Bureau of Environmental				

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Waste Gas	⌘ The machines and vehicles in line with the national standards of sanitation will be employed. ⌘ Tail gas cleaner will be equipped, so that the waste gas emission from the vehicle will below the limit of national standard. ⌘ The national standard of Car Scrapping Programs will be executed. Mandatory update will be practiced to the poor vehicles of high consumption , low efficiency and the tail gas emission seriously exceeding the limit. ⌘ The machines will be maintained in good conditions. ⌘ The site of tunnel engineering will be equipped with ventilation and dust removal equipment such as axial-flow fans and air purifiers.		Protection				

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Environmental Mitigation Measures against Noise in the Construction Period							
Engineering Noise	⌘ The engineering staff will be access to earplug, ear protector, cotton and headpiece of noiseproof. ⌘ Machine base of vibration reduction will be used for equipment with large vibration. ⌘ Whenever possible, engineering activities at night (from 22:00 to 09:00) should be avoided.	Contractor	Provincial Department of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection; Tuokexun County Bureau of Environmental Protection				
Transportation Noise	⌘ The roads and vehicles will be properly repaired and maintained to reduce noise. ⌘ The vehicle to be employed will be of low noise and in line with regulations such as Limits of Noise Emitted by Stationary Road Vehicles (GB16170-1996) and Limits and Measurement Methods for Noise Emitted by Accelerating Motor Vehicles (GB1495-79).						
Environmental Mitigation Measures against Solid Waste in the Construction Period							

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Domestic Garbage	⌘ Mobile recycling collection points and garbage bins will be arranged at the temporary living quarters and the dam engineering site. ⌘ These sanitation facilities will be regularly managed to prevent and reduce mosquitoes and flies. ⌘ Garbage truck will be equipped to carry the domestic garbage for landfill disposal.	Contractor	Provincial Department of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection; Tuokexun County Bureau of Environmental Protection				
Ecological Environmental Protection Measures in the Construction Period							

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Protection of Terrestrial Plants	⌘ The scope of construction sites and living quarters will be clarified, and the engineering staff are not allowed to go to the places outside the project scope. ⌘ After the completion of engineering activities, the temporary facilities of construction and livelihood will be demolished, and these sites together with the material grounds will be leveled for vegetation rehabilitation.	Contractor	Provincial Department of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection; Tuokexun County Bureau of Environmental Protection				

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Protection of Terrestrial Animals	⌘ In the construction period, information publicity of ecological protection will be strengthened among the engineering staff and the local people. ⌘ A mechanism of punishment against damaging ecological environment will be set up. ⌘ The scope of construction sites and living quarters will be clarified, and the engineering staff are not allowed to go to the places outside the project scope. ⌘ Fire will be forbidden outside the construction sites. ⌘ The pattern, quantity and time of the exploding activities should be well planned. ⌘ Supervision on environmental protection will be strengthened. Supervision institution of environment protection will be set up and be equipped with full-time staff. The engineering staff will be upgraded with environmental protection education						

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Soil Conservation in the Construction Period							

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
	① **Dam Construction Site** ⌘ Masonry retaining walls will be built at downstream dam toe to prevent the soil and stone from dropping into the river downstream. ⌘ Before the construction of the reservoir management station, the surface soil will be peeled off, put at a corner of the site, kept with bagged retaining wall around and covered at the days of big wind and rainfall. After the completion of the construction, the surface soil will be put back and the site will be rehabilitated with vegetation. ⌘ Before the road construction, bagged retaining walls will be built at the both sides of the filled subgrades for soil conservation . ② **Material Excavation Ground** ⌘ Excavation at stable slope ratio; ⌘ Backfill with engineering waste; ⌘ Masonry slope protection; ⌘ Gravel mulching;	Contractor	Provincial Department of Water Resources; Turpan Prefecture Bureau of Water Resources; Tuokexun County Bureau of Water Resources	Intensity of wind erosion	8~10 monitoring each year. Once there is a big wind in the monitoring day, a monitoring will be done to make up later. In the critical period from March to June, one monitoring per month.	2 sets at dam construction site, one set at management area, one sit at road. 3 sets at material excavation grounds (i.e. 2 sets at the slop of Yuegou Sand/Stone Excavation Ground and one set at downstream river beach. One set at material stacking ground. One set at temporary road building site. 2 sets at engineering site and living quarter.	

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Protection of Public Health in the Construction Period							
Infective Matter	⌘ After the completion of the civil construction for temporary living quarter and management area, the site will be cleared. ⌘ Drinking water will be disinfected. ⌘ Domestic garbage and sewage will be properly treated. ⌘ Drugs for epidemic prevention and rat killer will be regularly applied to cut of the infective vectors.	Contractor	Provincial Department of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection; Tuokexun County Bureau of Environmental Protection				
Prevention of Infectious Disease	⌘ Before entering the construction sites, all the cooking staff and the sampled engineering staff should pass the medical examination. ⌘ Health archive system will be set up for the engineering staff. ⌘ Health and epidemic prevention station will be set up.						
Risk Prevention Measures in the Construction Period							

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
	⌘ In accordance with the relevant regulations from Ministry of Public Security, the transport of dangerous goods should be carefully planned before the transport and well handled in the whole process. The planned activities will include the routes, vehicle and time of transport as well as transport escorts and hand-over and acceptance. ⌘ According to the current regulations on storing dangerous goods, the user is required to submit the quantity of daily use to the supply, who will deliver the dangerous goods according to the plan of daily transport so as to avoid long time store of dangerous goods. ⌘ The stipulations for the use of dangerous goods will be strictly followed. The operator must have induction eligibility. ⌘ The vehicle to transport dangers	Contractor	Supervision Agency				

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Management of Wastewater from Fire Fighting against the Water and Soil Environment around	⌘ The management staff of the power station will be upgraded in the awareness of fire safety through information publicity and education. ⌘ Management regulations of safe production will be formulated and executed. ⌘ There should be drainage around the oil storage. At the end of the drainage, a concrete tank with a volume of 1.5 times of the maximum water use in a fire fighting will be constructed to collect the wastewater from fire fighting. It is forbidden to randomly discharge the wastewater from fire fighting.						
Operation Period							
Impact on Water Environment in the Operation Period							
Domestic Sewage in Management area	The domestic sewage from the management area of the reservoir will be managed with WSZ sewage treatment system.	Tuokexun County Project Office	Provincial Department of Environmental Protection; Turpan Prefecture Bureau of Environmenta	COD_{cr}, BOD_5, coliform group, total phosphorous, total nitrogen, anionic surfactant	3 years successive monitoring after the completion of the construction. One monitoring each year	Inlets and outlets of the sewage treatment system for management area	

Impact Source	Measure of Environmental Protection	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	EMP Total Cost (10,000 RMB)
Domestic Garbage in Management area	⌘ Recycling collection points and garbage bins will be arranged; ⌘ Garbage truck will be equipped to carry the domestic garbage for landfill disposal.		l Protection; Tuokexun County Bureau of Environmental Protection				
Reservoir Impoundment	⌘ Long-term observation of river water quality. ⌘ Long-term observation of river hydrology.			pH, dissolved oxygen, COD_{Mn}, BOD_5, ammonia nitrogen, total phosphorus, total nitrogen, fluoride, hexavalent chrome, sulfate, chloride, iron, mercury, lead, coliform group etc	Monitoring at high-water, stage, moderate flow stage and low-water stage, respectively. 2 sampling in each stage at intervals over 5 days.	End of reservoir backwater, outlet of water supply culvert from the reservoir.	
				reservoir inflow, reservoir outflow, water temperature etc	3 times daily. Higher frequency at flooding period.		

Notes:
(1) The cost of 150,200 Yuan for Alagou Reservoir bed clearance has already been integrated into the compensation fund for land requisition and resettlement, and it is not re-calculated in the EMP total cost.
(2) Xinjiang is an autonomous region. In China, an autonomous region is at the same level of a province. For an easier expression in translation, “provincial” level refers to “autonomous region” level.

Annex Table 4-4. Abstract of Environmental Management Plan for the Construction of Turpan City Water Conservation Project

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Design Period								
	① In the engineering design, the plan of permanent land occupation will be comprehensive considered in details for reasonable land use on the basis of the environmental design around. ② In the process of designs, the temporary stacking grounds in the construction period and the permanent dump grounds after the construction completion will be reasonably arranged in accordance with the actual situation. The retaining structures will be built to protect the dumped from flooding, so as to minimize the impact of residue stacking on the environment. ③ In formulating a soil conservation plan, the types, intensity and hazard degree of water-soil loss due to the engineering activities will be sufficiently considered. At the same time, the overall plan of the	Design Institute Environmental Working Group	Turpan City Environmental Management Office					18.34

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
	management area in the operation period will be considered. ④ In the designs, high attention will be paid to the health of the engineering staff. The conditions of the temporary living quarter will not be too simple, and the living quarter will not be too much crowded. The place with better environment will be selected for the living quarter, so as to prevent disease. ⑤ It can be quite noisy during the engineering. Noise reduction measures will be considered in the engineering design, so as to reduce the impact of on-the-site noise on the engineering staff. Impacted groups will be identified through public participation. Before, during and after the project development, public opinions and proposals on environment issues will be solicited, so as to improve the project design. The EIA staff of the project							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
	will carry out varieties of public participation such as by means of posters, newspapers, questionnaires, interviews, forums and so on.							
Construction Period								
Water Environment	① At each of the production areas and living quarters, one set of temporary sewage tank will be built (altogether 7 sets). The domestic sewage will be collected in the tanks. It will be less by means of natural evaporation and seepage. A tank will be big enough to contain the sewage production of 3 days. Its capacity can be 6.94m^3 (length x width x depth = 2m x 2m x 2m. ② In each of the living quarter, one set of dry toilet will be constructed with brick-concrete structure. Each set 6 m^2, 7 sets together. After the completion of the construction, the dry toilet will be cleared, disinfected and buried.	Employer	Turpan City Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection					389.16

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Air Environment	□ The engineering staff will be properly protected for safe production. They will be access to protective things such as respirators, goggle and so on. □ Powder materials such as cement and lime will be carried in containers or bags. It is forbidden to scatter and lose powder materials in transport to generate dust. The materials will be covered with tarpaulin in rainy and windy conditions. □ In the construction period, the transport routes will be strictly stipulated. Water-spraying will be done regularly to depress dust (2~3 times/day). Spraying water more frequently in windy days. □ No earthwork excavation or backfilling in the days of big winds, if applicable.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Acoustic Environment	□ Since the engineering sites are in the open field, there is no target sensitive to acoustic environment. However, it will be well planned to keep strong noise far away from the living quarter. In operation, the noise of machines such as excavator and concrete mixer will be controlled below 55 dB(A). □ In accordance with Noise Limits for Construction Site (GB12523-90), the daily working time of the staff working in strong noise environment such as operating concrete mixer, bulldozer and excavator will be controlled within the limit of labor insurance, and these staff will be access to noiseproof wares, so that the impact of noise on the engineering staff will be reduced.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Solid Waste	□ The engineering activities will be carefully planned. The residues from the engineering will be used as reclamation material or backfill material, if applicable, so as to reduce the quantity of the dump. The remaining residues will be transported to the permanent dump ground on the Gobi Desert in the project areas in Yaer Township and Aidinghu Township. □ Domestic garbage will be regularly cleared in 2 aspects: A. Seven sets of mobile recycling collection point will be set up (one set per living quarter). Information publicity on sanitation will be strengthened for capacity building of sanitation and environmental protection among the engineering staff. B. In the construction period, one set of garbage truck will be employed every week to carry the domestic garbage for landfill							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Ecological Environment	□ Information publicity on the Law of Environmental Protection and Law of Soil Conservation will be strengthened, so as to upgrade the engineering staff in the awareness of environmental protection, to regulate their behaviors in the engineering and to keep the vegetation and soil conditions from damage. □ The routes of the engineering vehicles and other machines will be strictly stipulated. Signing boards will be erected at the engineering sites and the roads.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
	□ The structures in the engineering site of distribution gate, sand basin and management house mainly include distribution gate, diverging canals, sand basin, surface water treatment station, pump house, management house, valve well and so on. The land coverage is 10.88 ha, including 0.0425 ha for the distribution gate and diverging canal, 1.18 ha for sand basin, 0.35 m^2 for management house and pump house and 9.31 ha for valve wells. The construction of distribution gate, sand basin, management house and valve well will be completed in Oct ~ Nov 2009 so as to avoid big winds in March and April. The earthwork excavation will be done with 1 m^3 excavator, while the transport will be done by auto-dumping	Contractor	Turpan Prefecture Bureau of Water Resources; Turpan City Bureau of Water resources	Intensity of wind erosion	Once a month in the construction period, natural rehabilitation. Once there is a big wind in the monitoring day, a monitoring will be done to make up later.	Annex Fig. 2-4	Eligible Institution of monitoring soil conservation	

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Public Health	□ The local sector of health and epidemic prevention will send professional staff to guide and supervise the sanitation management in the construction sites. □ Before entering the construction sites, all the cooking staff and the sampled engineering staff should pass the medical examination. □ Hurts and disease(s) should be timely treated and cured. □ Information publicity on sanitation will be strengthened for capacity building of sanitation and environmental protection among the engineering staff. □ All the possible measures will be taken to actively prevent any epidemic situation. □ All the possible measures will be taken for safety construction to prevent industrial injury.	Employer	Turpan City Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection					

Notes:

(1) Xinjiang is an autonomous region. In China, an autonomous region is at the same level of a province. For an easier expression in translation, “provincial” level refers to “autonomous region” level.

Annex Table 4-5. Abstract of Environmental Management Plan for the Construction of Shanshan County Water Conservation Project

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Design Period								
	□ It can be quite noisy during the engineering. Noise reduction measures will be considered in the engineering design, so as to reduce the impact of on-the-site noise on the engineering staff. □ In the engineering design, the plan of permanent land occupation will be comprehensive considered in details for reasonable land use on the basis of the environmental design around. □ In the process of designs, the temporary stacking grounds in the construction period and the permanent dump grounds after the construction completion will be reasonably arranged so as to minimize the impact of residue stacking on the environment. □ In formulating a soil conservation plan, the types, intensity and hazard degree of water-soil loss due to the engineering activities will be sufficiently considered. At the same time, the overall plan of the management area in the operation period will be considered. □ In the designs, high attention will be paid to the health of the engineering staff. The conditions of the temporary living quarter will not be too simple, and the living quarter will not be too much crowded. The place with better environment will be selected for the living quarter, so as to prevent disease. □ Impacted groups will be identified through public participation. Before, during and after the project development, public opinions and proposals on environment issues will be solicited, so as to improve the project design. The EIA staff of the project will carry out varieties of public participation such as by means of posters, newspapers, questionnaires, interviews, forums and so on.	Design Institute Environ-mental Working Group	Shanshan County Environmental Management Office					16.35
Construction Period								
Water Environment	The wastewater from the construction will come mainly from concrete preparation and concrete curing. This wastewater is small in quantity and does not contain toxic or harmful substance. It can be directly discharged.	Employer	Shanshan County Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection					356.55
Air Environment	□ Water-spraying will be regularly done over the soil stacked along the roads and pipeline for dust depression. Normally 1~2 times a day except in winter. Higher frequency in windy period. □ The stacked materials will be covered with tarpaulin in rainy and windy conditions. □ Powder materials such as cement and lime will be carried in containers or bags. It is forbidden to scatter and lose powder materials in transport to generate dust. □ Lime, sand or residues will not be stacked on open ground, if applicable. Otherwise, water-spraying will be done to depress dust. □ The engineering staff will be properly protected for safe production. They will be access to protective things such as respirators, goggle and so on.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Acoustic Environment	□ Low-noise equipment will be employed, if applicable. For instance, fuel machinery is replaced by hydraulic machinery, muffler is equipped to noisy machines such as concrete mixer, excavator and bulldozer. Using vent-pipe muffle and isolating vibrating parts are the measures to reduce noise. In addition, the repair and maintenance of machinery will be strengthened. □ In accordance with Standard of Noise at Boundary of Industrial Enterprises co-issued by Ministry of Public Health and Ministry of Labor, the working intensity of the staff working in strong noise environment will be controlled within the limit of labor insurance, and these staff will be access to noiseproof wares, so that the impact of noise on the engineering staff will be reduced.							
Solid Waste	The residues and soil from the construction can be directly used as reclamation material or backfill material to reduce the quantity of disposal. The extra soil can be evenly spread over the farmland nearby.							
Ecological Environment	□ The engineering activities such as excavating pipeline trenches, valve wells and checking wells will generate some damage to the local soil and vegetation. Therefore, the activities should be well planned to minimize disturbance against the original land conditions. The residues and soil from the construction can be directly used as reclamation material or backfill material to reduce the quantity of disposal. Measures of vegetation rehabilitation can be done according to the actual situation. □ In the construction period, the transport routes will be strictly stipulated to avoid mechanical damage to the soils and vegetation outside roads. Water-spraying will be done regularly to depress dust. □ In the construction period, information publicity on ecological protection will be strengthened among the engineering staff and local people in forms of leaflets and sign boards.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Soil Conservation	▯ The excavated soil in the construction of management house will be piled in a form of ladder-shaped truncated cone with slope ratio of 1:1 and a height of 1.0m. The windward site will be compacted to prevent wind erosion. After the completion of the construction, the temporary stacking ground will be leveled. ▯ The excavated soil in the construction of pipelines will be piled along the pipeline in a form of ladder-shaped truncated cone with slope ratio of 1:1 and a height of 1.0m. The windward site will be compacted to prevent wind erosion. After the completion of the construction, the temporary stacking ground will be leveled. ▯ The soil from the construction of temporary engineering road will be temporarily treated with dustproof measures such as water spraying. After the completion of the construction, it can be spread in farmland. ▯ The facilities in the temporary production area and living quarter will be involved in land occupation by concrete mixing facility, sand/gravel processing system, machine repair shop, reinforcement preparation site, wood processing shop, parking lot and stores (of machine, livelihood materials, cement, oils), offices, dormitories, sheds and so on. In the construction period, the dust in the temporary production area and living quarter will be depressed by water-spraying. After the completion of the construction, the pollutants such as garbage and oily matters will be cleared or landfilled. The ground structures will be demolished and transported to the dump ground. Since the site was originally covered with gravels before the construction, the treatment of land leveling (0.38 ha) can basically prevent the temporarily occupied land from wind erosion.	Contractor	Turpan Prefecture Bureau of Water Resources; Shanshan County Bureau of Water Resources	Intensity of wind erosion	Once a month in the construction period, natural rehabilitation. Once there is a big wind in the monitoring day, a monitoring will be done to make up later.	Annex Fig. 4-4	Eligible Institution of monitoring soil conservation	
Public Health	▯ All the possible measures will be taken for safety construction to prevent industrial injury. ▯ Before entering the construction sites, all the cooking staff and the sampled engineering staff should pass the medical examination. Hurts and disease(s) should be timely treated and cured. ▯ All the possible measures will be taken to actively prevent any epidemic situation. ▯ Information publicity on sanitation will be strengthened for capacity building of sanitation and environmental protection among the engineering staff. ▯ Special attention will be paid to the sensitive places of sanitation such as kitchen, dining-room, drinking water points. Health archives of the engineering staff will be set up, if applicable.	Employer	Shanshan County Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection					

Notes:

(1) Xinjiang is an autonomous region. In China, an autonomous region is at the same level of a province. For an easier expression in translation, “provincial” level refers to “autonomous region” level.

Annex Table 4-6. Abstract of Environmental Management Plan for the Construction of Tuokexun County Water Conservation Project

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Design Period				
	① In the engineering design, the plan of permanent land occupation will be comprehensive considered in details for reasonable land use on the basis of the environmental design around. ② In the process of designs, the temporary stacking grounds in the construction period and the permanent dump grounds after the construction completion will be reasonably arranged on the basis of the actual situation and residue retaining structure will be built, so as to minimize the impact of residue stacking on the environment. ③ In formulating a soil conservation plan, the types, intensity and hazard degree of water-soil loss due to the engineering activities will be sufficiently considered. At the same time, the overall plan of the management area in the operation period will be considered. ④ In the designs, high attention will be paid to the health of the engineering staff. The conditions of the temporary living quarter will not be too simple, and the living quarter will not be too much crowded. The place with better environment will be selected for the living quarter, so as to prevent disease. ⑤ It can be quite noisy during the engineering. Noise reduction measures will be considered in the engineering design, so as to reduce the impact of on-the-site noise on the engineering staff. ⑥ Impacted groups will be identified through public participation. Before, during and after the project development, public opinions and proposals on environment issues will be solicited, so as to improve the project design. The EIA staff of the project will carry out varieties of public participation such as by means of posters, newspapers, questionnaires, interviews, forums and so on.	15.48	Design Institute Environmental Working Group	Turpan Prefecture Environmental Management Office
Construction Period				
Water Environment	□ Some oily wastewater will come from the leakage and maintenance of vehicles and other machines. The wastewater contains some SS and petroleum substances. The local evaporation is as much as 3744 mm/year, the wastewater can be evaporated. □ The engineering staff will live in the residential houses of the local people around in the project area. The existing facilities can satisfy their daily needs. □ In the 7 sets of engineering sites and temporary production areas, 8 set of simple toilets will be constructed (6 m^2/set). After the completion of the construction, the toilets will be cleared, disinfected and buried.	342.06	Contractor	Turpan Prefecture Bureau of Environmental Protection; Tuokexun County Bureau of Environmental Protection
Air Environment	□ No activity of earthwork excavation or backfill in windy days, if applicable. □ The time, routes and speed of the project vehicles will be reasonably arranged. □ Regular water-spraying 2~3 times a day will be done along roads and over materials. Higher frequency of water-spraying is required at windy days. The residues of permanent disposal will be compacted for dustproof.			
Acoustic Environment	□ Noise will come mainly from the activities of earthwork excavation and backfill. In the construction period, the engineering staff will be access to labor protection appliances. □ The working time in strong noisy environment will be strictly controlled to reduce noise impact on the on-the-spot engineering staff.			

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Solid Waste	□ There will be 14,500 m^3 of residue from the agricultural water-saving project. Most of the soil from excavating pipeline trenches will be used for backfill. The pipeline engineering will produce 8,600 m^3 of residue, which will be used to build pipeline dyke with bottom width of 0.6m, height of 0.15m and slope ratio of 1:1.3. All the residue from the pipeline engineering can be on-the-spot used. The anchor blocks will be pre-cast products, and this engineering will produce 1,500 m^3 of residue. Considering the fact that the anchor blocks will be arranged along pipelines, the residue can be used to build pipeline dykes. After the sand basin is built, residue can be spread around to level the land. The land leveling of 2794m^2 will be 5 m in width and 0.5 m in thickness. The land will be compacted after leveling. Then, 1,400 m^3 of residue are used on-the-spot, while the remaining 2,800 m^3 will be sent to the permanent dump ground. Only 200 m^3 of residue will be produced in the construction of distribution gate. The management will be the same as for the residue from the construction of sand basin. □ At the construction peak, the daily production of domestic garbage will amount to 0.36 ton. In the construction period, the total production of domestic garbage will be 106 tons. The engineering staff will live in the local residential houses and the existing facilities will be available to them. However, each of the engineering sites and temporary production areas (7 sites altogether) will be equipped with one set of mobile recycling collection point and the garbage will be transported to the garbage dump ground of Tuokexun County Town.			
Ecological Environment	□ Information publicity on the Law of Environmental Protection and Law of Soil Conservation will be strengthened, so as to upgrade the engineering staff in the awareness of environmental protection, to regulate their behaviors in the engineering and to keep the vegetation and soil conditions from damage. □ The routes of the engineering vehicles and other machines will be strictly stipulated. Signing boards will be erected at the engineering sites and the roads.			
Soil Conservation	□ The temporary residue from the field pipeline engineering site can be compacted and water-sprayed for dust depression. The remaining soil can be used to build pipeline dyke. After the completion of the construction, the disturbed vegetation will gradually be rehabilitated by nature. The biological rehabilitation will cover 115 ha, while the mechanical management will cover 94.77 ha. □ Outside the engineering area, the excavated soil will be on-the-spot used to the maximum. The soil of temporary stacking will be compacted, while the waste residues will be leveled and compacted. After the completion of the construction, the waste residues will be cleared into the permanent dump ground. The mechanical management will cover 2.02 ha. □ The construction of the temporary road outside the engineering sites will occupy 2.40 ha. The natural slope will be used in the construction to reduce the quantity of earthwork excavation and backfill. The activities of excavation and backfill will be integrated to reduce the temporary stacking of the soil. In addition, water-spraying will be done in the construction period for dust depression. □ Water-spraying will be done in the construction period for dust depression in the temporary production area. After the completion of the construction, the pollutants such as garbage and oily matters will be cleared or buried. The ground structures will be demolished and the residues will be transported to the permanent dump ground. The mechanical management will cover 8.34 ha. □ The temporary soil stacking ground is located within 2.5 m of the excavation site. After the completion of the construction, the site will be leveled. The permanent dump ground is a piece of low-land (0.51 ha) at the north of Alagou irrigation scheme. The dumping height will be 1.0 m. The dump ground will be leveled and compacted. The mechanical management will cover 0.51 ha.			

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Public Health	□ All the possible measures will be taken to actively prevent any epidemic situation. Attention will be paid to the environmental sanitation at the engineering sites and living quarter. Special attention will be paid to the sensitive places of sanitation such as kitchen, dining-room, drinking water points. □ It is hot and windy in the project area, the engineering staff should be access to labor protection appliances such as topee, anti-dust respirator and goggles.			

Notes:
(1) Xinjiang is an autonomous region. In China, an autonomous region is at the same level of a province. For an easier expression in translation, “provincial” level refers to “autonomous region” level.

Annex Table 4-7. Abstract of Environmental Management Plan for the Construction of Taerlang Branch Canal in Turpan City

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Design Period								
	① In the engineering design, the plan of permanent land occupation will be comprehensive considered in details for reasonable land use on the basis of the environmental design around. ② In the process of designs, the temporary stacking grounds in the construction period and the permanent dump grounds after the construction completion will be reasonably arranged according to the actual situation of the canal section and the retaining structure for flood prevention will be built, so as to minimize the impact of residue stacking on the environment. ③ In formulating a soil conservation plan, the types, intensity and hazard degree of water-soil loss due to the engineering activities will be sufficiently considered. At the same time, the overall plan of the management area in the operation period will be considered.	Design Institute Environmental Working Group	Turpan City Environmental Management Office					9.68

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
	④ In the designs, high attention will be paid to the health of the engineering staff. The conditions of the temporary living quarter will not be too simple, and the living quarter will not be too much crowded. The place with better environment will be selected for the living quarter, so as to prevent disease. ⑤ It can be quite noisy during the engineering. Noise reduction measures will be considered in the engineering design, so as to reduce the impact of on-the-site noise on the engineering staff. ⑥Impacted groups will be identified through public participation. Before, during and after the project development, public opinions and proposals on environment issues will be solicited, so as to improve the project design. The EIA staff of the project will carry out varieties of public participation such as by means of posters, newspapers, questionnaires, interviews, forums and so on.							
Construction Period								

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Water Environment	The wastewater from the construction of Taerlong Branch Canal will be evaporated naturally, and no other treatment will be arranged. A sewage tank will be built close to the temporary living quarter for Taerlong branch canal construction. The domestic sewage in the construction period will flow into the tank. After the completion of the construction, the sewage tank will be cleared, disinfected and buried.	Employer	Turpan City Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection					177.31

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Air Environment	The engineering staff at the concrete preparation station will be properly protected for safe production. They will be access to protective things such as respirators, goggle and so on. Powder materials such as cement and lime will be carried in containers or bags. It is forbidden to scatter and lose powder materials in transport to generate dust. The stacked materials will be covered with tarpaulin in rainy and windy conditions. In the construction period, the transport routes will be strictly stipulated. Water-spraying will be regularly done for dust depression. Normally 2~3 times. Higher frequency in windy period. No activity of earthwork excavation in windy days, if applicable.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Acoustic Environment	In operation, the noise of machines such as excavator and concrete mixer will be controlled below 55 dB(A). In accordance with Noise Limits for Construction Site (GB12523-90), the daily working time of the staff working in strong noise environment such as operating concrete mixer and screening system will be controlled within the limit of labor insurance, and these staff will be access to noiseproof wares, so that the impact of noise on the engineering staff will be reduced. Low-noise equipment will be employed, if applicable. In addition, the repair and maintenance of machinery will be strengthened.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Solid Waste	The project design and engineering organization will be well planned. Whenever possible, the residue from the engineering will be used as reclamation material or backfill material so as to reduce the quantity of dumping. The temporary stacking ground will be located within 2.5 m from the excavation site. The soil will be piled in a form of ladder-shaped truncated cone with slope ratio of 1:1 and a height of 0.5 m. In the construction period, the temporarily stacked materials will be covered with dustproof net, and the disturbed ground will be protected by water-spraying. The permanent dump ground will be located along the canal within 5.0 m at the right side. The dumped will be mulched with gravels and compacted to reduce wind erosion. The solid waste from the production sites and living quarters is featured with scattered distribution and difficult collection. The measures will include: A．Each of the temporary living quarter will be equipped with one set of mobile recycling							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Ecological Environment	Information publicity on the Law of Environmental Protection and Law of Soil Conservation will be strengthened, so as to upgrade the engineering staff in the awareness of environmental protection and to keep the vegetation and soil conditions from damage. The routes of the engineering vehicles and other machines will be strictly stipulated. Signing boards will be erected at the engineering sites and the roads.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
	There are 2 engineering sites: A. Canal Engineering Site The canal engineering site will disturb 60.11 ha of land. The structures will include water supply canal as well as the culvert and aqueduct of flood prevention. After completing the construction of water supply canal, the discharge area will be 7.34 ha. According to the feasibility study report, intensified flow-line layout will be employed for the canal engineering site, so that less land resources will be disturbed. The activities of excavation and backfill will be integrated in land leveling, so that there will be less amount of earthwork in favor of soil conservation. The construction of canal-crossing structure will be harmonized with that of water supply canal. The flood discharge cross-section of the canal-crossing structure will be built of in-situ concrete plates or masonry liner so as to upgrade the active cross-section with higher capacity of scour protection. At the same time, there will be a V-shaped diffuser area of 9~12 m long downstream in favor of scour protection. Therefore, the engineering measures as describe in the feasibility study	Contractor	Turpan Prefecture Bureau of Water Resources; Turpan City Bureau of Water Resources	Intensity of wind erosion	Once a month in the construction period, natural rehabilitation. Once there is a big wind in the monitoring day, a monitoring will be done to make up later.	Annex Fig. 4-5	Eligible Institution of monitoring soil conservation	

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Public Health	□ The local sector of health and epidemic prevention will send professional staff to guide and supervise the sanitation management in the construction sites. □ Before entering the construction sites, all the cooking staff and the sampled engineering staff should pass the medical examination. □ Hurts and disease(s) should be timely treated and cured. □ Information publicity on sanitation will be strengthened for capacity building of sanitation and environmental protection among the engineering staff. Special attention will be paid to the sensitive places of sanitation such as kitchen, dining-room, drinking water points. All the possible measures will be taken to actively prevent any epidemic situation. All the possible measures will be taken for safety construction to prevent industrial injury.	Employer	Turpan City Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection					

Notes:

(1) Xinjiang is an autonomous region. In China, an autonomous region is at the same level of a province. For an easier expression in translation, “provincial” level refers to “autonomous region” level.

Annex Table 4-8. Abstract of Environmental Management Plan for the Anti-seepage Re-construction of Ertang Branch Canal in Shanshan County

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Design Period								
	①In the engineering design, the plan of permanent land occupation will be comprehensive considered in details for reasonable land use on the basis of the environmental design around. ②In the process of designs, the temporary stacking grounds in the construction period and the permanent dump grounds after the construction completion will be reasonably arranged according to the actual situation so as to minimize the impact of residue stacking on the environment. ③In formulating a soil conservation plan, the types, intensity and hazard degree of water-soil loss due to the engineering activities will be sufficiently considered. At the same time, the overall plan of the management area in the operation period will be considered. ④In the designs, high attention will be paid to the health of the engineering staff. The conditions of the temporary living quarter will not be too simple, and the living quarter will not be too much crowded. The place with better environment will be selected for the living quarter, so as to prevent disease. ⑤It can be quite noisy during the engineering. Noise reduction measures will be considered in the engineering design, so as to reduce the impact of on-the-site noise on the engineering staff. □ Impacted groups will be identified through public participation. Before, during and after the project development, public opinions and proposals on environment issues will be solicited, so as to improve the project design. The EIA staff of the project will carry out varieties of public participation such as by means of posters, newspapers, questionnaires, interviews, forums and so on.	Design Institute Environmental Working Group	Shanshan County Environmental Management Office					10.73
Construction Period								
Water Environment	The wastewater from the construction will come mainly from concrete preparation and concrete curing. This wastewater is small in quantity and does not contain toxic or harmful substance. It can be directly discharged.	Employer	Shanshan County Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection					147.84
Air Environment	① Powder materials such as cement and lime will be carried in containers or bags. It is forbidden to scatter and lose powder materials in transport to generate dust. ② The stacked materials will be covered with tarpaulin in rainy and windy conditions. ③ Lime, sand or residues will not be stacked on open ground, if applicable. Otherwise, water-spraying will be done to depress dust. ④ Water-spraying will be regularly done along the engineering roads and at engineering sites for dust depression. Normally 2 times a day except in winter. ⑤ The engineering staff will be properly protected for safe production. They will be access to protective things such as respirators, goggle and so on.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Acoustic Environment	Low-noise equipment will be employed, if applicable. For instance, fuel machinery is replaced by hydraulic machinery, muffler is equipped to noisy machines such as concrete mixer, excavator and bulldozer. Using vent-pipe muffle and isolating vibrating parts are the measures to reduce noise. In addition, the repair and maintenance of machinery will be strengthened. In accordance with Standard of Noise at Boundary of Industrial Enterprises co-issued by Ministry of Public Health and Ministry of Labor, the working intensity of the staff working in strong noise environment will be controlled within the limit of labor insurance, and these staff will be access to noiseproof wares, so that the impact of noise on the engineering staff will be reduced.							
Solid Waste	The residues and soil from the construction can be directly used as reclamation material or backfill material to reduce the quantity of disposal. The remaining will be stacked on dump ground.							
Ecological Environment	Information publicity on the Law of Environmental Protection and Law of Soil Conservation will be strengthened, so as to upgrade the engineering staff in the awareness of environmental protection and to regulate their behaviors in the engineering. In the construction period, the transport routes will be strictly stipulated to avoid mechanical damage to the soils and vegetation outside roads. Water-spraying will be done regularly to depress dust. Biological resources such as plants and wild animals will be effectively protected.							

Environmental Impact Factor	Mitigation Measures	Executing Agency	Supervising Agency	Monitoring Factor	Monitoring Frequency	Monitoring Points	Monitoring Unit	Cost (10,000 RMB)
Soil Conservation	□ Main Project Area: In the engineering period, the temporarily stacked materials will be covered with color stripe cloth. The disturbed land will be temporarily protected by water-spraying. After the completion of the construction, the temporary stacking ground will be cleared and leveled. No engineering activity in windy or rainy days, if applicable. No random excavating or stacking will be allowed to minimize damage to the original land resources. Whenever possible, the excavated soil will be used; and the soil will be properly stacked before using. Temporary stacking ground will be equipped with covering and retaining measures to keep the material in order. The solid waste will be dumped only at designated places. Effective measures will be taken to prevent geological hazards such as slope slide in engineering activities. After the completion of the construction, the engineering site will be cleared. □ The material ground of pebbles is located on riverbed, where the vegetation rehabilitation is impossible. In collecting pebbles, there will be as little disturbance to the riverbed as possible. Only the surface pebbles are collected. The criteria is the riverbed will not become of exposure. □ Road Building Site: The engineering site is convenient in access to the outside. The construction of the in-site road will take advantage of the natural slope. Water-spraying will be done in the construction period for dust depression. Therefore, the requirements for soil conservation are satisfied. □ To satisfy the needs in the canal construction, the stacking ground of the excavated will be located within 2.5 m from each of the engineering sites. Measures of covering and water-spraying will be taken for dustproof. The occupied land is basically a piece of Gobi desert. After the completion of the construction, the engineering site will be mulched with gravels. □ In the construction period, the dust in the temporary production area and living quarter will be depressed by water-spraying. After the completion of the construction, the pollutants such as garbage and oily matters will be cleared or landfilled. The ground structures will be demolished and transported to the dump ground. Since the site was originally covered with gravels before the construction, the proper land treatment can basically prevent the temporarily occupied land from wind erosion.	Contractor	Turpan Prefecture Bureau of Water Resources; Shanshan County Bureau of Water Resources	Intensity of wind erosion	Once a month in the construction period, natural rehabilitation. Once there is a big wind in the monitoring day, a monitoring will be done to make up later.	Annex Fig. 2-8	Eligible Institution of monitoring soil conservation	
Public Health	□The local sector of health and epidemic prevention will send professional staff to guide and supervise the sanitation management in the construction sites. □ Hurts and disease(s) should be timely treated and cured. □ Information publicity on sanitation will be strengthened for capacity building of sanitation and environmental protection among the engineering staff. □ Special attention will be paid to the sensitive places of sanitation such as kitchen, dining-room, drinking water points. All the possible measures will be taken to actively prevent any epidemic situation. Health archives of the engineering staff will be set up, if applicable.	Employer	Shanshan County Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection					

Notes:

(1) Xinjiang is an autonomous region. In China, an autonomous region is at the same level of a province. For an easier expression in translation, “provincial” level refers to “autonomous region” level.

Annex Table 4-9. Abstract of Environmental Management Plan for the Construction of Alagou Main Canal in Tuokexun County

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Design Period				
	① In the engineering design, the plan of permanent land occupation will be comprehensive considered in details for reasonable land use on the basis of the environmental design around. ② In the process of designs, the temporary stacking grounds in the construction period and the permanent dump grounds after the construction completion will be reasonably arranged on the basis of the actual situation and residue retaining structure will be built, so as to minimize the impact of residue stacking on the environment. ③ In formulating a soil conservation plan, the types, intensity and hazard degree of water-soil loss due to the engineering activities will be sufficiently considered. At the same time, the overall plan of the management area in the operation period will be considered. ④ In the designs, high attention will be paid to the health of the engineering staff. The conditions of the temporary living quarter will not be too simple, and the living quarter will not be too much crowded. The place with better environment will be selected for the living quarter, so as to prevent disease. ⑤ It can be quite noisy during the engineering. Noise reduction measures will be considered in the engineering design, so as to reduce the impact of on-the-site noise on the engineering staff. ⑥ Impacted groups will be identified through public participation. Before, during and after the project development, public opinions and proposals on environment issues will be solicited, so as to improve the project design. The EIA staff of the project will carry out varieties of public participation such as by means of posters, newspapers, questionnaires, interviews, forums and so on.	11.65	Design Institute Environmental Working Group	Turpan Prefecture Environmental Management Office
Construction Period				
Water Environment	□ Since the local evaporation is as high as 3744 mm/year, the wastewater from production will be evaporated by nature. □ For screening concrete aggregate in site, one set of sand basin will be built at the aggregate stacking ground. Its volume will be 60 m^3 to satisfy the wastewater discharge for 3 days (length x width x depth = 10m,3m,2m). After the completion of the construction, the sand basin will be demolished, the residues will be delivered to the permanent dump ground, and the pit will be backfilled. □ At the construction peak, the daily production of domestic garbage from the temporary production area and living quarter will amount to 10.1 m^3. A sewage will be constructed with a volume of 20.2m^3 to satisfy the sewage discharge for 2 days (length x width x depth = 5m,2m,2m). □ One set of environment-sound toilet (20m^2) will be built at the temporary production area and living quarter and one set of simple toilet (6m^2) will be constructed at the engineering site. After the completion of the construction, the toilets and sewage tank will be demolished, the residues will be delivered to the permanent dump ground, and the pit will be backfilled.	262.18	Contractor	Turpan Prefecture Bureau of Environmental Protection; Tuokexun County Bureau of Environmental Protection
Air Environment	□ No activity of earthwork excavation or backfill in windy days, if applicable. □ The time, routes and speed of the project vehicles will be reasonably arranged. □ Regular water-spraying 2~3 times a day will be done along roads and over materials. Higher frequency of water-spraying is required at windy days. The residues of permanent disposal will be compacted for dustproof.			
Acoustic Environment	□ Noise will come mainly from the activities of earthwork excavation and backfill. In the construction period, the engineering staff will be access to labor protection appliances. □ The working time in strong noisy environment will be strictly controlled to reduce noise impact on the on-the-spot engineering staff.			

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Solid Waste	① The temporary stacking ground will be located within 2.5 m from the engineering site. The residue will be piled in a form of ladder-shaped truncated cone with slope ratio of 1:1.5 and a height of 0.5 m. The permanent dump ground will be located at the right side of the flood prevention dyke. All the residue from the canal excavation will be used to reinforce the flood prevention dyke. The waste residues will be leveled and compacted. The waste residues from screening will be used to backfill the material excavation ground. ② The temporary living quarter will produce 0.17 ton/day of domestic garbage with a total production around 38.8 ton in the construction period. The temporary living quarter will be equipped with one set of mobile recycling collection point and the engineering site will be equipped with one set of garbage bin. The garbage will be cleared once in 3 days.			
Ecological Environment	□ Information publicity on the Law of Environmental Protection and Law of Soil Conservation will be strengthened, so as to upgrade the engineering staff in the awareness of environmental protection, to regulate their behaviors in the engineering and to keep the vegetation and soil conditions from damage. □ The routes of the engineering vehicles and other machines will be strictly stipulated. Signing boards will be erected at the engineering sites and the roads.			
Soil Conservation	□ Main Construction Area Whenever possible, the excavated soil from the engineering activities will be used. The temporarily stacked residues will be leveled and compacted with required cut slope. After the completion of the construction, the site will be cleared and the waste residues will be delivered to dump ground. The management area will be 22.60 ha. □ Road Building Site The project area is very convenient in transportation. The existing highway is helpful for the major engineering activities. A temporary road of 3.5 km will be built on the riverbed inside the flood prevention dyke. The road building will take advantage over the natural landscape to reduce engineering amount in favor of soil conservation. Water-spraying will be done in the engineering activities for dustproof. □ Temporary Stacking Ground and Permanent Dump Ground The excavated soil can be temporarily stacked. The piled surface of the stacked will be compacted and regularly water-sprayed in windy period. The permanent dump ground will be located at the left side of the flood prevention dyke. After the completion of the construction, the site will be leveled and compacted. The management area will be 2.60 ha. □ Material Ground The material ground of pebbles is located on riverbed. In collecting pebbles, there will be as little disturbance to the riverbed as possible. Only the surface pebbles are collected. The criteria is the riverbed will not become of exposure. After the completion of the main construction, the waste residues from concrete aggregate screening will be land-filled and leveled. The management area will be 1.73 ha. □ Temporary Production Area and Living Quarter In the construction period, the dust in the temporary production area and living quarter will be depressed by water-spraying. After the completion of the construction, the pollutants such as garbage and oily matters will be cleared or land-filled. The ground structures will be demolished and transported to the dump ground. The management area will cover 0.45 ha.			

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Public Health	□ All the possible measures will be taken to actively prevent any epidemic situation. Attention will be paid to the environmental sanitation at the engineering sites and living quarter. Special attention will be paid to the sensitive places of sanitation such as kitchen, dining-room, drinking water points. □ It is hot and windy in the project area, the engineering staff should be access to labor protection appliances such as topee, anti-dust respirator and goggles.			

Notes:

(1) Xinjiang is an autonomous region. In China, an autonomous region is at the same level of a province. For an easier expression in translation, “provincial” level refers to “autonomous region” level.

Annex Table 4-10. Abstract of Environmental Management Plan for the Protection of Wudaolin Karez in Turpan City

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Design Period				
	In the engineering design, the plan of permanent land occupation will be comprehensive considered in details for reasonable land use on the basis of the environmental design around. In the process of designs, the temporary stacking grounds in the construction period and the permanent dump grounds after the construction completion will be reasonably arranged according to the actual situation of the underground canal, open canal and water pond in the Karez system, so that the impact of residue stacking on the environment will be minimized. In the designs, high attention will be paid to the health of the engineering staff. The conditions of the temporary living quarter will not be too simple, and the living quarter will not be too much crowded. The place with better environment will be selected for the living quarter, so as to prevent disease. It can be quite noisy during the engineering. Noise reduction measures will be considered in the engineering design, so as to reduce the impact of on-the-site noise on the engineering staff. For the sake of protecting cultural relics, the principles of "as little interference as possible" and "to keep the existing article at its original" will be respected in the process of design. Impacted groups will be identified through public participation. Before, during and after the project development, public opinions and proposals on environment issues will be solicited, so as to improve the project design. The EIA staff of the project will carry out varieties of public participation such as by means of posters, newspapers, questionnaires, interviews, forums and so on.	3.28	Design Institute Environmental Working Group	Turpan City Environmental Management Office
Construction Period				
Water Environment	The wastewater from mortar preparation and concrete curing will be difficult to collect. The pollutants in the wastewater are mainly silt, debris and other solid wastes. Except the fact that the SS indicator is poor, there is basically no other toxic or harmful substance and the quantity is very small if ever. Since the engineering sites are scattered allover, this wastewater will disappear by evaporation and seepage. Relevant stipulations on the materials to be used for such project should be highly respected. In particular, water body should be kept safe from the shaft wall before the process of grouting. All the possible measures will be taken to prevent the water body and shaft wall from the pollution by an engineering material. When reinforcing a shaft, a temporary safeguard plate must be put over the underground canal to prevent the water from oily pollutant(s) from engineering activities. After the completion of reinforcing the underground canal and shaft, all the solid wastes such as muddy sand and rock debris must be cleared up. Since the evaporation in the project area is intensive and the engineering period is short and there is not much domestic sewage at each site, the sewage will be collected in a temporary sewage tank for natural evaporation and seepage. One set of temporary sewage tank will be constructed in the living quarter. After the completion of the construction, the sewage tank will be cleared, disinfected and buried. One set of dry toilet of brick-concrete structure will be built in the living quarter. Cement laid stone masonry will be used for anti-seepage treatment. After the completion of the construction, the dry toilet will be cleared, disinfected and buried.	31.262	Contractor	Turpan City Bureau of Environmental Protection; Turpan Prefecture Bureau of Environmental Protection

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Air Environment	The engineering staff will be properly protected for safe production. They will be access to protective things such as respirators, goggle and so on. Powder materials such as cement and lime will be carried in containers or bags. It is forbidden to scatter and lose powder materials in transport to generate dust. The materials will be covered with tarpaulin in rainy and windy conditions. The routes of the engineering vehicles and other machines will be strictly stipulated. Water-spraying will be regularly done to depress dust in the construction period. The wastes from dredging will be properly manage both in and after the period of the project activities.			
Acoustic Environment	In operation, the noise of machines such as drilling machine, excavator and concrete mixer will be controlled below 55 dB(A). In accordance with Noise Limits for Construction Site (GB12523-90), the daily working time of the staff working in strong noise environment such as operating concrete mixer and drilling machine will be controlled within the limit of labor insurance, and these staff will be access to noiseproof wares. Low-noise equipment will be employed, if applicable. In addition, the repair and maintenance of machinery will be strengthened.			
Solid Waste	Each of the temporary living quarter will be equipped with mobile recycling collection point and garbage bins (2 sets). Information publicity on sanitation will be strengthened for capacity building of sanitation and environmental protection among the engineering staff. In the construction period, one set of garbage truck will be employed every week to carry the domestic garbage to the garbage dump ground.			
Ecological Environment	Information publicity on the Law of Environmental Protection and Law of Soil Conservation will be strengthened, so as to upgrade the engineering staff in the awareness of environmental protection and to keep the vegetation and soil conditions from damage. The routes of the engineering vehicles and other machines will be strictly stipulated. Signing boards will be erected at the engineering sites and the roads. Measures of Soil Conservation A. Main Construction Area: The earthwork from the Karez dredging and the residues from drilling machine will be take out from the shaft. They will be stacked around the shaft with height of 0.5~1.5 m and internal/external slope of 1.75. The surface will be compacted and covered. The site will be cleared after the completion of the engineering. B. The land to be occupied by temporary engineering road will be a piece of Gobi desert with gravels all over and without vegetation coverage. Before the engineering, only some land leveling measures of slope cut and land fill will be taken. There will be a balance between the excavation and land fill to reduce residue production. C. Permanent dump ground will be located at the external side of the original soil ridge around each of the shaft. After the completion of the construction, the residues will be arranged as ring ridge on the external side of the original soil ridge. These 2 ring ridges will be integrated, mulched with gravels and compacted to prevent wind erosion.			

Environmental Impact Factor	Mitigation Measures	Cost (10,000 RMB)	Executing Agency	Supervising Agency
Public Health	The local sector of health and epidemic prevention will send professional staff to guide and supervise the sanitation management in the construction sites. Before entering the construction sites, all the cooking staff and the sampled engineering staff should pass the medical examination. Hurts and disease(s) should be timely treated and cured. Information publicity on sanitation will be strengthened for capacity building of sanitation and environmental protection among the engineering staff. All the possible measures will be taken to actively prevent any epidemic situation. All the possible measures will be taken for safety construction to prevent industrial injury. In particular, when the engineering is on-going underground at fragile condition, measures of roof propping should be reinforced and special watch-out staff should be arranged to make sure of safety engineering.			

Notes:

(1) Xinjiang is an autonomous region. In China, an autonomous region is at the same level of a province. For an easier expression in translation, “provincial” level refers to “autonomous region” level.