E4396 v2

Environmental and Social Assessment

Executive Summary

For

Xining Water Environment Management Project

Lanzhou University

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Table of Content

1. Introduction ---- 3
1.1 Background ---- 3
1.2 Environmental Laws, Regulations, Policies and Applicable Standards ---- 3
1.2.1 Laws and Regulations ---- 3
1.2.2 Safeguard Policies and EHS ---- 3
1.2.3 Applicable Standards ---- 4
1.3 EA Scope ---- 4
2. Project Description ---- 4
2.1 Composition of Project ---- 4
2.2 Low Impact Development (LID) ---- 6
2.3 Projection of Demand for Reclaimed Water ---- 6
3. Environmental Baseline ---- 6
3.1 General Setting ---- 6
3.2 River System ---- 6
3.3 Water Resource and Water Use ---- 6
3.4 Meteorology ---- 7
3.5 Geology and Soil ---- 7
3.6 Ecology ---- 7
3.7 Socio-economic Status ---- 7
3.8 Physical Cultural Resources ---- 7
3.9 Wastewater Collection and Treatment ---- 8
3.10 Acoustic Environment Quality ---- 8
3.10 Ambient Air Quality ---- 8
3.11 Surface Water Quality ---- 8
3.12 Groundwater Quality ---- 8
4. Comparison of Alternatives ---- 8
4.1 With and Without Project Scenario ---- 8
4.2 Options for Treatment of Initial Stormwater ---- 8
5. Environmental Impacts ---- 9
5.1 Environmental Impacts in Construction Phase ---- 9
5.1.1 Air pollution ---- 9
5.1.2 Water pollution ---- 9
5.1.3 Noise ---- 9
5.1.4 Solid Waste ---- 9
5.1.5 Impact on Ecology ---- 10
5.1.6 Social Impact ---- 10
5.2 Environmental Impacts in Operation Phase ---- 10
5.2.1 Positive Impact ---- 10
5.2.2 Cumulative Impact ---- 10
5.2.3 Noise Impact ---- 11
5.2.4 Air Impact ---- 11
5.2.5 Pest Management ---- 11
5.2.6 Other Impacts in Operation Stage ---- 11
5.3 Mitigation Measures ---- 12
6. Risk Analysis ---- 12
7. Land Acquisition and Resettlement ---- 12
8. Due Diligence Review ---- 13
8.1 Wastewater Treatment Plants ---- 13
8.2 Planning of core urban area of Beichunhe Area ---- 13
8.3 Land Acquisition and Resettlement ---- 13

8.4 Disposal of Sludge ----------14
8.5 Yinjiagou Landfill ----------14
9. Public Consultation and Information Disclosure ----------14
9.1 Public Consultation ----------14
9.2 Information Disclosure ----------14
10. Environmental Management Plan ----------15
10.1 Institutional Arrangement ----------15
10.3 Cost Estimate for Implementation of EMP ----------15
Annex 1 Generic Environmental Code of Practice for Design and Construction Stages ----------16
Annex 2 Mitigation Measures for Operation Stages ----------17
Annex 3 Environmental Monitoring Plan ---------- 0
Figure 2-1 Location of Project ---------- 0

1. Introduction

1.1 Background

The proposed Xining Water Environment Management Project (hereinafter the Project) consists of wastewater collection, reclaimed water reuse, low impact development and embankment improvement, and gullies and canals integrated rehabilitation works, as well as non-physical components regarding technical assistance and project management.

Xining is the provincial capital of Qinghai Province. Fast urbanization of Xining has led to serious water pollution and water shortage, which would constrain the sustainable development of the city of Xining. In order to tackle this problem, a set of ambitious plans has been developed by Xining which calls for comprehensive works for water environment improvement, and this Project is an integral part of the plans. This Project follows on the Bank financed Xining Flood and Watershed Management Project (XFWMP), which is intended to improve the protection of property and safety of people from flood events and bring about sustainable utilization of land and water resources within Xining.

This project has been classified into Category A, which requires EIA and EMP, collectively known as the EA documentation. An Environment Assessment (EA) has been prepared by the Lanzhou University which holds First Class EA accreditation from the Ministry of Environmental Protection. The report was prepared following relevant provisions specified in Chinese EA laws/regulations and technical guidelines, as well as World Bank safeguard policies.. In addition, a Social Impact Assessment (SA) report has been prepared by the Xining PMO, with the main findings and conclusions incorporated in the EA. An Environmental and Social Management Plan (ESMP) was prepared to synthesize recommendations of the EA report and the SA Report. This document is a summary of the EA and SA documentation.

1.2 Environmental Laws, Regulations, Policies and Applicable Standards

1.2.1 Laws and Regulations

The basis of the EIA Reports includes national and local environmental laws, regulations, policies, the World Bank's environmental and social safeguard policies and IFC's EHS Guidelines, as follows:

- Environmental Protection law of the People's Republic of China, 1989
- The Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, 2000
- The Law of the People's Republic of China on Prevention and Control of Water Pollution, 2008
- The Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise, 1996
- The Law of the People's Republic of China on Environmental Impact Assessment, 2003
- The Solid Waste Pollution Control Law of the People's Republic of China, 2005;
- Technical Specifications for Environmental Impact Assessment; and various applicable standards for air, water, and noise;

1.2.2 Safeguard Policies and EHS

- OP 4.01 Environmental Assessment;
- OP 4.12 Involuntary Resettlement;
- OP 4.09 Pest Management;
- OP 4.10 Indigenous Peoples;
- EHS: General EHS Guideline;
- EHS: Waste Management;
- EHS: Wastewater and Ambient Water Quality.

1.2.3 Applicable Standards

The applicable standards are included in Table 1-2.

Table 1-2 Applicable Standards

Category	Ref.	Name of standard
Environment quality standard	1	• Groundwater Quality Standard (GB/T14848-93)
	2	• Ambient Air Quality Standard (GB3095-1996)
	3	• Surface Water Quality Standard (GB3838-2002)
	4	• Acoustic Environment Quality Standard (GB3096-2008)
Pollutants discharge standard	5	• Noise Limits on Boundaries of Construction Sites (GB12523-90)
	6	• Noise Standard on Boundaries of Enterprises (GB12348-2008)
	7	• Nuisance Pollutants Discharge Standard (GB 14554-93)
	8	• Quality Standard for Sludge Co-landfilling, Disposal of Municipal Sludge (GB/T 23485-2009)
	9	• Pollutants Discharge Standard for Municipal WwTPs (GB 18918-2002)
	10	• Quality Standard for Reuse of Reclaimed Water for Misc. Use in Urban Areas

1.3 EA Scope

The scope of environmental assessment is shown in Table 1-3.

Table 1-3 Assessment Scope

No.	Environmental Factor	Assessment Scope
1.	Noise	• Areas within 200 m from the construction sites
1	Ambient air	
2	Surface water	
3	Groundwater	• Areas along the project
4	Ecology	• Areas 200 m from the pipelines and roads; areas within 200 m from the site boundaries of the construction sites; borrow pits or spoil stockpile yards.

2. Project Description

2.1 Composition of Project

The Project Development Objective is to reduce water pollution and conserve scarce water resources in Xining Municipality.This project consists of four components, as described in Table 2-1 below:

Table 2-1Description of the Project

Component	Description	Service area and population
1. Stormwater and	• Construction of pipelines along the south	1442 ha, 172,000 people.

Component	Description	Service area and population
wastewater collection	bank of Xichuan River, DN 400-1000, 16 km.	Wastewater will be conveyed to the No. 4 municipal WWTP.
	• Construction of pipelines along the both banks of Beichuan River, DN 400-1000, 34 km.	4740 ha, 83,500 people. Wastewater will be conveyed to the No. 5 WWTP through the existing sewers.
	• Construction of 34 km pipeline in Beichuan Area, DN 300-600; • Construction of 44 km storm water collection pipelines; • Construction of 27 km roads, including trunk roads, secondary roads and tertiary roads.	290 ha.,40,000 people. Wastewater will be conveyed to the No.3 WWTP through the sewers under construction.
2. Low Impact Development and Embankment Rehabilitation	• Rehabilitation of embankments of Beichuan River, including clean-up and transportation of 2,300 m3 spoil and site leveling; • Vegetation on the embankments of Beichun River, 0.6 million m2; • Construction of 119,775.19 m2 landscape roads and associated facilities; • Low Impact Development system including pervious surface, biro-retention cells, , vegetated swales, rain barrels etc..	_
3. Reclaimed water reuse	• One reclaimed water facility within No. 5 WWTP, 5000 m3/d with including 5 km pipeline, one 1,000 m3 water tank with 2 submersible pumps.	Reclaimed water will be for miscellaneous use in the core urban area of Beichunhe Area
4. Integrated gully and canal improvement	• Integrated improvement of an artificial 10.4km Chaoyangdian water diversion canal, including improvement of the canal's cross-section, installation of wastewater collection pipes, renovation of embankment roads, and affiliated structures; • Integrated improvement of 0.9km Liujia Gully including improvement of the flood discharge cross-section, slope protection, installation of wastewater collection pipes and re-vegetation; • Integrated improvement of 0.9km Shengou Gully including improvement of the flood discharge cross-section, slop protection and vegetation, and installation of wastewater collection pipe.	
5. Project management and capacity building	• Project management activities: project construction supervision, and management information systems (MIS); • consulting services: monitoring and evaluation (M&E), technical assistance for integrated water and environment management and review of usage of reclaimed wastewater; and	

Component	Description	Service area and population
	• workshops, (domestic and overseas) training and study tours policies, regulations and technical standards concerning reclamation of treated water and promotion	

The location of the project is illustrated in Figure 2-1.

2.2 Low Impact Development (LID)

Low Impact Development (LID) strategies strive to allow natural infiltration to occur as close as possible to the original area of rainfall. The LID under the project employs the combination of rainwater collection, bio-retention and permeable layers filtration facilities, thus the rainwater can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed.

2.3 Projection of Demand for Reclaimed Water

Reuse of reclaimed water is a pilot component which is intended to investigate the possibility of extensive application of reclaimed water in municipal sector in the city of Xining. The projection of the demand for reclaimed water is as follows:

Use	Water Demand (m3/d)
Municipal irrigation in core urban area of Beichun Area	3,914
Road washing in core urban area of Beichun Area	1,050
Total	4,964
Timing	March to October each year

3. Environmental Baseline

3.1 General Setting

Xining City is the Provincial capital of Qinghai Province. The city lies in the eastern part of the province and has a population of 2.23 million people and total area of 7,649km2. It is situated on a valley plain within the Huangshui River Basin. The terrain of the city of Xining is flat which slopes from southwest to northeast, with the main landforms being flooding plains and terraces.

3.2 River System

The total length of Huangshui River is 374 km with an area of catchment being 17,733 km2. It discharges through Xining from west to east with the length of the trunk river being 95.9 km and the catchment area within Xining being 7,335 km2. The flow rate of Huangshui River averages 39.6 m3/s which is generated by precipitation and ice melting. The Huangshui River basin within Xining is well drained with densely distributed tributaries, among which the largest ones are Beichuan River, Nanchuan River and Xichuan River. These tributaries flow from the west, south and north respectively and confluence on the middle area of Xining, before finally discharge to the east of Xining, thus dividing the city into four areas.

3.3 Water Resource and Water Use

The water resource in Xining is very limited. The total water resource of Xining is 1.314 billion m3 with 1.293 billion m3 in surface water and 0.894 billion m3 in groundwater, and the duplicated amount being 0.873 billion m3. The water resource per capita is 600 m3, only 1/4 of the national average and 1/20 of the provincial average respectively. The water resource is not evenly distributed throughout a year. The surface streams in the flooding season that is from June to September represent 63% of the annual total of surface water resource. In addition, the special topography of Xining leads to three areas with high precipitation and one area with low precipitation, thus the water resource amount varies largely in the areas in the city of Xining.

The situation of water resource shortage is further deteriorated by severe water pollution by low river environmental capacity, gully inflow with silt, and direct wastewater discharge and solid waste dumping into the rivers from local industrial and domestic sources.

To meet the rapidly increasing demand for water supply, the water resource has to be over abstracted. In 2012 totally 675 million m3 water is used representing 51.4% of the total water resource of the city, among which 338 million m3 is from groundwater. In the order of water consumption, agricultural irrigation consumed 265 million m3, 39.2% of the total water used in the city; industrial sector consumed 208 million m3, 30.8% of the total; and the residents of the city consumed 131 million m3, 19.4 % of the total. By water demand projection, the deficit between the demand and supply will be 150 million m3 and 350 million m3 in 2015 and 2020 respectively.

3.4 Meteorology

Xining is located in the plateau continental climate zone which is characterized with less precipitation and great evaporation, long freezing period and short frost-free period. The annual precipitation is 368.2 mm, most of which concentrates in the three months from July to September, while the precipitation in November to March of the next year representing only 3% of the yearly total. The Maximum yearly evaporation is 2095.8 mm while the Minimum yearly evaporation being 1535.9 mm. The SE wind dominates in the city with the wind speed averaging 1.97 m/s and the atmospheric pressure averaging 73.3 Kpa.

3.5 Geology and Soil

The city of Xining has a complex geology. The mountains and hills constituted by weathered metamorphic rocks and carbonatites, and the valley plain underlain with clastic rocks and loose rocks, together provides good conditions for storage of groundwater. The valley plain contains most of the groundwater that is hydrologically correlated with surface waters. The depth of groundwater largely varies with terrains, with the shallowest aquifers underlying the flood plains and lower terraces. The main types of soil in the city are chestnut soil and sierozem which form a thin soil layer with the thickness ranging from 0.3 m to 0.8 m.

3.6 Ecology

The project area has been intensively developed by human and generally is in rural setting. The agricultural crops dominate the flora system and the wild animals are only common small rodents. There are no rare species or large wild animals observed or recorded in the project area.

As Xining is on the transitional zone between the Loess Plateau and the Qinghai-Tibet Plateau, the soil erosion is severe. The project area is located in the region classified by Qinghai Provincial Government into the critical area for soil erosion control where the soil erosion index ranges from 1500 t/km2.a to 3000 t/km2.a.

3.7 Socio-economic Status

As the provincial capital of Qinghai Province, Xining contributes 1/3 of the total GDP of the province. In 2012, Xining produced RMB 85.1 billion GDP, 15.0% more than that of the previous year; the GDP per capita is RMB 38,034. Disposable income per capita of urban residents is RMB 17,633 and of rural residents is RMB 7,801. There are four districts and three counties under the jurisdiction of Xining. The rural residents of the city are 1.03 million and the total area of cultivated land is 1,841,112 mu. The economy of Xining is centered on mechanicals, chemical, food processing industries. In addition, the power resource in terms of hydro-power and thermal power is very abundant.

3.8 Physical Cultural Resources

It is confirmed by relevant authorities that this Project will involve neither family tombs nor cultural relics protected at any levels.

3.9 Wastewater Collection and Treatment

Recently the sewer network in the urban development area of Xining has been completed in phases with the total length of the sewers being 915 km. Currently there are four operating municipal WWTPs with a combined capacity being 0.25 million m3/d. The total discharge of wastewater in Xining is 0.264 million m3/d, 76% of which has been collected and treated. The separate system is adopted in the most parts of the area, while the combined system adopted in the small old parts. However there are no wastewater collection pipelines in the sub-urban areas including the Xichun Area, Beichuanhe Area and Beichuan Area.

3.10 Acoustic Environment Quality

The noise level on the boundary of No. 3 WWTP was monitored in June 2013, and the monitored noise results carried out in 2011 and 2012 respectively for the No. 4 and No. 5 WWTPs during the EA preparation were used to represent the current status of acoustic environment quality in Xichuan and Beichuan River areas. The noise monitoring data indicate that the acoustic environment quality is fairly good and meet the Class 2 of the standard.

3.10 Ambient Air Quality

An air quality monitoring program was carried out in Aug. 2013 and the monitoring results indicate that the air quality in the project area is fairly good and meet the Class 2 of Ambient Air Quality Standard. The monitoring results for 2012 from the Planning EA for Beichuan Area are used in the EA for this project, which indicate that the TSP and PM_{10} in the ambient air of the Beichuan Area exceed the respective standards because of the special geographic location and climatic features of the project where cultivated land is easily prone to strong wind causing serious air-borne dust.

3.11 Surface Water Quality

Three points were selected for surface water quality monitoring. The monitoring results indicate that the water quality is not good with the pollutants of primary concern being Total Coliform, NH3-N and TP. This represents the situation where the residential settlements upstream are not connected with sewers and the domestic solid wastes are dumped into the rivers.

3.12 Groundwater Quality

Two points in the project area were selected for carrying out groundwater quality monitoring program, and the results show that the groundwater quality is good and meet the Class III of Groundwater Quality Standard.

4. Comparison of Alternatives

During project development, various alternatives have been screened and compared with technical, economic and environmental criteria. In terms of the environmental assessment of alternatives, the primary objective was to identify and adopt options with the least adverse environmental impacts at reasonable cost.

4.1 With and Without Project Scenario

The scenarios of With and Without Project have been considered and compared. The positive impact to be brought by the scenario of With Project is obviously in improving the water environment and enhancing water conservation. Thus the With Project is preferred.

4.2 Options for Treatment of Initial Stormwater

Two options are considered and compared based on above criteria. They are Option1 –reduction and treatment at source, which intends to increase the penetration to soil layers so as to reduce the flow of surface stream, and treat the storm water through the scattered treatment facilities rather than discharging the storm water into the municipal sewers; Option 2- Storage and treatment in central treatment facilities, which intends to collect and store the storm water before discharging into the central treatment facilities after the rainfall is over. Option 1 is considered to be the preferred option because it promotes the water conservation, and causes less negative

environmental impacts and capital requirements, implies easy technical application.

5. Environmental Impacts

5.1 Environmental Impacts in Construction Phase

5.1.1 Air pollution

Concrete mixing stations and asphalt mixing stations will not be established under the project, so all concrete and asphalt will be purchased from commercial stations. The air pollution during the construction stage will be caused by the exhaust gas from operating equipment and the air-borne dust generated from site cleaning, excavation and refilling, and material transportation. The pollutant of primary concern in the air-borne dust is considered to be the TSP, which would be dispersed to a distance of dozens of kilo meters in such a dry area as Xining. However with the mitigation measures such as water spray applied on construction sites, the concentration of TSP will be reduced to less than 0.3 mg/m3 at 50 m from the site.

The exhaust gas will cause impact on the residents and properties in close proximity. However, as the equipment is in small number and will be scattered along the sites, and the construction schedule on each section of works is short, thus the impact of exhaust is minor.

5.1.2 Water pollution

The wastewater mainly includes the domestic wastewater from the workers' camps, and construction wastewater. The materials stockpiled in rainy season will be a source of construction wastewater. Repair and maintenance of equipment would also cause wastewater. Operation of the concrete mixing stations and manufacturing of pre-fabricated parts will cause wastewater containing high concentration of SS. Construction of bridges will cause solid waste and wastewater which would pollute the water quality if they are not properly managed on site.

The workers' camps are required for the works of wastewater collection along the Xichuan River and Beichuan River, and the rehabilitation of gullies and canals. The domestic wastewater to be generated from workers' camps is estimated at 28 t/d, containing organic pollutants. If the domestic wastewater is directly discharged into small surface streams, the water quality will be drastically deteriorated.

The wastewater will be well managed by providing collection and disposal methods for each type of wastewater: The construction wastewater will be settled to reduce SS before being reused on site, domestic wastewater will be discharged into temporary lavatories or settlement tanks which will be cleaned routinely.

5.1.3 Noise

As the residents in the Beichuan Area have been relocated to other places, there are no sensitive receptors to be affected by construction of the project roads. The primary noise impact in construction stage will be on the residents along the roads where the wastewater pipelines will be constructed and residents near the site for construction of the reclaimed water plant. It is estimated that the noise level at 40 m from the construction site will meet the standard for daytime, but at least at 200 m will meet the standard for nighttime. However, with adoption of mitigation measures, such as noise barriers and careful schedule of construction time, the noise impact in construction stage will be mitigated to an acceptable level. And with the completion of the works, the noise impact will disappear immediately.

5.1.4 Solid Waste

The solid wastes include the construction waste and domestic waste, and the solid waste dumped in the project area requiring disposal.
The domestic solid waste from the workers' camps is estimated to be 182.5 t/a and the solid waste dumped on the project area is about 12,951 m3. These solid wastes will be collected and transported to local landfill for disposal.

In addition, the Project will involve the excavation of earth of 425,000 m3 and filling of earth of

1.358 million m3. The deficit of earth work will be satisfied by borrow pits, and there will be no spoil grounds under the project. In current stage, the location for the borrow pits has not be identified yet, the criteria for site selection and management measures for the borrow pits have been developed in the ESMP to avoid or minimize the potential environmental impacts of the borrow pits.

5.1.5 Impact on Ecology

As the project is located in an artificial ecology without presence of rare plants and big wild animals, the main impact on ecology is largely limited to soil erosion. Site cleaning and grading, and temporary stockpiling of soil, may collectively cause the new loss of soil at 13,170 t. Given the context that the project is located in an area with critical soil erosion status, the soil erosion would be a major impact of the project in the construction stage. A Soil Conservation Plan has been developed to mitigate and monitor the soil erosion caused in construction stage where the new soil erosion will be reduced to 705 t during the 3-year recovery period. In addition, as a major positive benefit of the project, after the project is completed the soil erosion will be reduced by 2,665 t per year, compared against the baseline.

5.1.6 Social Impact

The major social impact includes the traffic blocking, interruption of infrastructure and agricultural irrigation facilities, impact on landscape and safety of traffic, etc. The impacts will be addressed through careful scheduling of construction and cooperation with local departments on traffic control and infrastructure service.

5.2 Environmental Impacts in Operation Phase

5.2.1 Positive Impact

The positive impacts of the project have been assessed which will:

1) collect wastewater of 80.8 thousand m3/d;
2) conserve water by 4,800 m3/d each year through application of reclaimed water;
3) filter and retain 390,000 m3/a stormwater by the LID system with part to be reused in the municipal irrigation;
4) improve water environment and reduce the water-borne disease;
5) increase the employment opportunity and living conditions; and
6) reduce soil erosion by 2,665.8 t per year.

5.2.2 Cumulative Impact

The cumulative impact has been assessed in water quality, water resource and soil erosion in the context of relevant planning and the XFWMP. The cumulative impacts have been summarized in Table 5-1 below.

Table 5-1 Summary of Cumulative Impacts

Category	Cumulative Impact
Water quality	• This project will collect 68 thousand m3/d wastewater; • The XFWMP has intercepted 103 outfalls collecting wastewater of 66,300 m3/d; • With the construction and operation of the planned municipal WwTPs, the wastewater collection will be 0.44 million m3/d by the end of Xining Master Plan, increasing the wastewater treatment ratio to 90%.
Water resource	• This project will conserve water resource by 4,800 m3/d; • With the implementation of the close-off well fields, and construction of reclaimed water plants, the water reuse ratio will be increased to 31% amounting at 0.164 million m3/d by the end of Xining Master Plan.
Soil erosion	• This project will reduce the soil erosion by 2,665 t/a; • With the implementation of small catchment management works in Xining, the soil erosion will be effectively controlled.

5.2.3 Noise Impact

The primary source for noise impact is the vehicular traffic on the project roads in operation stage. The model recommended by the Technical Guideline for Acoustic Impact Assessment is used to predict the noise levels along the roads under the project. The modeling results indicate that the noise level out of the distance at 105 m from the trunk roads, 78 m from the secondary roads and 70 m from the linking roads respectively will meet the Class 2 Standard of Acoustic Environmental Quality. These results are suggested to be used in the urban planning of the Core Area of Beichuan Area. The acoustic quality at the two sensitive receptors, Kunlun Institute of Qinghai University and No. 4 Senior High School of Xining, will still remain compliance with the standard in short term, however the acoustic quality at the two sensitive receptors will not meet the standard in the medium and long term. Thus a noise barrier wall is suggested to mitigate the noise impact in the operation stage for the two sensitive receptors.

In addition, the rehabilitation of embankments and the gullies will also involve construction of new roads. Apart from the new pedestrian roads designed to provide access to the landscape of the rehabilitated rivers or gullies, the motor ways are only for movement of equipment/materials for maintenance of the embankments, thus will not induce large flow of traffic into the area. Furthermore, there are no residents within 200 m of the roads. The impact of traffic noise is minor.

There will be two sets of submersible pumps with one standby in the reclaimed water storage tank to be built under the project. As the pumps will be installed under the water and the tank will be enclosed, the noise impact on the residents nearby will be very minor.

5.2.4 Air Impact

During the operation of the project, the major source for the air impact includes the vehicular emission, and nuisance odor from the reclaimed water tank.

A comparative analysis with a similar transport project is made for assessing the vehicular emission impact to be caused by this project. It is suggested that the air quality affected by the vehicular emission from this project will meet the Class II of the Ambient Air Quality Standard for the short, medium and long term.

The proposed reclaimed water facility will be located in the southwestern corner of the No.5 WwTP which is in the leeward of the sensitive receptor-Shuangshupu Village which is far from the buffer zone of the WwTP. In addition, the nuisance odor to be emitted from the reclaimed water tank can be reduced by covering the tank with lid. Thus the air impact by the reclaimed water facility is minor.

5.2.5 Pest Management

The project will involve planting of a large number of vegetation and trees, which may increase the amount of pesticide to be applied in the operation stage. Although no pesticide will be procured as part of the project, this raises issues of improper use of pesticides, and the public health and the biological safety may be affected. A Pest Management Plan, as part of the ESMP, has been developed. The project will (i) be vegetating the areas using non-invasive species; and careful selection of species of vegetation and trees would minimize the pest accidents; (ii) promote the use of biological or environmental control methods; and (iii) improve local capacity to apply knowledge to minimize use and to safely and properly apply pesticides. In addition, as the project is located in the northwest area characterized with dry and cold climate, the probability of pest accidents is very small. A Pest Management Plan has been developed as an integral part of the ESMP

5.2.6 Other Impacts in Operation Stage

Other potential adverse impacts of the project in the operation phase are summarized in Table 5-1.

Table 5-1 Other Potential Impacts in Operation Phase

No.	Issue	Negative impacts

1	Wastewater	• It is the domestic wastewater from the operating staff of the reclaimed water plant. The wastewater will be collected and treated by the No. 5 WwTP.
2	Solid Waste	• It is the domestic solid wastes, to be generated from the operating staff of the reclaimed water plant, as well as the pedestrians on the project roads. They will be collected by dust bins and transported to landfills.
3	Ecology	• The original land use will be improved to sustain more diversified eco-system; • Application of reclaimed water may potentially bring high load of TDS to the vegetation, resulting in salinized soil. However this is only a small pilot component designed with close monitoring of soil. Thus the potential impact is minor.; • The study component of the project is intended for investigating the possibility of extensive application of reclaimed water in Xining, which may lead to excessive concentration of TDS in soil layers. However the positive and negative impacts of the application of reclaimed water will be carefully studied, thus the negative impact will be minimized and the positive impact will be enhanced by the study.
4	Social Impact	• Ethnic Minorities are expected to the primary beneficiary of the project; • Affordability issue for vulnerable groups for wastewater drainage; • Willingness to pay for the wastewater collection and treatment; • Traffic safety issue for the people using the project roads; • Traffic blocking where the wastewater pipelines are broken; • Dumping of solid waste into rivers or gullies by residents or by small businesses, if the environmental awareness is not enhanced and solid waste collection service is not provided in timely manner; • Drowning accidents for residents near the rivers.
5	Indirect Impact	• Attraction of the Beichun Area will be improved and enhanced by construction of roads, sewers, and vegetation, which would help induce the immigration of people and investment.

5.3 Mitigation Measures

For details of the generic environmental codes of practice please see the Annex one and mitigation measures for operation stage please see Annex two attached.

6. Risk Analysis

Risk analysis has been carried out in line with the Technical Guideline for Environmental Risk Analysis Assessment. The potential risks have been identified to be the accidents of pollution of surface water and groundwater due to break of wastewater pipelines and reclaimed water pipelines, and the leakage, explosion or fire of the toxic or dangerous materials during transportation on the project roads. The aftermath of such accidents have been assessed which include the pollution of water bodies, air, ecology and damage to human health. According to the guideline, there will be no source of significant risk under the project, with the preventive and mitigation measures developed in the EA, the risk of environmental accidents will be mitigated effectively.

7. Land Acquisition and Resettlement

A Resettlement Action Plan has been prepared by Hehai University for this project. This project will occupy land of 406.035 mu, among which permanent acquit ion of collectively owned land is 2.4 mu, affecting 128 people in 35 households in 7 villages; temporary occupation of land is 403.635 mu with 74.82 mu state owned land and 328.815 mu collectively owned land, affecting 414 people in 91 households in 7 villages.

The land occupation of the reclaimed water facility is 11.7 mu within the area already acquired by

the No. 5 WwTP. The land to be occupied by the roads and the LID and rehabilitation of rivers and gullies under the project are within the boundary of the core area of Beichuan Area being acquired by the local government.

The land use involved in the land occupation is summarized in Table 7-1 below.

Table 7-1 Land Use Involved in Land Occupation Unit: mu

Component	Permanent land occupation	Temporary land occupation				Sub-total
	Cultivated land	Irrigated farmland	Dis-used land	Woods land	roads	
Storm water and Wastewater Collection	2.4	303.915	-	24.9	68.37	399.585
Low Impact Development and Embankment Rehabilitation	-	-	6.45	-	-	6.45
Total	2.4	403.635				406.03

8. Due Diligence Review

8.1 Wastewater Treatment Plants

The wastewater to be collected by the project will be conveyed to the No. 3, No. 4 and No. 5 respectively for treatment. The due diligence review has been made during the EA preparation on the environmental performance of these municipal WwTPs, and found that the construction schedule for the No. 5 and No. 4 WwTP fit in well with the schedule of the project, and the capacities of these WwTPs can accommodate the wastewater collected by the project; and the environmental performance of the operating No. 3 WwTPis is in compliance with the domestic requirements.

8.2 Planning of core urban area of Beichunhe Area

The core area of Beichuanhe Area is in the north of Xining, with a planning area being 9.32 km2. the core area is scheduled to be developed in two phases. Currently the Planning EA for this core area development has been prepared and reviewed by Qinghai EPB in 2013. The Planning EA covers the analysis of environmental and social impacts and provides the main conclusion that the development of the Beichun Area is in line with the regional environmental protection requirements and will not cause severe adverse impact. To enhance the positive impacts and minimize the adverse impacts, the Planning EA suggests to 1)recloate the Ning-Da Railway so as to reduce the noise impact on the area and avoid the segmentation of the area; 2) preserve the woods land in the area so as to ensure the good ecology; 3) employment issue for the relocated people should be considered; and 4) the reclaimed water form the No. 5 WwTP should be reused for greening and toilet flushing in the area.

The land acquisition and resettlement of this core area has been completed, therefore there is no residents living in this area. The development of the area in phases will lead to migration of people into this area, which will generate traffic flow, wastewater and demand for municipal vegetation. However these issues induced by the development of the area have been considered in the Planning EA and designed as a part of the Project through construction of roads and wastewater collection pipelines, as well as reuse of reclaimed water.

8.3 Land Acquisition and Resettlement

The No. 5 WwTP where the reclaimed water facilities under the Project will be constructed involves permanent acquisition of 64 mu collectively owned land, which affects 34 households with 135 villagers; no demolition of houses will be required.

The core area development of Beichuan Area will occupy 3356.67 mu collectively owned land with 1278.83 mu house sites and 2,077.84 mu paddy field. In addition, it will demolish 1.1816

million m2 houses which affects 1348 households with 6495 villagers in 4 villages; it will demolish 25.9 thousand m2 non-residential structures affecting 38 enterprises in 3 villages.

A Due Diligence Review has been made by Hehai University for the land acquired and the people relocated and an external monitoring for the on-going land acquisition and resettlement has been established. And it is found that the land acquisition and resettlement is in compliance with the relevant laws of China, the people affected are satisfactory and there are no public complaints reported on the land acquisition and resettlement.

8.4 Disposal of Sludge

The approval document for EA for No. 4 and No. 5 WwTPs requires that the sludge be dewatered and disposed of in municipal sanitary landfill facility designated by EPB. The sludge generated from the operating No. 3 WwTP is dewatered before landfilled in Yinjiagouou Sanitary Landfill.

8.5 Yinjiagou Landfill

The solid waste to be collected by the project during the site cleaning stage is 12,951 t which will be transported to the Yinjiagou Sanitary Landfill Facility for landfill. A due diligence review has been conducted on the Yinjiagou Landfill and found that the landfill has a designed daily capacity of 466 t/d and actual amount of solid waste landfilled is currently 420 t/d, and the EA for the landfill has been approved by relevant government department.

9. Public Consultation and Information Disclosure

9.1 Public Consultation

In accordance with the requirements of the China's EA Law and the World Bank, two rounds of public consultation were conducted by the EIA team. The first round focused on environmental screening to define public concerns, to assist identification of key environmental issues and to draw public response and comments on the initially developed mitigation measures for the potential adverse impacts identified before EA TOR finalization. The second round was designed to ensure public awareness of the EA effort and final project definition and mitigation by presenting a draft EA report to the public through information disclosure procedures. Details of the two rounds of public consultation undertaken are presented in Table 9-1.

Table 9-1 Implementation of the Public Consultation

Round	Timing	Participants	Method	Organizer
1	May, 2013	Representatives of communities and villages in the project affected area	Questionnaires and public meeting	Lanzhou University
2	Sept. 2013	Representatives of communities and villages in the project affected area	Questionnaires and public meeting	

During the consultation, the public expressed several concerns on the land occupation and environmental impacts including odor of reclaimed water, impact on irrigation facilities, and traffic interruption, and these concerns have been responded in the public meetings or incorporated in the EA. Through the consultation, it is understood that the public strongly support the project as they think it would be a good approach to improving their living conditions. During the consultation, all of the people think that the impacts of primary concern are effectively mitigated to an acceptable level.

9.2 Information Disclosure

Information on the project EA has been disclosed to the public throughout the public consultation. An advertisement has been placed on the Xining Evening News, the most popular local newspaper during the second round consultation to invite the public to express their concerns about the project, and to inform the public the place to assess to the draft EIA report which has been placed

in the Management Office of Huangshui River Basin, the Management Office for Beichuan River, as well as the affected villages since Sept. 17, 2013. The full text of the EA documents have been disclosed on local website since Dec. 5, 2013 at an address: http://www.xining.gov.cn/html/56/319812.html.

10. Environmental Management Plan

10.1 Institutional Arrangement

Several organizations will take responsibility for environmental management, supervision and monitoring.

- The Huangshui River Basin Committee will take the ultimate responsibility for environmental protection and management. This organization is the overall leading agency for project implementation;
- The Xining Drainage Company and Huangshui River Investment Company will jointly responsible for the environmental management in the operation phase of the project.
- The Xining PMO is the implementing agency being responsible for day to day environmental management during the construction phase and operation phase. Its responsibilities will include engagement of professional supervision and monitoring services, allocation of budget for environmental management, response to environmental monitoring reports and the taking of appropriate mitigation actions. They will also handle any environmental events which may occur during construction and operation;
- Qinghai Provincial EPB will be responsible for enforcement of environmental regulations and standards and review of environmental monitoring reports;
- Environmental Supervisor will be responsible will be responsible for day to day environmental management during the construction phase;
- Contractors will be responsible for implementing the mitigation measures for construction phase.

A training program will be undertaken during project implementation for management and technical staff from the above organizations. Training course contents will include responsibilities of the relevant organizations, environmental regulations, mitigation measures, supervision, reporting system and public grievance.

An environmental monitoring plan has been developed for both the construction and operation phases and incorporated into the EMP as shown in Annex 3, so as to further ensure the proper implementation of mitigation measures.

10.2 Reporting and Public Grievance Mechanism

The requirements for environmental supervision and monitoring, as well as the reporting system has been clearly specified. The public grievance mechanism will be established and maintained throughout the project to deal with any public concerns in environmental management.

10.3 Cost Estimate for Implementation of EMP

The total cost estimate for implementing the EMP is 10.815 million RMB. The budget for the environmental monitoring plan is 4.07 million RMB and for the soil erosion monitoring plan is 3.5 million RMB respectively.

Annex 1 Generic Environmental Code of Practice for Design and Construction Stages

Links and key elements	Mitigation Measures
A. Design Stage	
Social	• The selection of the sites for the reclaimed water facility, the alignment of roads and pipelines should be based on the social and environmental considerations, so as to save farmland and avoid sensitive receptors; • The existing route of roads should be used so as to avoid the new routes development; • The structures should be reasonably located so as to minimize the impact on the people; • The construction should be carefully scheduled to minimize the impact on people.
Surface water	• The interceptors should be carefully designed to connect all of the wastewater pipelines .
Ecology	• The alignment of the roads should be designed in line with the local topographical features so as to minimize the need for excavation and filling; • The boundary of the reclaimed water facility should be determined based on the scale of the facility so as to minimize the occupation of the land; • The excavation and filling works should be determined based on the transportation economy. The borrow pits should be carefully located in the context of landform improvement and farmland creation. The construction spoil should be used as much as possible if it meets the quality standard; • The site boundary for the construction of pipelines should be strictly controlled.
Acoustic environment	• The road network in the Beichuan Area should be carefully planned taking into account the traffic noise impact on the communities and schools; • The location of the reclaimed water facility should be far from the residents and proper buffer zone established.
Landscape	• The roads should be designed in an integrated way with the surrounding landscape; • The reclaimed water facility should be located far from the central urban area to avoid disturbance on the landscape; • The vegetation of the embankment and gullies should use local species and integrate the local urban planning demand.
Traffic safety	• The traffic signals should be clearly established; • The intersection should be clearly canalized and monitoring system be established.
B. Construction Stage	
Air pollution	• During the storage and loading, the materials should be covered; • water spray should be provided at each construction site per day; • Trucks transporting earth and solid waste should be covered; • Construction sites should be enclosed; • Transportation of materials in the urban area should be arranged in nighttime; • Equipment and vehicles certified with national codes for sanitation should be used so as to ensure the vehicular emission meet the relevant standards.
Water pollution	• Constructors shall used the existing civil facilities near the construction site as much as possible; • Site management should be enhanced so as to control material loss, scattering and overflowing to reduce the amount of wastewater. • Stockpiling sites for materials or solid waste should be located far from surface streams; • The maintenance of the equipment should be conducted in designated location where wastewater and waste oil collection and treatment device is installed.
Noise	• Construction time should be carefully scheduled. Where the construction sites are close to residential buildings, operation of the equipment with high noise level should be prohibited from night (22:00-6:00). Where the construction procedure require the operation of the equipment in night, the contractors should complete the procedure for allowing construction in night. At the meantime, public bulletin should be established on site for soliciting the public understanding; • The construction sites should be enclosed with steel plates with height of 1.5-2 m if they are close to sensitive receptors; • Labor should be used to replace equipment in the sites very close to the residential area or schools in the construction of pipelines; • Are plugs should be provided and shifts of workers should be arranged where the equipment generates strong noise..

Links and key elements	Mitigation Measures
Solid Waste	• Construction solid waste should be cleaned and transported to the solid waste disposal site in timely manner; • Domestic solid waste should be collected and disposed by local environmental sanitation department; • Temporary stockpile site for solid waste should be far from rivers; • Transportation of solid waste should be carefully scheduled so as to avoid the urban areas.
Ecology	• The farmland and trees should be protected. The workers should be provided with training sessions on protection of wild animals and vegetations; • The construction of vegetation, side slope and drainage ditches should be carried out together with the main structures; • The land temporarily occupied should be restored for cropping or vegetation establishment immediately after the construction is completed; • The area for site cleaning should be strictly controlled. Any vegetation beyond the area to be cleaned should be restored for establishment of vegetation; • The occupation of farmlands should be minimized. Borrow pits should be established in the context of local agricultural development planning and construction of base farmland; • The width of greening belts should be controlled; • Local species of trees and vegetations should be selected and used for compensation for the loss of vegetation due to the construction.
Soil Erosion	• Construction of borrow pits should be scheduled in low flow season; • Topsoil should be removed and stockpiled in a flat area with temporary retaining wall surrounded with ditches and sedimentation tank. The stockpile should be covered. The topsoil will be used for ecological restoration of the works; • The borrow pits should be filled with soils immediately after the it is closed for vegetative establishment; • The existing roads should be selected for access roads; • The construction site surface should be hardened. After the construction, the hardened surface should be loosened for vegetative establishment; • Construction should be reasonably scheduled to minimize the period of temporary land occupation. The site to be temporarily occupied should be restored with vegetation after the construction is completed.
Cultural Resources	• If physical cultural relics are found during construction, (including ancient sites and ancient tombs), construction should be suspended immediately. • The construction site should be closed and protected under the supervision of the engineering supervisor and report to local cultural departments. Without the permit from the cultural department the construction should not be resumed.
Construction Safety	• Warning signs should be set up at the place or equipment that would cause occupational health impact; • Protective equipment, such as helmet, safety belt, shoes and gear, should be provided to the workers; • During the high temperature, cooling equipment or materials should be provided in site and the rest schedule should be carefully arranged.

Annex 2 Mitigation Measures for Operation Stages

Works	Mitigation Measures
Roads and Pipelines	• Before completion and operation of construction, complete the connection with relevant road and setting of safety signs. • Perform regular maintenance for the road, so as to ensure the normal traffic. • Clean and transport the waste residue removed from road maintenance and other solid waste immediately, and send to the designated location for landfill treatment. • Enhance traffic safety management, and play the full functions of road, so as to reduce traffic accident. • Provide a reasonable number of waste bins along the road, for convenience of pedestrian littering, so as to maintain urban environmental health. • After construction of wastewater pipe network along Xichuan River and Beichuan River, recover the occupied sandstone road. • Pack the household waste along the road in bags by classification for centralized treatment. • During operation period, try best to avoid destroying original landform for road maintenance. • Strengthen traffic management, and reduce noise source. Make the public participant in

	the environmental noise pollution prevention consciously through publicity. • When planning house building on both side along the road, consideration shall be given to the impact of traffic noise of the proposed project. • Forbid various vehicles with leakage and overload in bulk on the road, to avoid water pollution caused by loss of goods on the road; try best to collect the oil leaked for traffic accidents, so as to reduce the pollution of ground water, natural vegetation and crops. • Check and maintain the facilities for soil conservation works and drainage works along the line regularly, and repair immediately in case of damage. Check the sediment deposition in the culvert along the line regularly, and clean timely. • In case of heavy wind, heavy fog, icy pavement and other serious conditions, remind the drivers to slow down, so as to reduce the rate of the traffic accidents. • According to the requirements for bridge maintenance in Technical Specification of Highway Maintenance JTJ073-96, enhance the safety inspection and monitoring for bridge project, and ensure the safety of the section in important water areas. • Enhance vehicle management. Environmental protection and traffic police department shall enhance supervision and monitoring, strictly enforce the inspection system for vehicle emission, and forbidden the vehicles with the discharge of pollutants exceeding the current vehicle emissions standards according to relevant regulation on the road or specify its drive route. • Enhance management for transport vehicles, and forbid the vehicles without covering on the road which may cause raising dust during transportation. • Enhance road management and road surface maintenance, and maintain good operation of road, so as to reduce traffic jam. • Plant more trees and grasses on both sides of the road, which can not only absorb and purify the pollutants in the vehicle emissions, but also beautify the environment and improve landscape along the road. • Carry out the ambient air monitoring program, and take corresponding environmental protection measures according to monitoring results. • Develop and promote laws and regulations to forbid the passengers and pedestrians littering on the road, so as to ensure traffic safety and cleanliness on both sides of the road. • Set trash container or garbage can on bus stop and both sides of the road for convenience of passengers. Forbid to build an exposed dump of refuse. • Enhance management, clean and transport waste timely, transport the stacked waste to the household waste landfill in Xining Municipality for centralized treatment, and forbid littering at random.
Reclaimed water Facility	• Carry out greening in and around the site, try to expand the area of green land and plant evergreen arbor and shrub, and flowers and plants which have certain function of absorbing the stench. • The greening area in the site shall be more than 30% of the total area of plant area in the feasibility study design. • Use low speed water pump; • Provide a cover for water tank.
Risk for Pipeline Accidents	• In case of such accidents, first-aid repair shall be organized timely to reduce the wastewater spillover and the impact on surrounding environment as far as possible. • Relevant departments shall strengthen management of wastewater pipe network. In case of breakage of pipe network, emergency measures shall be taken immediately to repair and maintain, so as to avoid the accidental spillover of wastewater causing relatively large environmental impact.
Risk for Transportation Accidents	• The vehicles without certificate, signs, or with leakage, overload of dangerous chemicals in bulk is forbidden on the road; • Consigner must submit to relevant departments of public security organ timely for application, approval and supervision of public security organ. • The unit delivering the cargo shall be qualified for transportation of hazardous substances. Driver delivering the cargo and supercargo shall be qualified to perform duties, and improve skill of driver, enhance education on safe driving and courteous driving. Carrier vehicles and vessels shall conform to relevant national standards. • In case of transportation of highly toxic chemical, transportation shall be performed according to “Road Transport Pass for Highly Toxic Chemical” approved and issued by public security organ; • Under adverse weather conditions, such as, heavy fog and heavy wind, vehicles for hazard transportation shall be forbidden on the road; • Visible signs shall be provided on the road close to river, so as to draw the attention of drivers for hazardous substance transportation. Speed limit signs and speed bumps shall be provided, so as to reduce accident rate; • After accident, drivers and carriers shall report immediately and indicate all important related matters.

	• After receiving the report, the traffic administration and highway management department shall report to municipal government, and start emergency plan for emergency treatment of accident; • For the drivers for transporting hazardous substances, relevant department shall carry out business training for eliminating traffic accident of vehicles for transporting hazardous substances regularly, so as to enhance awareness of unexpected development of employees, and minimize the accident risk for transporting hazardous substances.
Risk for Transportation of Dangerous Materials	• Guiding thought and principle of emergency rescue plan; • Establishment and responsibility of discipline group for site rescue.

Annex 3 Environmental Monitoring Plan

Table 1 Environmental Monitoring Plan for Reclaimed Water Reuse Works

Periods	Environmental Factors	Monitoring Locations	Monitoring Items	Monitoring Frequencies	Responsible Agencies	Implementation Agencies	Supervision Agencies	Monitoring Expense (RMB 10,000)
Construction period	Sound	Construction site of sensitive points (Shuangsubao Village) surrounding Reclaimed Water Plant	LAeq	Once every quarter, 2 consecutive days every time, once respectively during day and night every day	Contractor	The entrusted monitoring unit	Xining Environmental Protection Bureau	0.4/year
	Atmosphere	Construction site of sensitive points (Shuangsubao Village) surrounding Reclaimed Water Plant	TSP, PM_{10}, PM2.5	Once every quarter, 2 consecutive days every time, 4 times every day				2/year
Operation period	Sound	Boundaries of Reclaimed Water Plant	LAeq	Twice every year, 2 consecutive days every time, once respectively during day and night every day	Xining Drainage Company			0.2/year
	Atmosphere	Boundaries of Reclaimed Water Plant	Concentrations of ammonia, hydrogen sulfide and stench	Once every quarter, 2 consecutive days every time, 4 times every day				3/year
	Water	Outlet of Reclaimed Water Plant	PH, chroma, smell, turbidity, total dissolved solid, BOD5, COD, ammonia nitrogen, total nitrogen, total phosphorus, anionic surfactant, iron, manganese, dissolved oxygen, total residual chlorine, total coliforms	Before application of water at greening season Once every day during greening period Once every day during period of road sprinkling		Analysis laboratory of No.5 Wastewater Treatment Plant		/
	Soil	Areas where reclaimed water is adopted for greening	Total salt content, chloride content (calculated by cl %), and sulfate content (calculated by SO_4^-%) of soil	Once every month, 3 consecutive days every time		The entrusted monitoring unit		3/year

Table 2 Environmental Monitoring Plans for Rainwater and Wastewater Collection Pipe Network Works, Reclaimed Water Reuse Pipe Network Works, Ancillary Road Works, Low-Impact Development and River Bank Environmental Improvement Works Implemented within Beichuan Area

Period	Environmental Factors	Monitoring Locations	Monitoring Items	Monitoring Frequencies	Responsible Agencies	Implementation Agencies	Supervision Agencies	Monitoring Expense (RMB 10,000)
Construction period	Sound	Construction sites with strong noise within 200m from residential area and sensitive area (Hetan Village, Zhangjiawan Village, Xiaozhai Village)	LAeq	Once every quarter, 2 consecutive days every time, once respectively during day and night every day	Contractor	The entrusted monitoring unit	Xining Env. Protection Bureau	0.4/year
	Atmosphere	Construction sites with strong noise within 200m from residential area and sensitive area (Hetan Village, Zhangjiawan Village, Xiaozhai Village)	TSP, PM_{10}, PM2.5	Once every quarter, 2 consecutive days every time, 4 times every day				2/year
	Water	Runze Bridge, Chaoyang Bridge, Zhamalong, Xigang Bridge, Xinning Bridge	pH, COD_{Cr}, SS, BOD5, DO, Cr^{6+}, petroleum, phosphate, ammonia nitrogen, sulfide, total number of bacteria, coliforms	Once respectively during high, normal and low flow seasons				5/year
Operation period	Sound	Kunlun College of Qinghai University, Xining No.4 Senior Middle School	LAeq	Once every year, 2 consecutive days every time, once respectively during day and night every day	Executive Office of Xining Huangshui Investment Management Co., Ltd.			0.4/year
	Atmosphere		SO_2, NO_x, CO, TSP, PM_{10}, PM2.5	Once every year, 2 consecutive days every time, 4 times every day				1/year

Table 3 Monitoring Plan for Integrated Gully Improvement

Stage	Environmental Factors	Monitoring Items	Monitoring Locations	Monitoring Frequencies and Time	Responsible Agencies	Implementation Agencies	Supervision Agencies	Monitoring Expense (RMB 10,000)
Construction period	Sound	LAeq	3 sensitive points selected along ditch (Guojiata Village, Jiujiawan Village, Xin Village)	Once every quarter, 2 consecutive days every time, once respectively during day and night every day	Contractor	The entrusted monitoring unit	Xining Environmental Protection Bureau	0.4/year
	Atmosphere	TSP, PM_{10}	3 sensitive points selected along ditch (Guojiata Village, Jiujiawan Village, Xin Village)	Once every quarter, 2 consecutive days every time, 4 times every day				2/year

Table 4 Environmental Monitoring Plans for Relevant Supporting Projects during Operation Period

Stage	Monitoring Locations	Monitoring Items	Monitoring Frequencies	Implementation Agencies	Responsible Agencies	Supervision Agencies	Monitoring Expense (RMB 10,000)
Operation period	Outlets of No. 3, No. 4, No. 5 Wastewater Treatment Plants	pH, SS, COD, BOD5, animal and vegetable oils, petroleum, anionic surfactant, total nitrogen, ammonia nitrogen, total phosphorus, chroma, number of fecal coliforms	Routine monitoring frequency of Wastewater Treatment Plant	Analysis laboratory of plant	Water Supply and Drainage Company	Xining Environmental Protection Bureau	/

Table 5 LID Implementation Effect Monitoring

Stage	Monitoring Locations	Monitoring Items	Monitoring Frequencies	Implementation Agencies	Responsible Agencies	Supervision Agencies	Monitoring Expense (RMB 10,000)
Before construction	Surface rainfall within areas of River Bank Restoration Works in Beichuan area	BOD5, COD, SS, TN, TP, escherichia coli	After every rainstorm	Executive Office of Xining Huangshui Investment Management Co., Ltd.	The entrusted monitoring unit	Xining Environmental Protection Bureau	0.5/time
Construction period	Surface rainfall where LID system is set up						
Operation period							

Table 6 Monitoring of Water and Soil Conservation

Stage	Monitoring Locations	Monitoring Items	Monitoring Frequencies	Implementation Agencies	Responsible Agencies	Supervision Agencies	Monitoring Expense (RMB 10,000)
Before construction	Temporary waste yard, large excavation area, borrow pit, construction camp, and the ditch and river bank covered by environmental management	Current situation of landscape and vegetation of the proposed construction area Current situation of grass coverage Current situation of intensity and amount of water and soil loss	Once every quarter within one year before construction. Add monitoring after rainstorm	Executive Office of Xining Huangshui Investment Management Co., Ltd.	The entrusted monitoring unit	Xining Environmental Protection Bureau, Xining Water and Soil Conservation Bureau	10/year
Construction period		Scope of responsibilities for water and soil loss prevention; Area of land occupied by project construction and area of disturbed surface; Changes of landscape and vegetation disturbance area; Excavation and filling quantity changes of the project; Area, amount and intensity changes of water and soil loss;	Once every month. Add monitoring after rainstorm. Monitoring of earthwork volume once every 10 days;	Contractor			10/year
Operation period		Quantity and quality of prevention measures for water and soil conservation (engineering measures, vegetation measures and temporary measures); Area, situation of growth and development (height of tree, DBH of arbor, and crown breadth of arbor and shrub), survival rate, preservation rate and vegetation coverage of grass; Reliability, soundness and operating condition of engineering protection measures; Effect (soil conservation effect) monitoring of implemented water and soil conservation measures, including effects of controlling water and soil loss amount, improving rate of slag retaining, and improving ecological system.	Once every month. Add monitoring after rainstorm. Monitoring of earthwork volume once every 10 days; Monitoring of survival rate, coverage rate and growth increment of vegetation once every 3 months.	Executive Office of Xining Huangshui Investment Management Co., Ltd.			10/year

Figure 2-1 Location of Project