E4637 V2 REV

Sichuan-Chongqing Cooperation: Guang'an Demonstration Area Infrastructure Development Project

Qianfeng *Component*

Environmental Impact Assessment

The People´s Government of Qianfeng District
China Railway Eryuan Engineering Group Co., Ltd.

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1 Preface

1.1 Project Background

The Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project meets the need to realize the national economic development strategy. As required in the notice issued by the National Development and Reform Commission, the Ministry of Finance, the World Bank loan shall be actively applied to the infrastructure construction for Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area. In the second half of 2011, Guang'an City launched the loan application for the Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project (including Qianfeng and Linshui Components) and in the early half of 2012, and the Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project was included in the World Bank Loan Funded National Plan for 2013-2015.

According to *China's Memorandum for Proposed Infrastructure Project for Sichuan-Chongqing Cooperation Demonstration Area* dated June 2013, the Infrastructure Project for Qianfeng Industrial Park of Guang'an is one of the components in the Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project .

1.2 Necessity of Construction

The necessity of the construction of Infrastructure Project for Qianfeng Industrial Park of Guang'an Economic & Technological Development Zone includes:

(1) It meets the need to adapt to the Western Development Strategy and accelerate the local social and economic development. Qianfeng, the only industrial area in the central downtown of Guang'an, has become the leader of the whole city in industrial development field. The Project is intended to construct the infrastructures of Qianfeng Industrial Park of Guang'an Economic & Technological Development Zone, improve the urban infrastructures, enhance the urban service functions, improve the living quality of the local people, adapt to the Western Development Strategy and promote the overall progress of the economic development and social undertakings of the local people.

(2) It takes on a high priority in the regional development

In order to improve the opening image of and enhance the investment attracting effect of the Demonstration Area, it is necessary to improve the infrastructure construction of Qianfeng Industrial Park of Guang'an Economic & Technological Development Zone in Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area. According to the existing construction and development of the Demonstration Area, the supporting infrastructures and public services of the Demonstration Area shall be upgraded to increase the attraction to and enhance the confidence of the foreign investors. Therefore, it takes on a high priority in the regional development.

(3) It meets the need to actively carry on the industrial transfer

It is clearly stated in the *Overall Construction Scheme for Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area* that the construction will be mainly focused on Qianfeng, Zaoshan and Guang'an Port. Moreover, the Central Business District and Logistics Park will be constructed and the trade and logistics service platform connecting Chongqing and radiating the CDB areas will be established as well. In addition, the construction of the Project will improve the

infrastructures of Qianfeng District and it meets the need to actively carry on the industrial transfer of the central downtown of Chongqing and Liangjiang New Area.

(4) It meets the need to improve the urban road and traffic network structures

Since the roads in constructed area of Qianfeng District are mainly concentrated in central Qianfeng, and with the significant increase of enterprises settling in Qianfeng, the available land in the constructed area is far reaching the actual need, making Qianfeng Industrial Park the development area attached with great importance. After the completion of roads in the Project, the traffic network structure of Qianfeng Industrial Park and the traffic condition for enterprises and residents along the roads will be will be greatly improved, and the construction of the Project meets the need to improve the urban road and traffic network structures. With the construction of the Project, the traffic connection between Qianfeng Industrial Park and the constructed area of Qianfeng District as well as Guang'an Xinqiao Industrial Park will be greatly improved, the logistics transportation for enterprises in the Industrial Park will be facilitated, the infrastructure conditions of the Industrial Park will be improved and the competitiveness of the Industrial Park on investment attraction will be increased.

In conclusion, it is necessary and urgent to have the Project accomplished.

1.3 Targets and Contents

The development objective of the proposed project is *to support Linshui County and Qianfeng District of Guang'an Prefecture to improve transport, wastewater, skills and investment promotion services for current needs and projected growth.*. For this purpose, the Project will support the following activities in Qianfeng District:

This component will: (a) develop a passenger and cargo route between the railway station and industrial area, bypassing the urban core; and (b) revitalize urban public space and create a slow, green transport corridor along the Lvxi River, connecting low-income areas of the urban core with industrial areas.

With reference to the *Law of the People's Republic of China on Environmental Impact Assessment (EIA)*, the *Regulations on the Administration of Construction Project Environmental Protection*, the *Notice on Enhancing the Administration of Environmental Impact Assessment for International Financial Institutions (IFI) Financed Construction Projects,* the World Bank's Safeguard Policies, as well as the environmental impact assessment procedures of China and World Bank, this exercise is to describe the positive environmental impacts of the project implementation, identify, screen and predictively analyze potential negative environmental impacts thereof and propose targeted and effective mitigation measures and an environmental management plan (EMP) for main unavoidable and negative impacts so as to provide the basis for both the independent project assessment by World Bank and the decision making and management by the administrative and environmental management departments of the government.

1.4 EIA Progress

In April 2014, China Railway Eryuan Engineering Group Co., Ltd. (hereinafter referred to as "China Railway Eryuan") was entrusted by the World Bank Load Funded Guang'an Project Department to undertake the environmental impact assessment of the Project. After that, China Railway Eryuan established a project team, which collected, compiled and reviewed related materials, visited all the proposed project sites and looked at the surrounding environment of each site, and carried out preliminary analysis regarding the nature, content and size, main pollutants and potential environmental impacts of each component. Besides, the

Environmental Impact Assessment Report of the Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area was prepared in accordance with domestic technical guidelines on environmental impact assessment and the specific provisions on environmental impact assessment in the Safeguard Policies and based on the *Feasibility Study Report of the Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project* .

2 General

2.1 Preparation Basis

2.1.1 Laws and regulations on environmental protection

1. Environmental Protection Law of the People's Republic of China (December 26, 1989);
2. Law of the People's Republic of China on Environmental Impact Assessment (Order 77 of the President of the People's Republic of China, September 1, 2003);
3. Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution (September 1, 2000);
4. Law of the People's Republic of China on Prevention and Control of Water Pollution (June 1, 2008);
5. Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise (March 1, 1997)
6. Law of the People's Republic of China on Prevention and Control of Environmental Pollution by Solid Wastes (April 1, 2005);
7. Cleaner Production Promotion Law of the People's Republic of China (July 1, 2012);
8. Circular Economy Promotion Law of the People's Republic of China (August 29, 2008);
9. Law of the People's Republic of China on Protection of Cultural Relics (December 29, 2007);
10. Land Administration Law of the People's Republic of China (August 28, 2004);
11. Urban and Rural Planning Law of the People's Republic of China (January 1, 2008);
12. Law of the People's Republic of China on Water and Soil Conservation (March 1, 2011);
13. Law of the People's Republic of China on the Protection of Wildlife (August 28, 2004).

2.1.2 Ministerial Environmental Protection Regulations

1. Regulations on the Administration of Construction Project Environmental Protection (Order 253 of the State Council in 1998, November 29, 1998);
2. Regulations on the Implementation of the Land Administration Law of the People's Republic of China (Order 256 of the State Council in 1999, January 1, 1999);
3. Regulations on the Implementation of the Law of the People's Republic of China on Prevention and Control of Water Pollution (Order 284 of the State Council in 2000, March 20, 2000);
4. Regulations on the Implementation of the Law of the People's Republic of China on Water and Soil Conservation (Order 120 of the State Council in 1993, August 1, 1993);
5. Regulation of River Administration of the People's Republic of China (Order 167

of the State Council in 1994, December 1, 1994);

6. Circular on Further Enhancing Environmental Impact Assessment Management and Preventing Environmental Risks (HF [2012] No. 77);
7. Interim Measures for Public Participation in Environmental Impact Assessment (HF [2006] No. 28);
8. Catalogue for the Classified Administration of Environmental Impact Assessments for Construction Projects (Order of State Environmental Protection Administration, October 2008);
9. Decision of the State Council on Several Issues Concerning Environmental Protection (GF [1996] No. 31);
10. National Compendium on Eco-environmental Protection (November, 16, 2000);
11. Notice of State Development Planning Commission and State Environmental Protection Administration Regarding Issues on Regulating Charges for Environmental Impact Assessment (JJG [2002] No. 125);
12. Notice on the Implementation of Issues Concerning Environmental Impact Assessment System for Construction Projects (State Environmental Protection Administration, HF [1999] No. 107);
13. (22)Several Proposals of Enhancing Construction Project Environmental Protection in the Western Development (State Environmental Protection Administration, [2001] No.4);
14. Regulations on the Implementation of the Land Administration Law of the People's Republic of China (Order 256 of the State Council, January 1, 1999);
15. Notice on Effective Urban Fatigue Dust Control (State Environmental Protection Administration and Ministry of Construction, HF [2001] No. 56);
16. Administrative Provisions on the Prevention and Control of Source Water Protection Areas (July 1989);
17. Environmental Protection Regulations of Sichuan Province (September 24, 2004);
18. Measures of Sichuan Province for Implementation of the Water Law of the People's Republic of China (July 1, 2005);
19. Measures of Sichuan Province for Implementation of the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution (September 1, 2002);
20. Notice of Sichuan Provincial People's Government on the Division of Key Prevention Area of Water and Soil Loss;
21. Provisions on the Administration of Urban Construction Garbage (Order 139 of Ministry of Construction in 2005);
22. Standard for Pollution Control on Storage and Disposal Site of General Industrial Waste (GB 18592-2001);
23. Measures for the Administration of Environmental Protection of Transport Construction Projects (Order 5 of the Minister of Communications, May 2003);
24. Notice on Enhancing the Administration of Environmental Impact Assessment for International Financial Institutions (IFI) Financed Construction Projects, HJ [1993] No. 324, 1993).

2.1.3 Technical guidelines and specifications for environmental impact assessment

1. Technical Guidelines for Environmental Impact Assessment - General Principles (HJ2.1—-2011), September 1, 2011;
2. Technical Guidelines for Environmental Impact Assessment - Groundwater Environment (HJ/T2.3 -93), September 1993;
3. Technical Guidelines for Environmental Impact Assessment - Atmospheric Environment (HJ2.2—-2008), December 31, 2008;
4. Technical Guidelines for Environmental Impact Assessment - Acoustic Environment (HJ2.4—-2009), December 23, 2009;
5. Technical Guidelines for Environmental Impact Assessment - Ecological Environment (HJ19—-2011), April 8, 2011;
6. Technical Guidelines for Environmental Impact Assessment - Groundwater Environment (HJ610-2011), February 11, 2011;
7. Technical Guidelines for Environmental Risk Assessment on Projects (HJ/T 169 —2004) December 11, 2004;

2.1.4 Relevant planning and environmental function division documents

1. Overall Construction Scheme for Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area (Nov. 14, 2012)
2. Approval of the Overall Construction Scheme for Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area (Nov. 2012)
3. Approval of Adjustment of Part of Adminsitrative Division of Guang'an (Feb. 2013)
4. Zoning Plan of Qianfeng District of Guang'an City (2013~2030)
5. Regulatory Plan of Qianfeng New City of Guang'an (2008-2020);
6. Overall Plan of Qianfeng Industrial Park of Guang'an District, Guang'an City (2011-2020);

2.1.5 Relevant technical documents for construction projects

1. Letter of Authorization for Preparation of Environmental Impact Assessment Report;
2. Feasibility Study Report of the Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project ;
3. Notice of Environmental Protection Bureau of Guang'an on Executive Environmental Standards for the Infrastructure Project for Qianfeng Industrial Park (GSF [2014] No. 119).

2.1.6 World Bank's Safeguard Policies

1. World Bank's ten safeguard policies and compliance

   There are ten operation policies on social and environmental safeguards of the World Bank. Based on the nature, the engineering layout, the scope of assessment as identified by the EA and the field investigation, a review and screening was carried out to see whether those ten policies are triggered and the findings are shown in the table below:

Table 2.1.6-1 Bank's Safeguard Operation Policies Triggered by the Project

SN	Description	Triggered by the Project (Yes/ No)	Reasons for Screening
1	OP/BP4.01 Environmental Assessment	Yes	Category A project; A full EIA and EMP are prepared; Two rounds of public consultation have been carried out as part of the EIA procedure.
2	OP/BP4.01 Natural Habitats	Yes	It is applicable to the policy. The construction and operation of the Project have potential negative impacts on the land and water areas in the project area. The operation of wastewater interceptors and related wastewater treatment plants has positive impacts on the water quality and ecosystem of rivers in the project area.
3	OP/BP4.36 Forests	No	Not triggered. The Project would not finance any activity that may involve a major change or degradation of the important forest area or related major natural habitat.
4	OP/BP4.09 Pest Management	No	Not triggered. No pesticide would be procured under the Project, causing no increase in the use of pesticide. No activity is needed according to the policy.
5	OP/BP4.11 Physical Cultural Resources	Yes	The project construction will involve the relocation of tombs, the procedures and compensation methods about which have been specified in the resettlement action plan (RAP)
6	OP/BP4.37 Safety of Dams	No	There is no dam in the project area.
7	OP/BP4.10 Indigenous Peoples	No	No indigenous group lives in the project area or is affected by the Project.
8	OP/BP4.12 Involuntary Resettlement	Yes	Triggered and a RAP is prepared.
9	OP/BP7.50 Projects on International Waterways	No	There is no international waterway involved in the project area.
10	OP/BP7.60 Projects on Disputed Areas	No	There is no disputed region involved in the project area.

2. Compliance of the Project with World Bank Group Environmental, Health, and Safety Guidelines and relevant policies

The *World Bank Group Environmental, Health, and Safety Guidelines* (the General EHS Guidelines), section on wastewater treatment of the *Environmental, Health, and Safety Guidelines for Water and Health*, the *Environmental, Health, and Safety Guidelines for Toll Roads*, section on waste collection and transport of the *Environmental, Health, and Safety Guidelines for Waste Management Facilities* are also applicable to the Project. The mitigation measures included in the Project Environmental Management Plan (EMP) are fully consistent with the requirements of the above EHS Guidelines (especially the provisions on construction management). It is noteworthy that what the EHS Guidelines recommend is largely consistent with the China's laws, regulations, guidelines, and construction management rules.

Table 2.1.6-2 Compliance with World Bank EHS Guidelines

World Bank EHS Guidelines	Compliance of EIA/EMP
If the facility or project is close to an identified ecologically sensitive area (such as a national park), it shall minimize the increase in pollution	Clean energy is used in the industrial park and can reduce the pollution level; there is no ecologically sensitive area inside the project area.

level whenever and wherever feasible. In addition, appropriate mitigation measures may also include the use of clean fuels or technologies, and application of comprehensive pollution control measures.	
The most common pollutant involved in fugitive emissions is dust or particulate matter (PM).This is released during certain operations, such as transport and open storage of solid materials, and from exposed soil surfaces, including unpaved roads.	Dust-control methods, such as coverage, sprinkling for dust suppression or moderate wetting of the materials in open-air stack will be applied during the construction period. Sprinkling and suppression will be applied to the transport of materials on paved or unpaved roads.
Environmental, Health, and Safety Guidelines for Water and Sanitation	**Compliance of EIA/EMP**
No industrial wastewater, domestic wastewater, wastewater from operations of public works or storm water shall be discharged into a public or private wastewater treatment system unless it meets the pretreatment and monitoring requirements of such wastewater treatment system.	In Qianfeng Economic And Technological Development Zone, the industrial wastewater is not allowed to enter the wastewater treatment plant (WWTP) unless it is subject to a pretreatment and meets the Level 3 discharge limits of the *Integrated Wastewater Discharge Standards* (GB8978-1996).
Storm water shall be separated from industrial wastewater and domestic wastewater in order to reduce the wastewater generation that needs treatment before emission.	Separate storm water and wastewater systems are applied in Qianfeng Economic And Technological Development Zone, and separate storm sewers and wastewater pipes will be laid.
Noise prevention and control measures shall be applied if the predicted noise level at the most sensitive receiving point due to the operation of project facilities or operation activities will exceed the noise limits.	Low sound power level equipment will be selected; vibration isolation device will be installed for machinery and equipment; Running time of certain equipment or operation will be limited, particularly mobile noise sources that will travel through in a community.
Design, construct, operate, and maintain wastewater treatment facilities and achieve effluent water quality consistent with applicable national requirements or internationally accepted standards.	The Level 1-A standards of the *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002) will be executed for wastewater discharge from the WWTP.
Odors from treatment facilities can also be a nuisance to workers and the surrounding community.Measures are recommended to prevent, minimize, and control air emissions and odors.	Structures, such as coarse screen and influent pumping station, may be designed as enclosed chambers with covers at the top to constrain the odor diffusion space. For the sludge dewatering room that is of bigger space, odor will be collected for centralized biological treatment. An isolation zone consists of tall trees that are strongly pollution resistant and capable of absorbing harmful gases will be provided around the WWTP boundary to function as an absorptive barrier. Health protection distance will be specified. No residence, schools or other projects with relatively high population density shall be planned within the 100m scope surrounding the WWTP site, especially in areas at its downwind direction.
Sludge treatment and utilization. Following stabilization, the sludge can be dewatered and disposed of in a landfill or incinerator, or subject to further processing for beneficial uses.	Sludge will be dewatered by mechanical pressure filter and transferred to the Guang'an Pu'an Waste Treatment Plant for sanitary landfilling.
Environmental, Health, and Safety Guidelines for Toll Roads	**Compliance of EIA/EMP**
Siting roads and support facilities to avoid critical terrestrial and aquatic habitat (e.g. old-growth forests, wetlands, and fish spawning habitat) utilizing existing transport	The area where the Project is located is not part of a critical terrestrial and/or aquatic habitat.

corridors whenever possible.	
Minimizing removal of native plant species, and replanting of native plant species in disturbed areas.	A water and soil conservation plan has been specially prepared. Native plant species as appropriate will be planted according to the water and soil conservation plan.
Paving in dry weather to prevent runoff of asphalt or cement materials.	During the construction period, paving works are prohibited in windy weather and working sites will be laid out in a proper manner.
Where significant oil and grease is expected, using oil/water separators in the treatment activities.	Vessels of oily wastewater from construction machinery will be provided on the working sites for collecting the oily wastewater to be generated. The collected oily wastewater will be delivered to a facility with the treatment capacity for treatment. Direct discharge is prohibited.
Avoiding the generation of contaminated runoff from cleaning of asphalt equipment by substituting diesel with vegetable oil as a release and cleaning agent; containing cleaning products and contaminated asphalt residues; scraping before cleaning; and conducting cleaning activities away from surface water features or drainage structures.	The technical specifications of the Contractor will include special requirements on the storage of fuel, oil/grease, and other hazardous or toxic matter, and that all the fuel materials on the working sites are fenced for storage; the space for storage is 110% of volume of the fuel storage vessels. Fuel storage sites are not to be located near any source waters (i.e., within 100m from the source water).
Insulation of nearby building structures (typically consisting of window replacements); Use of road surfaces that generate less pavement/tire noise such as stone-matrix asphalt.	There shall be restricting provisions on the functions of the areas along the arterial roadways during the operation period of the roads. Roadside buildings shall be rationally planned and laid out with optimal acoustic design and installed with sound-proof windows as appropriate. Asphaltic pavement is designed for all the road of the Project.
Environmental, Health, and Safety Guidelines for Waste Management Facilities	**Compliance of EIA/EMP**
Waste Collection and Transport	**Handed over to Guang'an Pu'an Waste Treatment Plant for unified treatment.**
Encourage use of containers or bags for waste at the point of collection for each household and establishment; implement a regular collection schedule with sufficient frequency to avoid accumulation of garbage; cover collection and transfer vehicles along the entire route of transport to avoid windblown litter.	Wastes will be dumped at designated sites and Local health department will be operating the equipment and facilities to collect and transport the refuse to the Guang'an Pu'an Waste Treatment Plant.
Establishing frequent waste collection schedules; Instituting a washing program for waste collection and transport vehicles and for company-owned waste collection and transfer containers; Promoting the use of bags to reduce the odors from soiling of waste collection and transport equipment.	
Optimize waste collection and transport routes to minimize distance traveled and overall fuel use and emissions; Implement transfer stations for small vehicles to consolidate waste into large vehicles for transport to a waste disposal plant.	

3. Compliance with Domestic Laws and Regulations

Preparation of the environmental assessment documents is in full accordance

with the above laws, regulations and guidelines. Compliance with domestic laws and regulations associated with the Project are summarized in the table below.

Table 2.1.6-3 Compliance with China Laws and Regulations

China's Laws and Regulations	Compliance of the Project
Law of the People's Republic of China on Environmental Impact Assessment	The full EIA report was prepared by a certified EIA consultant and the project implementation unit, and has been approved by the Sichuan Provincial Environmental Protection Department. Two rounds of public consultation have been carried out.
Notice on Enhancing the Administration of Environmental Impact Assessment for International Financial Institutions (IFI) Financed Construction Projects	The EIA report and EMP are in line with the Bank's Safeguard Policies.
Land Administration Law of the People's Republic of China	The Qianfeng Economic And Technological Development Zone meets the requirements on land use planning in *Zoning Plan of Qianfeng District of Guang'an City*.
Law of the People's Republic of China on Prevention and Control of Water Pollution	The Qianfeng Economic And Technological Development Zone will be developed with such sewer networks as to enable centralized wastewater treatment. The WWTP outfall is not located in a surface water source reserve.
Law of the People's Republic of China on Water and Soil Conservation	A soil and water conservation plan is prepared, and submitted to the Sichuan Water Authority for approval. Water and soil loss prevention and control measures will be carried out in accordance with the approved soil and water conservation plan. The sand, stone, soil, etc. abandoned during the building activities will be stacked on the spoil ground as specified in the water and soil conservation plan, and measures will be taken to ensure that no new hazards occur. A water and soil loss monitoring program is prepared and the monitored results will be reported on a regular basis to Guang'an Water Authority.
Law of the People's Republic of China on Protection of Cultural Relics	No cultural protection unit has been discovered withint the project area. During construction, any unit or individual, upon discovering cultural relics, shall protect the site and report to the local cultural relic administrative department immediately.
Law of the People's Republic of China on the Protection of Wildlife	An awareness campaign about the law on wildlife protection is carried out for the contractors; constructors must observe the *Law of the People's Republic of China on the Protection of Wildlife* and no hunting of wild animals is allowed in the construction and surrounding areas.

2.2 Assessment Purposes

1. Know well the physical and social environment of assessed area, understand existing environmental quality and issues on regional environment protection in the area and set clear environmental protection targets of project through the analysis and investigation of project overview and environmental conditions.

2. Select proper forecasting methods to predict the degree and scope of proposed project on the environment during the construction and operation and propose preventive measures.

3. Discuss the uniformity of economic, social and environmental benefits of the proposed project through analyzing the environmental and economic gains and losses. 4. Propose practical and feasible pollution prevention and control measures and discuss feasibility of environmental protection through actual assessment to provide basis for engineering and environmental management.

2.3 Assessment Principles

It is required to strictly implement the national and local regulations, decrees, standards and specifications on environmental protection and comply with requirements on Qianfeng urban development planning and environmental protection.

The Project is focused on the ecological impact assessment, acoustic environmental impact assessment, risk assessment and environmental protection measures and countermeasures during the construction, in the spirit that the ecological protection and pollution control should be well adapted to the regional ecological function and environmental protection targets.

The assessment shall be performed in accordance with the principle of scientificity, objectivity, fairness and practicability to ensure practical and realistic, objective and fair assessment.

2.4 Environmental Impacts, Assessment Factors and Criteria

2.4.1 Identification of environmental impacts

For the proposed project is located in Qianfeng District of Guang'an City, and the project is composed of the road works, wastewater interceptor works and landscape reconstruction works, so the wastewater treatment plant works related to the wastewater interceptors are assessed. Different impacts of engineering activities on the environmental aspects are mainly reflected on the ecological environment, acoustic environment, ambient air, social environment, surface water environment and groundwater environment. The process and results of identifying environmental impacts are shown in the table below.

Table 2.4.1-1 List of Identified Environmental Impacts

Engineering Activities / Environmental Resources		Prior Period		Construction Period			Operation Period	
		Land acquisition	Demolition	Material transport	Mechanical operation	Main works	Daily life	Vehicle driving
Social environment	Land use	■						□
	Economy	●						□
	Agriculture	■						
	Travel			●	●		□	□
	Tourism							□
Ecological resources	Water quality					●	□	
	Water and soil conservation					●		
	Farmland and nursery	■						
Physical environment	Living environment		●				□	
	Acoustic environment		●	●	●	●		■
	Water environment (including ground water environment)				●	●	□	
	Ambient air		●	●	●			■
	Landscaping		●		●	●	□	

Note: "□/ ○ " indicates long-term/short-term impacts; the solid/hollow symbol indicates unfavorable/favorable impacts; and the blank indicates no mutual impact.

1. Contents

The main contents of EIA are determined as below according to the engineering features and surrounding environmental features:

- Project overview and engineering analysis
- Environmental status investigation and assessment
- Environmental impact prediction and assessment
- Environmental protection measures
- Environmental risks
- Public consultation
- Conclusions

2. Assessment factors

Based on the survey along the proposed project and in combination with the engineering construction and operation features, regional environment functions of the project, importance of environmental factors and possible degree of impact, the environmental factors are identified and screened in all environmental aspects through the environmental impact analysis and the assessment factors are listed in the table below.

Table 2.4.1-2 List of Assessment Factors

Description	Environmental Factors	Assessment Factors
Road works	Ecological environment	Status quo: land use status, plants, animals, etc.; During construction: earth-rock, water and soil loss, plants, animals, etc.; During operation: impacts on plants, animals, landscape, etc.
	Ambient air	Status quo: NO_2, SO_2 and PM_{10}; During construction: asphalt fume and fugitive dust; During operation: NO_2 and CO.
	Water environment	Assessment factors of existing water environment quality: pH, SS, BOD_5, CODcr, NH3-N, etc.; During construction: SS, CODcr, BOD_5, animal and vegetable oils; During operation: SS, BOD_5 and petroleum.
	Acoustic environment	Status quo: Leq; During construction: mainly include construction noise from construction machinery: During operation: noise of road service.
	Solid waste	During construction: domestic garbage of constructors and construction waste; During operation: street refuse.
Wastewater interceptor works	Ecological environment	Status quo: land use status, plants, animals, etc.; During construction: earth-rock, water and soil loss, plants, animals, etc.
	Ambient air	Status quo: NO_2, SO_2 and PM_{10}; During construction: fugitive dust; During operation: NO_2 and CO.
	Water environment	Assessment factors of existing water environment quality: pH, SS, BOD_5, CODcr, NH3-N, etc.; During construction: SS, CODcr, BOD_5, animal and vegetable oils;
	Acoustic	Status quo: Leq;

Description	Environmental Factors	Assessment Factors
	environment	During construction: mainly include construction noise from construction machinery; During operation: noise from pump station.
	Solid waste	During construction: domestic garbage of constructors and construction waste; During operation: street refuse.
Landscape Reconstruction Works	Ecological environment	Status quo: land use status, plants, animals, etc.; During construction: earth-rock, water and soil loss, plants, animals, etc.; During operation: impacts on plants, animals, landscape, etc.
	Ambient air	Status quo: NO_2, SO_2, PM10, H_2S and NH_3; During construction: fugitive dust;
	Water environment	Assessment factors of existing water environment quality: pH, SS, BOD_5, CODcr, NH3-N, etc.; During construction: SS, CODcr, BOD_5, animal and vegetable oils;
	Acoustic environment	Status quo: Leq; During construction: mainly include construction noise from construction machinery;
	Solid waste	During construction: domestic garbage of constructors and construction waste; During operation: refuse removal

2.5 Assessment Criteria

2.5.1 Environment function division

The environment function divisions in the project area are listed in the table below:

Table 2.5.1-1 List of Environment Function Divisions

SN	Description	Category of Assessed Area
1	Ecological function division	The project area is located in Qujiang Ecological Industrial Area II -- Qujiang Ecological Industrial Area II 2 in Middle Hills Ecological Industrial Comprehensive Development Area
2	Water and soil conservation “Three-zone” division	Provincial key rehabilitation region in Qianfeng District of Guang’an City
3	Noise function division	Qianfeng Industrial Park is divided into three types of standard applicable areas and noise function regionalization has not been implemented in the other regions in Qianfeng District, in accordance with the *Approval of the People’s Government of Guang’an on the City-wide Adjustment of Urban Ambient Noise Function Zones* (GAFF [2010] No. 125).
4	Water environment function division	Luxi River is classified as category III water area function zone in accordance with the *Notice of General Office of the People’s Government of Guang’an on the Issuance of Scheme for Regionalizing Water Environment Function in Guang’an (GAFBH [2007] No. 102).*
5	Air environment function division	Qianfeng District is classified as Class II function zone in accordance with the *Notice of General Office of the People’s Government of Guang’an on the Issuance of Scheme for Regionalizing Ambient Air Quality Function in Guang’an* (GAFB [2007] No. 93).
6	Nature reserve	Not involved
7	Scenic spot	Not involved
8	World cultural and natural heritage	Not involved
9	Source water	No approved centralized drinking water source protection area

SN	Description	Category of Assessed Area
	protection area and water source	involved
10	Forest park	Not involved
11	Geopark	Not involved
12	Cultural relics protection unit	No cultural relics protection unit involved

2.5.2 Assessment criteria

The assessment criteria is made as per *Notice of Environmental Protection Bureau of Guang'an on Executive Environmental Standards for the Infrastructure Project for Qianfeng Industrial Park* (GSF [2014] No. 119).

1. Acoustic environment

(1) Acoustic environment quality standard

Class 4a standard in the *Environmental Quality Standard for Noise* (GB3096-2008) is executed in area within 30m right of way, Class III standard in the industrial park and Class II standard in other areas.

Table 2.5.2-1 Limits for Environmental Noise (unit: dB (A))

Location	Day (dB (A))	Night (dB (A))	Executive Standards
Residential area	60	50	GB3096-2008, Class II
Industrial park	65	55	GB3096-2008, Class III
On both sides of traffic artery	70	55	GB3096-2008, Class IVa

(2) Noise emission standard

The *Emission Standard of Environment Noise for Boundary of Construction Site* (GB12523-2011) is executed for noise during the construction period. See the table below for details.

Table 2.5.2-2 Limits for Noise at Construction Site (unit: dB (A))

Category	Day	Night	Executive Standards
Noise during the construction period	70	55	GB12523-2011

2. Ambient air

(1) Ambient Air Quality Standard

Due to the location of the Project in Class II environment function zone, Class II standard in *Ambient Air Quality Standard* (GB3095-2012) is executed. See the table below for limits.

Table 2.5.2-3 Ambient Air Quality Standard

Assessment Criteria		SO_2	NO_2	PM_{10}
Ambient Air Quality Standard (GB3095-1996), Class II standard	Annual average	0.06	0.04	0.07
	Daily average	0.15	0.08	0.15
	Hourly average	0.50	0.2	/

(2) Pollutant emission standard

Due to the location of works in Class II zone as per in *Ambient Air Quality Standard* (GB3095-1996), Class II standard in *Comprehensive Emission Standard of Air Pollutants* (GB16297-1996) is executed for waste gas emission during the construction period. See the table below for maximum

allowable emission concentration limits of waste gas.

Table 2.5.2-4 Limits for Air Pollutant Emission

Comprehensive Emission Standard of Air Pollutants (GB16297-1996), Class II standard		
Pollutant	NO_x	CO
Concentration limit of fugitive emission (mg/m^3)	0.12	/

3. Surface water environment

(1) Water environment quality standard

Due to the location of the Project in Qianfeng District of Guang'an City, Luxi River is the main river in the assessed area and standards of category III water area in *Environmental Quality Standards for Surface Water* (GB3838-2002) are executed for the surface water environment quality. See the table below for details.

Table 2.5.2-5 Limits for Surface Water

Water Quality Factor	pH	COD_{Cr}	BOD_5	NH_3-N	TP	Fecal coliform
Concentration limit	6～9	20mg/L	4.0 mg/L	1.0 mg/L	0.2 mg/L	10000/L

(2) Wastewater discharge standard

Class 1 standard in *Integrated Wastewater Discharge Standard* (GB8978-1996) is executed for domestic sewage and production wastewater discharge during the construction period. Please refer to the table below.

Table 2.5.2-6 Integrated Wastewater Discharge Standard Unit: mg/L

Discharge Standard	Pollutants				
	pH	SS	CODcr	BOD_5	Animal and vegetable oil
Class I Standard in GB8978-1996	6~9	70	100	30	20

4 Groundwater environment

Class III standard in *Quality Standard for Ground Water* (GB/T14848-93) is executed for groundwater environment. See the table below for details.

Table 2.5.2-7 Limits for Groundwater (unit: mg/LM, excluding pH)

Item		Class III standard
1	pH	6.5～8.5
2	Total hardness (in C_aCO_3)	≤450
3	Total dissolved solids	≤1000
4	Sulfate	≤250
5	Chloride	≤250
6	Fe	≤0.3
7	Nitrate	≤20
8	NH_4	≤0.2
9	Volatile phenol	≤0.002
10	Cyanide	≤0.05
11	Fluoride	≤0.1

Item		Class III standard
12	Zn	≤1.0
13	As	≤0.05
14	Hg	≤0.001
15	Cr^{6+}	≤0.05
16	Cd	≤0.01
17	Pb	≤0.05
18	total coliform	≤3.0

5. Solid waste

Relevant requirements in *Standard for Pollution on the Storage and Disposal Site for General Industrial Solid Wastes* (GB18599-2001) shall prevail.

6 Prevention and control standards of water and soil loss

In accordance with the *Technical Code on Soil and Water Conservation of Development and Construction Projects* and the *Prevention and Control Standards of Water and Soil Loss in the Development and Construction Projects*, Qianfeng District of Guang'an City involved in the Project is classified as a provincial key rehabilitation region and the water and soil loss prevention and control standards (Class II) apply to the Project.

Table 2.5.2-8 Prevention and Control Standards of Water and Soil Loss

Item	Standards and Specifications		Correction by the precipitation		Correction by soil erosion intensity		Correction by landform		Final value applied	
Period	Construction period	Trial operation	Construction period	Trial operation	Construction period	Trial operation	Construction period	Trial operation	Construction period	Trial operation
Treatment percentage of disturbed land (%)	*	95	*	0	*	*	*	*	*	95
Controlled percentage of erosion area (%)	*	85	*	+5	*	*	*	*	*	90
Controlled ratio of soil erosion modulus (%)	0.5	0.7	*	*	+0.1	+0.3	*	*	0.6	1.0
Percentage of dammed slag or ashes (%)	90	95	*	*	*	*	0	0	90	95
Recovery percentage of forestry and grass (%)	*	95	*	+4	*	*	*	*	*	99
Percentage of the forestry and grass coverage (%)	*	20	*	+5	*	*	*	*	*	25

2.6 Level and Focus of Assessment

2.6.1 Level of Assessment

Table 2.6.1-1 Environmental Factors and Assessment Level

SN	Component	Environmental Factors and Assessment Level				
		Air	Surface water	Groundwater	Acoustic environment	Ecological environment

1	Road works	Level 2	Level 3	---	Level 1	Level 3
2	Wastewater interceptors	Level 3	Level 3	---	Level 3	Level 3
3	Landscape Reconstruction	Level 3	Level 3	Level 3	Level 3	Level 3

2.6.2 Assessment focus

According to the engineering features and surrounding environmental features of the proposed project, this assessment is focused on the air environment impact, surface water environment impact, acoustic environment impact, risks and the environmental protection measures and countermeasures during the construction period, with the impact analysis for public consultation and social environment taken into consideration.

2.7 Assessment Scope and Environmentally Sensitive Area

2.7.1 Assessment scope

1 Assessment scope of each project component

According to the EIA guidelines, the assessment scope of each environmental factor in the Project is shown in the table below:

Table 2.7.1-1 Assessment Scope of Each Project Component

Environmental Factor	Assessment Scope	
Ecological environment	Road works	300m within both sides of the road central line
	Wastewater interceptor works	300m within both sides of the pipeline central line
	Landscape reconstruction works	300m within both sides of the central line of green belt
Acoustic environment	Road works	200m within both sides of the road central line
Surface water environment	Road works	Domestic sewage from construction camp at 200m within both sides of the road central line; from 100m upstream to 1,000m downstream of the proposed bridge
Groundwater environment	Wastewater interceptor works	All hydrogeological units where the works is located
Air environment	Road works	200m within both sides of the road central line; within 300m outside the construction boundary
Risk assessment	Wastewater interceptor works	From 100m upstream to 1,000m downstream of the proposed bridge
Social environment	Throughout Qianfeng District	

According to the principle of EIA Policy OP4.01 of the World Bank, the potential impact scope of the Project shall be contained in the EIA, including Luxi River landscape reconstruction, road construction, wastewater interceptor construction as well as the WWTP. These assessment objects contain activities to be or not to be funded by the World Bank loan, and the specific analysis is shown in Chapter 3.

2 Induced and cumulative environmental impact assessment scope

The Project is located in Qianfeng District, Guang'an City and the assessment will not only include the environmental impact of the Project, but also include the environmental impact of the constructed area of the development zone; and the environmental impact of the current development activity will be predicted.

See the figure below for the details of induced and cumulative impact assessment scope:

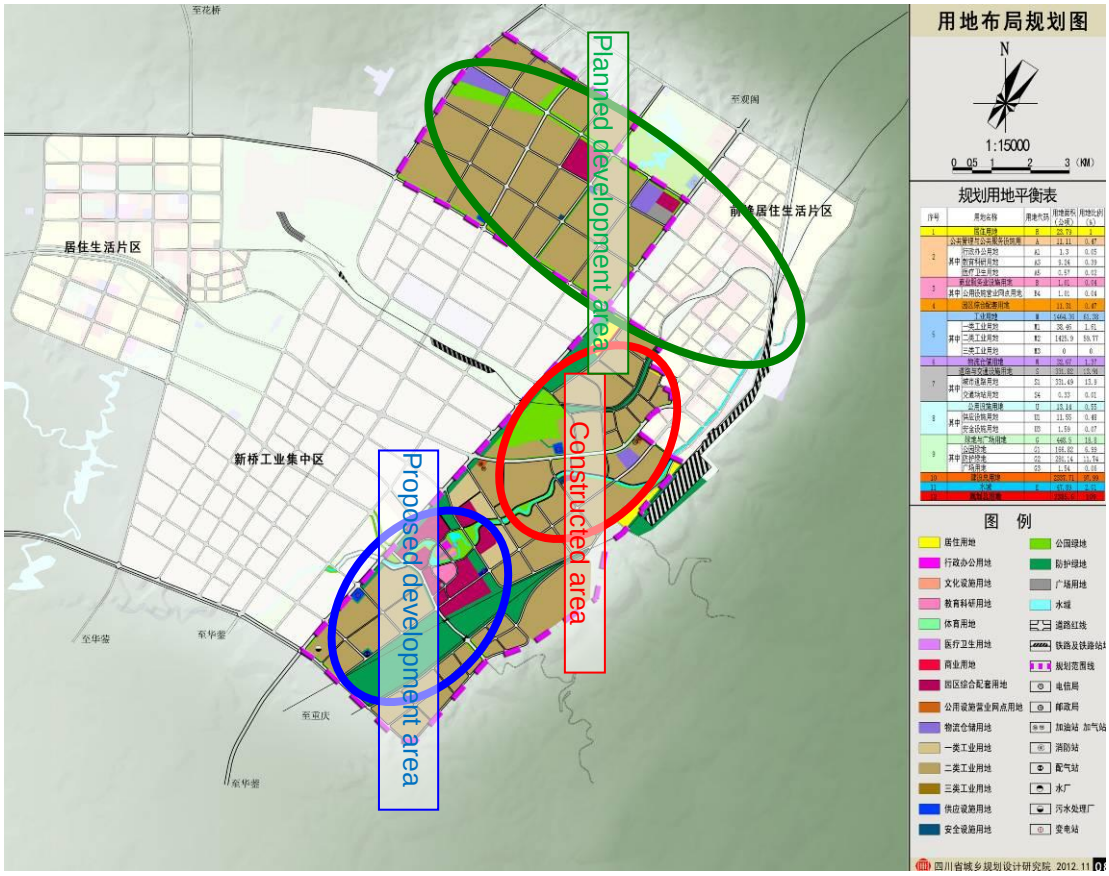


Figure 2.6.1-1 Cumulative Assessment Scope

2.8 Environmental Protection Targets and Pollution Control

2.8.1 Environmental protection targets

The environmental protection targets and distribution of this assessment are determined through field survey and investigation and by combining the environmental impact features of the Project and the distribution of sensitive areas in the scope of assessment. See the diagram of external environment relations for the distribution of targets.

1. Social environment protection targets

   The targets include the regional socio-economic development, land use, the living standard of land-acquired and relocated residents and the compliance of planning.

2. Ecological environment protection targets

   The targets include the cultivated land and the vegetation and water and soil conservation facilities. See the table below for details.

Table 2.8.1-1 Ecological Environment Protection Targets around the Project

SN	Sensitive targets	Location	Main Contents of Protection
1	Cultivated land	Land for permanent and temporary	Farmland, paddy field in particular

SN	Sensitive targets	Location	Main Contents of Protection
		acquisition	
2	Natural vegetation	Land for permanent and temporary acquisition	Natural vegetation
3	Aquatic animals and plants	Construction of the landscapes of Luxi River	Aquatic animals and plants of Luxi River within the scope of assessment; rare fishes and “three grounds ” for fishes not involved
4	Water and soil conservation	Land of surface excavation and temporary storage yard	Water and soil loss

3 Water environment protection objects

Table 2.8.1-2 Water Environment Protection Targets around the Project

Name of Sensitive Area	Locational Relation with the Project	Level and Type of Protection Target	Overview
Luxi River	The wastewater interceptors are distributed along the North and South Binhe Road and the Bridge 1 on Industrial Avenue passing through the Luxi River	Surface water, category III waters	Luxi River is the primary branch of Qujiang River, which is located in the northeast of Sichuan Province, with the geographical coordinates of 106°17′ ~ 109°00′ E, 30°00′ ~ 32°45′ N, high in the north and east and increasingly low in the downstream.

4. Acoustic and air environment protection targets

According to the FSR and site survey, the acoustic and air environment protection targets of the Project are shown as follows:

Table 2.8.1-3 Distribution of Acoustic Environment Sensitive Targets for the Road Works

Road	Number of Target	Name of Target	Function	Mileage	Locational Relation with Right of Way (m)			Scale and Overview of Sensitive Area	Environment Function Divisions
					Location	Shortest Distance	Height Difference		
Industrial Avenue	N1-1	Youjiayuanzi, Group 4, Chunlei Village	Residence	K0+180~+360	On the right side	25	3	With 21 households, residing in the self-built housing with 1~3 floors either in ordinary brick masonry structures or in masonry-concrete structures	Category 3 area
	N1-2	Ancient Yejiayuanzi, Group 5, Xinqiao Village	Residence	K1+320~+420	On the right side	130	-3	With 12 households, residing in the self-built housing with 1~5 floors either in ordinary brick masonry structures or in masonry-concrete structures	Category 3 area

Road	Number of Target	Name of Target	Function	Mileage	Locational Relation with Right of Way (m)			Scale and Overview of Sensitive Area	Environment Function Divisions
					Location	Shortest Distance	Height Difference		
	N1-3	Luojiayuanzi, Group1, Yongxin Village	Residence	K1+320~+420	On the left side	26	-1	With 17 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 3 area
	N1-4	Yujiayuanzi, Group 5, Suzhai Village	Residence	K1+500~+560	On the left side	36	-1	With 7 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 4a\3
	N1-5	Daijiayuanzi, Group 5, Eli Village	Residence	K1+680~+820	On the right side	100	4	With 18 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 4a\3
	N1-6	Pujiayuanzi, Group 3, Eli Village	Residence	K1+940~K2+000	On the right side	93	5	With 6 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 4a\3
	N1-7	Groups 1 and 2, Jijian Village	Residence	K2+720~K3+260	On the left side	46	-4	With 53 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 4a\3
North Binhe Road	N2-1	Group 2, Jingwan Village	Residence	K0+200~+260	On the left side	6	1	With 8 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 3 area
	N2-2	Group 7, Chunlei Village	Residence	K0+560~+720	On the left side	23	-4	With 12 households, residing in the self-built housing with 1~2 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 3 area
	N2-3	Group 3, Chunlei Village	Residence	K0+720~+960	On the left side	116	-2	With 30 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 3 area

Road	Number of Target	Name of Target	Function	Mileage	Locational Relation with Right of Way (m)			Scale and Overview of Sensitive Area	Environment Function Divisions
					Location	Shortest Distance	Height Difference		
	N2-4	Group 4, Chunlei Village	Residence	K1+520~+680	On the left side	12	-4	With over 27 households, mainly residing in self-built housing with 1~3 floors, mainly in brick masonry and masonry-concrete structures	Category 3 area
	N2-5	Group 4, Gaofeng Village	Residence	K2+500~+600	On the left side	6	1	With 14 households, residing in the self-built housing with 1~3 floors, mainly in masonry-concrete structures	Category 3 area
	N2-6	Group 4, Yongxing Village	Residence	K2+800~+920	On the left side	14	1	With 16 households, residing in the self-built housing with 1~3 floors, mainly in masonry-concrete structures	Category 3 area
South Binhe Road	N3-1	Group 1, Jingwan Village	Residence	K0+120~+520	On the right side	60	-3	Sporadically distributed with about 30 households, residing in the self-built housing with 1~3 floors, mainly in masonry-concrete structures	Category 3 area
	N3-2	Group 6, Chunlei Village	Residence	K0+860~K1+060	On the right side	13	-2	Sporadically distributed with about 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	N3-3	Group 8, Chunlei Village	Residence	K1+120~+200	On the right side	15	1	Sporadically distributed with about 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	N3-4	Liujiayuanzi, Group 8, Chunlei Village	Residence	K1+460~+600	On the right side	48	2	With 16 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	N3-5	Luojialiangzi, Group 5, Xinqiao Village	Residence	K1+800~K2+220	On the right side	69	-4	With 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area

Road	Number of Target	Name of Target	Function	Mileage	Locational Relation with Right of Way (m)			Scale and Overview of Sensitive Area	Environment Function Divisions
					Location	Shortest Distance	Height Difference		
	N3-6	Group 2, Yongxing Village	Residence	K0+440~+700	On the right side	30	1	With 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	N3-7	Wenjiayuanzi, Group 3, Yongxing Village	Residence	K0+820~+900	On the right side	10	-1	With 15 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	N3-8	Hejiayuanzi, Group 3, Yongxing Village	Residence	K1+100~+380	On the right side	25	-1	With 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	N3-9	Group 3, Jijian Village	Residence	K1+440~+600	On the right side	77	-1	With 12 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area

Table 2.8.1-4 Distribution of Acoustic Environment Protection Targets for the Wastewater Interceptor Works

Location	Name of Target	Function	Mileage	Locational Relation with Wastewater Interceptor (m)		Scale and Overview of Sensitive Area	Environment Function Divisions
				Location	Shortest Distance		
North Binhe Road	Group 2, Jingwan Village	Residence	K0+200~+260	On the left side	6	With 8 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 3 area
	Group 7, Chunlei Village	Residence	K0+560~+720	On the left side	23	With 12 households, residing in the self-built housing with 1~2 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 3 area
	Group 3, Chunlei Village	Residence	K0+720~+960	On the left side	116	With 30 households, residing in the self-built housing with 1~3 floors in adobe, masonry-timber, masonry-concrete or other structures	Category 3 area

Location	Name of Target	Function	Mileage	Locational Relation with Wastewater Interceptor (m)		Scale and Overview of Sensitive Area	Environment Function Divisions
				Location	Shortest Distance		
	Group 4, Chunlei Village	Residence	K1+520~+680	On the left side	12	With over 27 households, mainly residing in self-built housing with 1~3 floors, mainly in brick masonry and masonry-concrete structures	Category 3 area
	Group 4, Gaofeng Village	Residence	K2+500~+600	On the left side	6	With 14 households, residing in the self-built housing with 1~3 floors, mainly in masonry-concrete structures	Category 3 area
	Group 4, Yongxing Village	Residence	K2+800~+920	On the left side	14	With 16 households, residing in the self-built housing with 1~3 floors, mainly in masonry-concrete structures	Category 3 area
South Binhe Road	Group 1, Jingwan Village	Residence	K0+120~+520	On the right side	60	Sporadically distributed with about 30 households, residing in the self-built housing with 1~3 floors, mainly in masonry-concrete structures	Category 3 area
	Group 6, Chunlei Village	Residence	K0+860~K1+060	On the right side	13	Sporadically distributed with about 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	Group 8, Chunlei Village	Residence	K1+120~+200	On the right side	15	Sporadically distributed with about 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	Liujiayuanzi, Group 8, Chunlei Village	Residence	K1+460~+600	On the right side	48	With 16 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	Luojialiangzi, Group 5, Xinqiao Village	Residence	K1+800~K2+220	On the right side	69	With 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	Group 2, Yongxing Village	Residence	K0+440~+700	On the right side	30	With 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	Wenjiayuanzi, Group 3, Yongxing Village	Residence	K0+820~+900	On the right side	10	With 15 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area

Location	Name of Target	Function	Mileage	Locational Relation with Wastewater Interceptor (m)		Scale and Overview of Sensitive Area	Environment Function Divisions
				Location	Shortest Distance		
	Hejiayuanzi, Group 3, Yongxing Village	Residence	K1+100~+380	On the right side	25	With 20 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area
	Group 3, Jijian Village	Residence	K1+440~+600	On the right side	77	With 12 households, residing in the self-built housing with 1~3 floors in adobe, brick masonry, masonry-concrete or other structures	Category 3 area

Table 2.8.1-5 Distribution of Acoustic Environment Protection Targets for the Landscape Renovation Works

Name of Target	Function	Locational Relation with Land Boundary of Landscape Renovation Works		Scale and Overview of Sensitive Area	Environment Function Divisions
		Location	Shortest Distance		
Residential district in Qianfeng Town	Residence	On both sides	15	Riverside housing with 6-7 floors in masonry-concrete structures	Category 2 area

Table 2.8.1-6 Distribution of Air Environment Sensitive Targets

Road	Name of Target	Function	Mileage	Locational Relation with Road (m)		Scale and Overview of Sensitive Area	Environment Function Divisions
				Location	Shortest Distance		
Industrial Avenue	Youjiayuanzi, Group 4, Chunlei Village	Residence	K0+180~+360	On the right side	36	With 21 households, residing in the self-built housing with 1~3 floors	Category 2 area
Industrial Avenue	Ancient Yejiayuanzi, Group 5, Xinqiao Village	Residence	K1+320~+420	On the right side	130	With 12 households, residing in the self-built housing with 1~5 floors	Category 2 area
Industrial Avenue	Luojiayuanzi, Group1, Yongxin Village	Residence	K1+320~+420	On the left side	30	With 17 households, residing in the self-built housing with 1~3 floors	Category 2 area
Industrial Avenue	Yujiayuanzi, Group 5, Suzhai Village	Residence	K1+500~+560	On the left side	33	With 7 households, residing in the self-built housing with 1~3 floors	Category 2 area
Industrial Avenue	Daijiayuanzi, Group 5, Eli Village	Residence	K1+680~+820	On the right side	100	With 18 households, residing in the self-built housing with 1~3 floors	Category 2 area
Industrial Avenue	Pujiayuanzi, Group 3, Eli Village	Residence	K1+940~K2+000	On the right side	93	With 6 households, residing in the self-built housing with 1~3 floors	Category 2 area

Road	Name of Target	Function	Mileage	Locational Relation with Road (m)		Scale and Overview of Sensitive Area	Environment Function Divisions
				Location	Shortest Distance		
Industrial Avenue	Groups 1 and 2, Jijian Village	Residence	K2+720~K3+260	On the left side	46	With 53 households, residing in the self-built housing with 1~3 floors	Category 2 area
North Binhe Road	Group 2, Jingwan Village	Residence	K0+200~+260	On the left side	6	With 8 households, residing in the self-built housing with 1~3 floors	Category 2 area
North Binhe Road	Group 7, Chunlei Village	Residence	K0+560~+720	On the left side	23	With 12 households, residing in the self-built housing with 1~2 floors	Category 2 area
North Binhe Road	Group 3, Chunlei Village	Residence	K0+720~+960	On the left side	116	With 30 households, residing in the self-built housing with 1~3 floors	Category 2 area
North Binhe Road	Group 4, Chunlei Village	Residence	K1+520~+680	On the left side	12	With 27 households, residing in the self-built housing with 1~3 floors	Category 2 area
North Binhe Road	Group 4, Gaofeng Village	Residence	K2+500~+600	On the left side	10	With 14 households, residing in the self-built housing with 1~3 floors	Category 2 area
North Binhe Road	Group 4, Yongxing Village	Residence	K2+800~+920	On the left side	14	With 16 households, residing in the self-built housing with 1~3 floors	Category 2 area
South Binhe Road	Group 1, Jingwan Village	Residence	K0+120~+520	On the right side	60	Sporadically distributed with about 30 households, residing in the self-built housing with 1~3 floors	Category 2 area
South Binhe Road	Group 6, Chunlei Village	Residence	K0+860~K1+060	On the right side	22	Sporadically distributed with 20 scattered households, residing in the self-built housing with 1~3 floors	Category 2 area
South Binhe Road	Group 8, Chunlei Village	Residence	K1+120~+200	On the right side	15	Sporadically distributed with 20 scattered households, residing in the self-built housing with 1~3 floors	Category 2 area
South Binhe Road	Liujiayuanzi, Group 8, Chunlei Village	Residence	K1+460~+600	On the right side	48	With 16 households, residing in the self-built housing with 1~3 floors	Category 2 area
South Binhe Road	Luojialiangzi, Group 5, Xinqiao Village	Residence	K1+800~K2+220	On the right side	69	With 20 households, residing in the self-built housing with 1~3 floors	Category 2 area
South Binhe Road	Group 2, Yongxing Village	Residence	K0+440~+700	On the right side	30	With 20 households, residing in the self-built housing with 1~3 floors	Category 2 area
South Binhe Road	Wenjiayuanzi, Group 3, Yongxing Village	Residence	K0+820~+900	On the right side	10	With 15 households, residing in the self-built housing with 1~3 floors	Category 2 area
South Binhe Road	Hejiayuanzi, Group 3, Yongxing Village	Residence	K1+100~+380	On the right side	25	With 20 households, residing in the self-built housing with 1~3 floors	Category 2 area

Road	Name of Target	Function	Mileage	Locational Relation with Road (m)		Scale and Overview of Sensitive Area	Environment Function Divisions
				Location	Shortest Distance		
South Binhe Road	Group 3, Jijian Village	Residence	K1+440~+600	On the right side	77	With 12 households, residing in the self-built housing with 1~3 floors	Category 2 area

Since the Project aims at the infrastructure construction of the Industrial Park, the existing sensitive area within the Industrial Park will be demolished successively after the completion of the Project.

2.8.2 Pollution control target

(1) Control and reduce water and soil loss and vegetation destruction by the land acquisition and protect the ecological environment;

(2) Properly handle the impact of project on the socio-economic environment and avoid compromising the environment quality;

(3) Strengthen the construction management to avoid pollution caused by fugitive dust to the regional air environment;

(4) Ensure the emission of up-to-standard pollutants and prevent noise nuisance. All means of pollutant treatment shall satisfy the requirements of urban planning and environmental management.

2.9 Technical Method for Assessment

2.9.1 Technical method

Based on the nature of proposed project, the mode prediction method is applied for noise and ambient air in this assessment, while investigation and analogy analysis are applied for ecological environment, social environment, surface water and ground water environment.

2.9.2 Procedures of assessment

The procedures of this assessment are shown in the following figure:

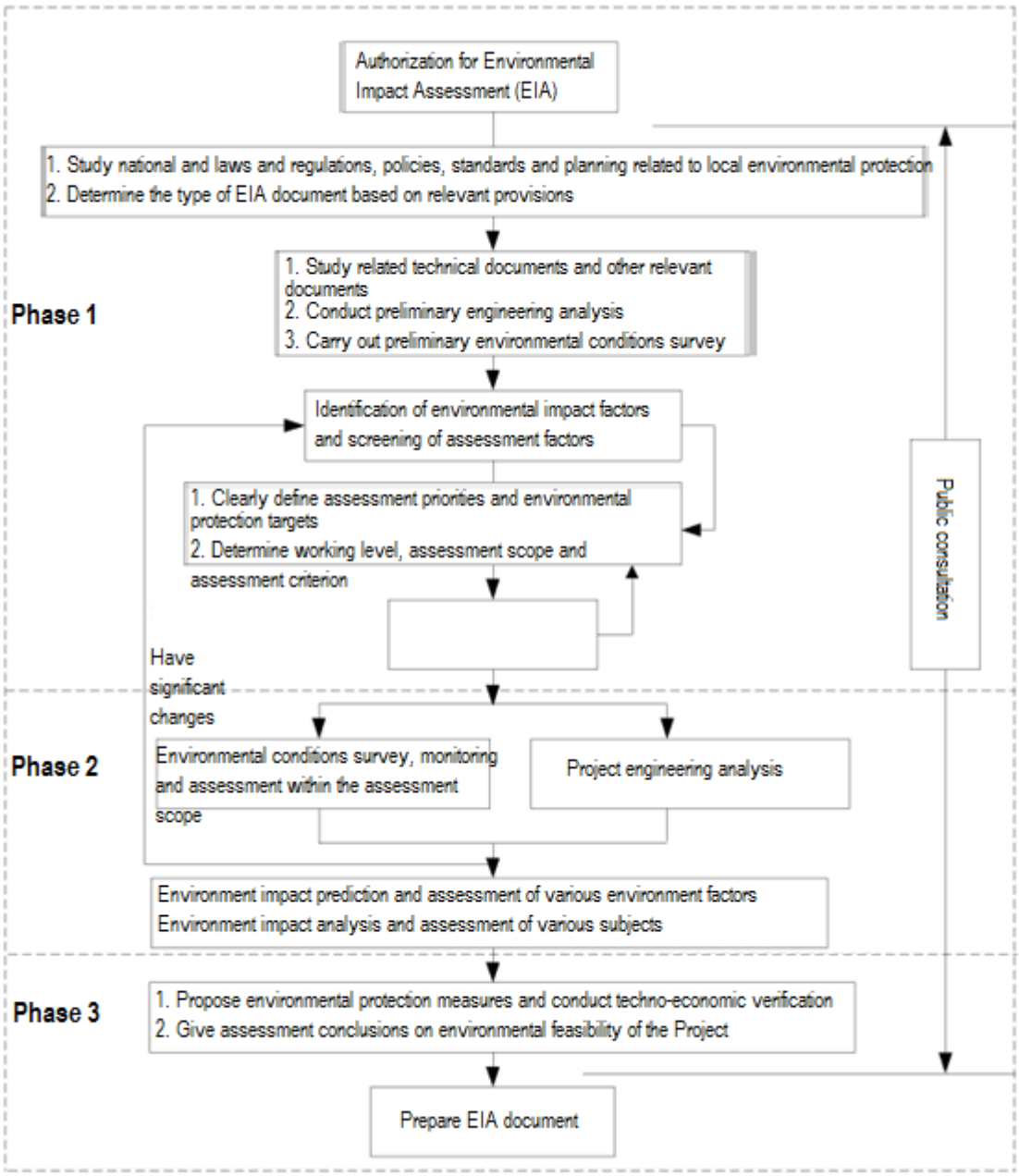


Figure 2.9.2-1 Diagram of Assessment Procedures

3 Project Overview and Engineering Analysis

3.1 Name, Nature and Location of the Project

Project name: Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area

Project nature: Municipal infrastructure projects

Type of Construction: New

Geographic Location: the Project is located in Qianfeng District, Guang'an City, see the geographical location map below for details.

Figure 3.1-1 Geographic Location Map of the Project

3.2 Project Components

Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area includes three components, namely, municipal road, wastewater interceptors and wastewater treatment.

Items to be funded by the World Bank loan within the scope of assessment include:

(1) Three municipal traffic roads, design of which includes water supply and drainage pipe network, lighting, electric power and communication pipe trench, bus stop, traffic safety and management facilities (signs and mark lines, barrier-free facilities of roads, and traffic lights), of which South and North Binhe Road include the landscaping works.

(2) Two new wastewater interceptors on both sides of the upper, middle and lower reaches of Luxi River in Qianfeng District, with pipe length of 13066m and diameter of DN400~DN1200.

(3) Luxi River landscape reconstruction works, which includes the landscape

on both sides of the upstream Luxi River in Qianfeng District, with a length of about 1400m and width of about 20~60m.

Items not to be funded by the World Bank loan within the scope of assessment include:

(1) One municipal traffic road works, Guang'an Port-Qianfeng Avenue, which is proposed to be constructed during 2014~2015 and the design of which includes lighting, landscaping and pipe networks;

(2) New WWTPs for Qianfeng District, Guang'an City and Western Jeans Industrial Zone, with a construction scale of 20,000m^3/d.

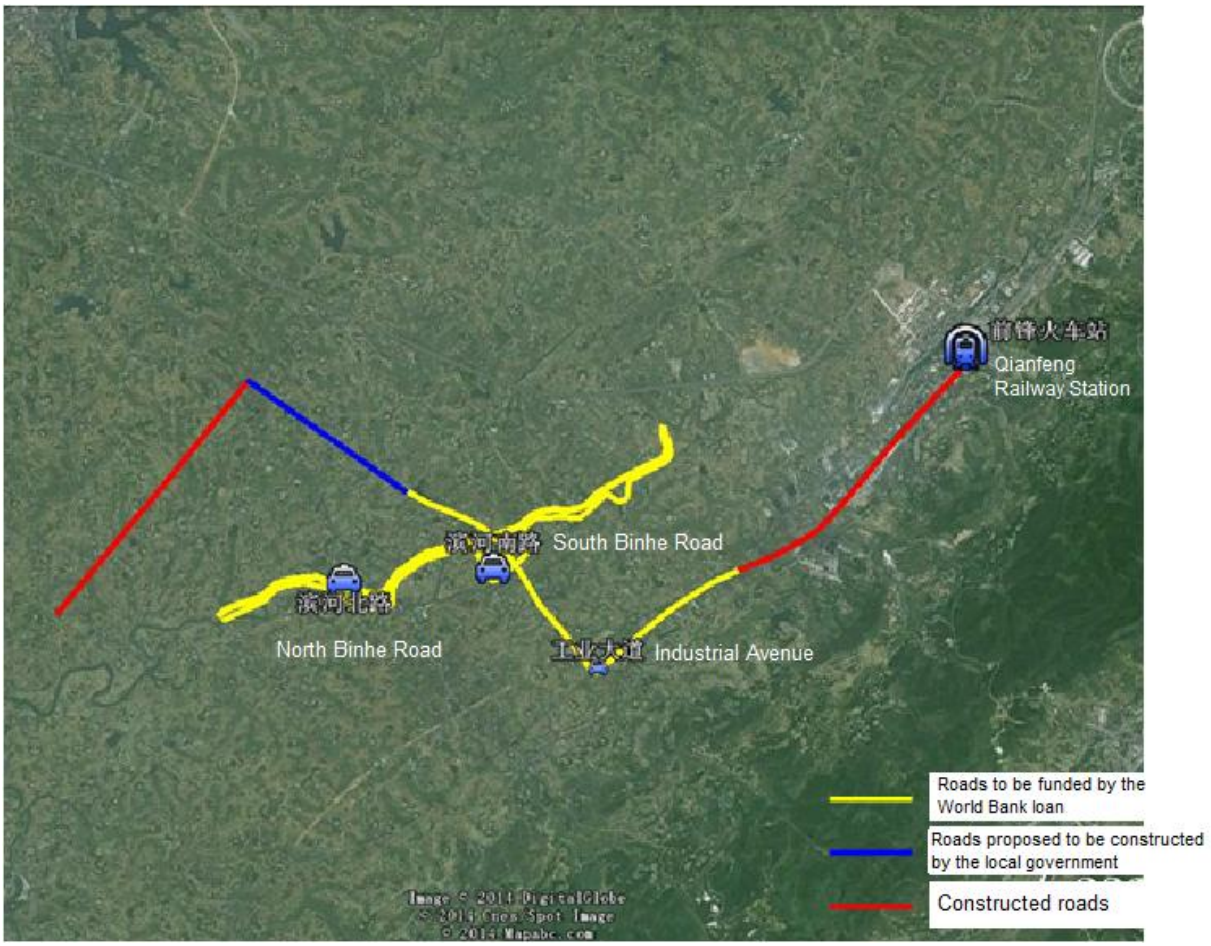
3.2.1 Road works component

See Table 3.2.1-1 for the project components and Table 3.2.4-1 for the project road network.

Table 3.2.1-1 List of Road Works Component

Category		Component and Nature
Raod works component	Road works	Roads to be funded by the World Bank loan within the scope of assessment include: 3 new roads will be constructed, with a total length of 11540.476m and width of 18~30m, in which: Industrial Avenue has a total length of 3279.035m and right-of-way width of 30m, being an urban trunk road with two-way four lanes and a design speed of 50km/h; North Binhe Road has a total length of 3,831.305m and right-of-way width of 18m, being an urban branch road with two-way two lanes and a design speed of 20km/h; South Binhe Road, including Section A, B and C, of which Section A has a total length of 1,945.343m and right-of-way width of 18m, being an urban branch road with two-way two lanes and a design speed of 20km/h; Section B has a total length of 358.172m and right-of-way width of 20m, being an urban branch road with two-way four lanes and a design speed of 20km/h; and Section C has a total length of 2,126.594m and right-of-way width of 18m, being an urban branch road with two-way two lanes and a design speed of 20km/h. Items not to be funded by the World Bank loan within the scope of assessment include: 1 The Guang'an Port-Qianfeng Avenue is proposed to be constructed, with a total length of 1,600m and width of 24m, connecting to the Industrial Avenue and the existing Keta Road.
	Bridge works	The new Medium Bridge 1 with a length of about 35m on Industrial Avenue will be built and a 1×25m small prestressed box girder crossing the Luxi River will be provided.
	Pipe network	Rainwater pipe network will be laid along South and North Binhe Road and Industrial Avenue, with a pipe length of 19,275m (including rainwater branch pipe, gutter inlet connecting pipe) and pipe diameter of d500~d1800; Sewage pipe network will be laid along the Industrial Avenue, with a pipe length of 600m and pipe diameter of d400mm.
	Landscaping works	For Industrial Avenue, it mainly includes the landscaping on the outer separators on both sides of the 1.5m width MV and NMV

Category		Component and Nature
		mixed lanes and the 3m width sidewalk; For South and North Binhe Road, it mainly includes the landscaping on the sidewalks on both sides.
	Auxiliary works	Including bus stations and barrier-free facilities, road traffic safety and management facilities, slow traffic design and lighting works



1 Road works

Roads to be funded by the World Bank loan within the scope of construction include:

(1) Construction scale

The Project includes 3 roads, namely, Industrial Avenue, South Binhe Road and North Binhe Road, with a total length of 11,540.476m. See Figure 3.2.1-1 for the details of the general layout of roads.

Industrial Avenue, the starting point of which is directly connected to the proposed Guang'an Port-Qianfeng Avenue (see the blue line in Figure 3.2.1-1), then it extends to intersect the North Binhe Road and South Binhe Road respectively, upon which it turns to the north and finally reaches the existing roads of Qianfeng District, connecting to Qianfeng Railway Station. It has a total length of 3279.035m and right-of-way width of 30m, being an urban trunk road with two-way four lanes and a design speed of 50km/h.

North Binhe Road, which will be constructed along the Luxi River with functions such as traffic, landscaping and entertainment, having a total length of 3,831.305m and right-of-way width of 18m, being an urban branch road with two-way two lanes and a design speed of 20km/h.

South Binhe Road, which will be constructed along the Luxi River, including Section A, B and C, of which Section A has a total length of 1945.343m and right-of-way width of 18m, being an urban branch road with two-way two lanes; Section B has a total length of 358.172m and right-of-way width of 20m, being an urban branch road with two-way four lanes; and Section C has a total length of 2126.594m and right-of-way width of 18m, being an urban branch road with two-way two lanes and a design speed of 20km/h.

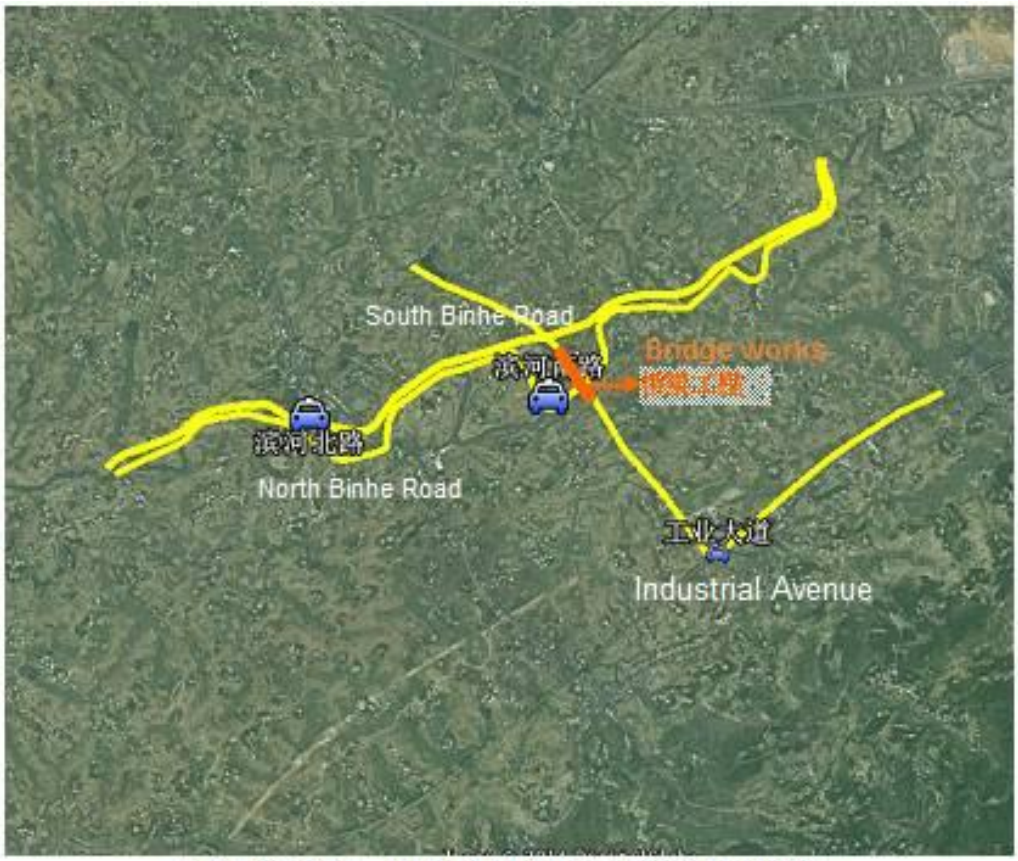


Figure 3.2.1-2 Site Plan for Roads to be Funded by the World Bank Loan

(2) Technical standard for road works

According to design documents, technical standard for new roads is shown in the table below.

Table 3.2.1-2 List of Technical Standards for Road Works

SN	Description		Length	Right-of-Way Width (m)	Grade	Design Speed (km/h)	Type of Pavement Structure
1	Industrial Avenue		3279.035	30	Urban trunk road	50	Asphalt concrete
2	North Binhe Road		3831.305	18	Urban branch road	20	Cement concrete
3	South	Section A	1945.343	18	Urban branch road	20	Cement concrete

	Binhe Road	Section B	358.172	20	Urban branch road	20	Cement concrete
		Section C	2126.594	18	Urban branch road	20	Cement concrete
Total			11540.449	/	/	/	/

(3) Road traffic volume prediction

According to FSR and by means of interpolation, the short term (2020), medium term (2026) and long term (2034) traffic volume of each road are calculated.

Table 3.2.1-3 Predictions of Traffic Volume of Each Road Unit: vehicle/hour

Road Name	Proposed roads in 2020						Proposed roads in 2026						Proposed roads in 2034					
	Heavy truck		Midsize car		Car		Heavy truck		Midsize car		Car		Heavy truck		Midsize car		Car	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Section A of Industrial Avenue	92	20	110	24	137	30	101	22	120	27	150	33	114	25	136	30	170	38
Section B of Industrial Avenue	17	4	21	5	26	6	18	4	22	5	27	6	20	4	24	5	30	7
North Binhe Road	11	3	13	3	17	4	12	3	14	3	18	4	13	3	15	3	19	4
South Binhe Road	10	2	12	3	14	3	10	2	12	3	15	3	11	3	13	3	17	4

(4) Cross-sectional design

Industrial Avenue (urban trunk road):

The cross-section will be composed of 3m (sidewalk), 3m (NMV lane), 1.5m (outer separator), 0.25m (marginal strip), 2×3.5m (carriageway), 0.5m (marginal strip), 2×3.5m (carriageway), 0.25 (marginal strip), 1.5m (outer separator), 3m (NMV lane) and 3m (sidewalk). The cross-section diagram is shown as follows:

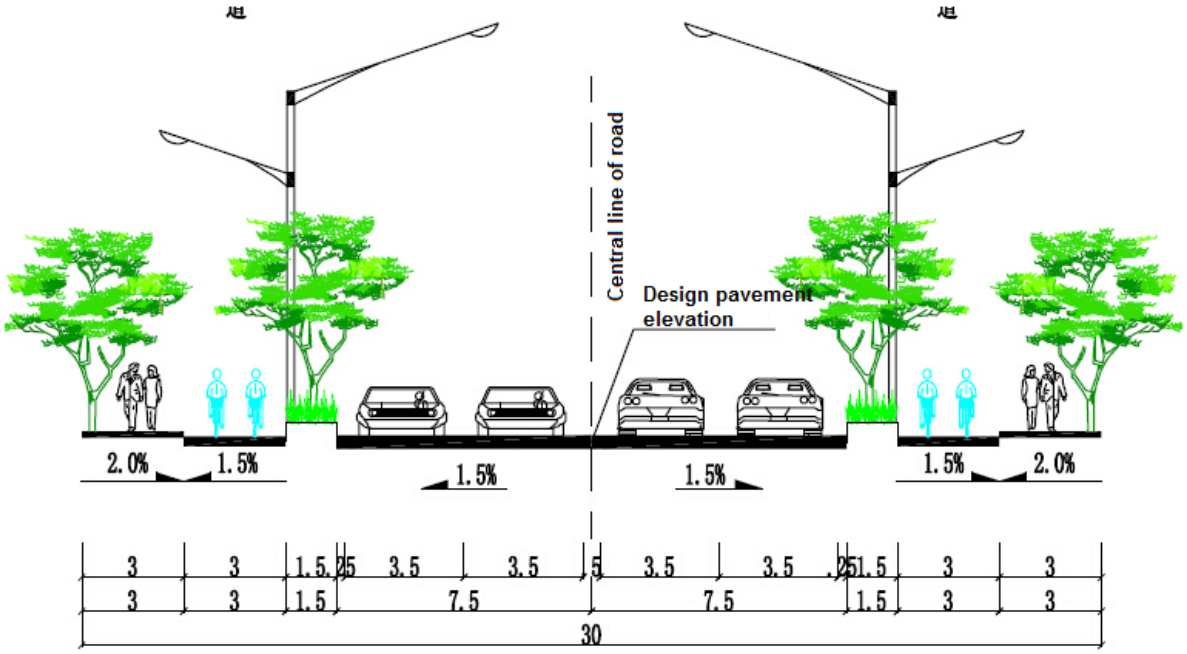


Figure 3.2.1-3 Cross-sectional Diagram of Urban Branch Road

North Binhe Road (urban branch road):

The cross-section will be composed of 3.0m (green belt on the left side of road), 4m (sidewalk and NMV mixed lane), 0.25m (marginal strip), 3.5m (carriageway), 3.5m (carriageway), 0.25m (marginal strip) and 4m (sidewalk and NMV mixed lane).

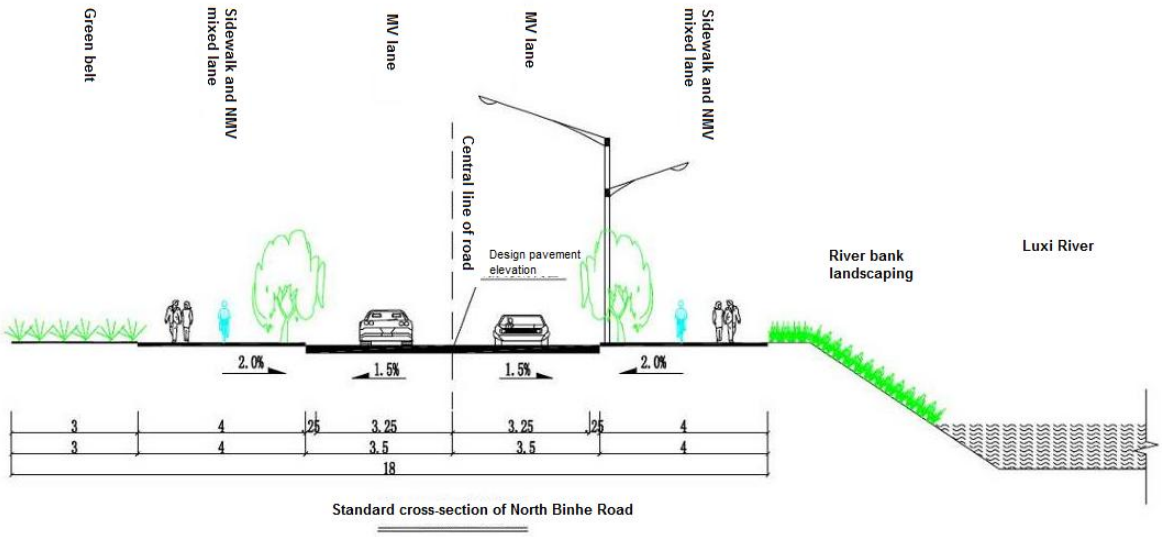


Figure 3.2.1-4 Cross-sectional Diagram of Urban Branch Road

South Binhe Road (urban branch road):

It is the urban branch road to be constructed on both sides of Luxi River with a design speed of 20km/h, consisting of Section A, B and C, of which the width of Section A and C will be 18m and that of Section B will be 20m.

The cross-section of Section A and C will be composed of 4m (sidewalk and NMV mixed lane), 0.25m (marginal strip), 3.5m (carriageway), 3.5m

(carriageway), 0.25m (marginal strip), 4m (sidewalk and NMV mixed lane) and 3.0m (green belt on the right side of road).

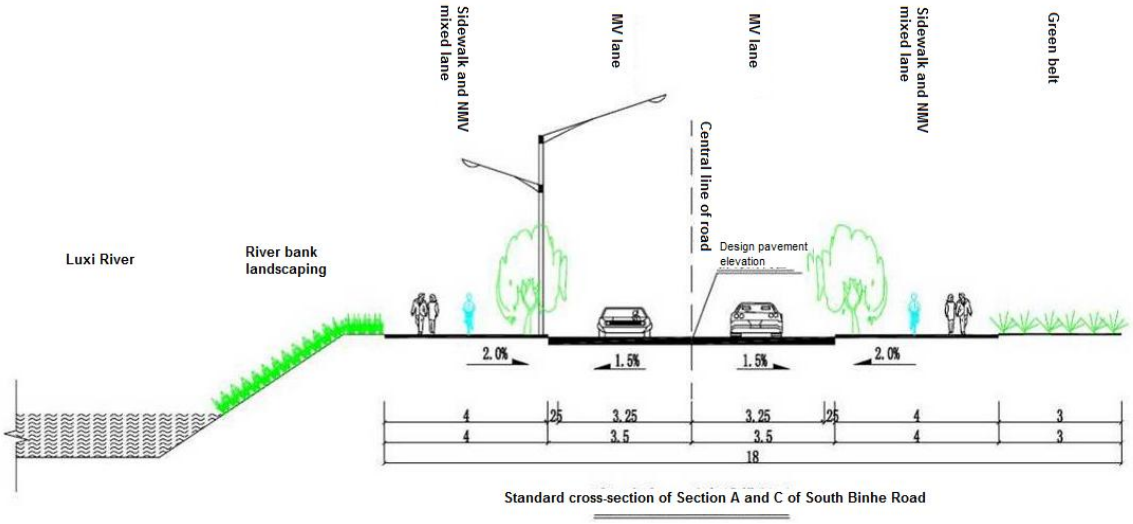


Figure 3.2.1-5 Cross-sectional Diagram of Urban Branch Road

The cross-section of Section B will be composed of 2.5m (sidewalk), 4m (MV and NMV mixed lane), 3.25m (carriageway), 0.5m (double amber lines), 3.25m (carriageway), 4m (MV and NMV mixed lane) and 2.5m (sidewalk).

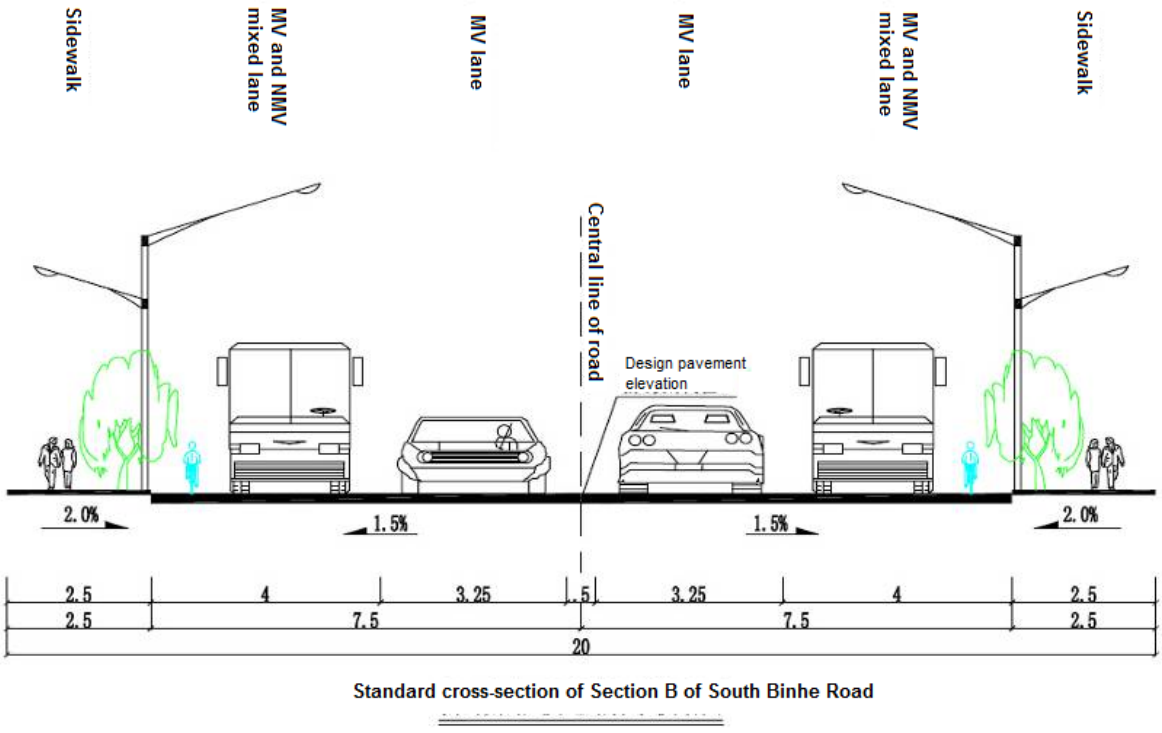


Figure 3.2.1-6 Cross-sectional Diagram of Urban Branch Road

(5) Design plan of road works

1) Carriageway

Three roads will be included in the design, of which the Industrial Avenue is an urban trunk road and the South and North Binhe Road are urban branch roads.

The pavement structure for carriageway of the urban trunk road (Industrial Avenue) will be composed of 4cm-thick fine-grained type SBS modified asphalt concrete (AC-13), 5cm-thick medium-grained type asphalt concrete (AC-16C), 6cm-thick coarse-grained type asphalt concrete, 1cm-thick emulsified asphalt slurry seal, 20cm-thick 5% cement stabilized macadam, 20cm-thick 4% cement stabilized macadam and 20cm-thick graded gravel cushion.

The pavement structure for carriageway of the urban branch road (South and North Binhe Road) will be composed of 8cm-thick concrete, 1cm-thick emulsified asphalt slurry seal, 20cm-thick 5% cement stabilized macadam and 25cm-thick graded gravel cushion.

2) NMV lane

NMV lanes will be provided on both sides of the Industrial Avenue, the pavement structure of which will be composed of 4cm-thick fine-grained type asphalt concrete (AC-13), 6cm-thick medium-grained type asphalt concrete (AC-16C), 1cm-thick emulsified asphalt slurry seal, 20cm-thick 5% cement stabilized macadam and 20cm-thick graded gravel cushion.

3) Sidewalk

According to the different functional orientations and locations, the sidewalk will be divided into artificial granite-made carriageway and pervious brick-made carriageway in the design, in which pervious brick-made carriageway will be adopted by South and North Binhe Road and artificial granite-made carriageway will be adopted by the Industrial Avenue.

The pavement structure of artificial granite-made carriageway will be composed of 8cm-thick C25 concrete artificial granite, 3cm-thick mortar and 15cm-thick C15 cement concrete.

The pavement structure of pervious brick-made carriageway will be composed of 5cm-thick pervious bricks, 3cm-thick medium-grained sand cushion and 15cm-thick pervious cement stabilized macadam subgrade.

2 Bridge works

(1) Bridge works overview

The design width of Industrial Avenue in Qianfeng District is 30m, which will intersect Luxi River at the elevation of K0+840, the watercourse of which will orthogonally intersect the central line of road; the Medium Bridge 1 on the proposed Industrial Avenue will intersect the Luxi River.

(3) General layout of bridge

The cross-section structure of Medium Bridge 1 on the Industrial Avenue will be composed of 0.4m guardrail, 3.0m sidewalk, 3.0m NMV lane, 1.5m green belt, 15m MV lane, 1,5m green belt, 3.0, NMV lane, 3.0m sidewalk and 0.4m guardrail, with a full length of 30.8m.

A 1×25m one-span prestressed small box girder is proposed to be used to intersect the Luxi River; the bridge abutments on both sides will be located on both sides of Luxi River; and water piers will not be provided. The full length of the bridge will be about 35m.

3. Pipeline Works

(1) Rainwater pipe network

Rain and sewage diversion system is adopted for drainage system within the project area. Proposed rainwater pipe network are all provided under the new roads. Pipe diameter is d500～d1800mm. Gravity flow tube is used for rainwater pipe network, and socket type reinforced concrete pipe with "O" type rubber ring flexible interface is used. Concrete circular well or rectangular well shall be used as rain manhole, manhole spacing is normally 50 ~ 120m.Reserved branch pipe spacing is 120~150m, the reserved branch pipe extends 2m beyond the right-of-way (ROW).

(2) Sewage pipe network

Rain and sewage diversion system is adopted for drainage system within the project area. The sewage pipe is laid along the new road. Pipe diameter is d400 ~d800mm. Gravity flow tube is used for sewage pipe network, and socket type reinforced concrete pipe with "O" type rubber ring flexible interface is used. Concrete circular well or rectangular well shall be used as sewage manhole, manhole spacing is normally 40 ~ 100m.

4. Landscaping works

For urban trunk roads, landscaping works mainly includes the outer separators for motorized and non-motorized vehicles and sidewalk. Landscaping mainly uses evergreen trees, together with multilayers of dungarunga and shrub. The outer separators use trees as backdrop, combined with flowering small trees and with the ground covered with grass flower in order to add color; thus urban trunk roads characterized by many varieties and multi-function landscaping, four seasons evergreen, three seasons of flowering, bright and colorful, and thriving are presented.

For Industrial Avenue, an urban trunk road, it mainly includes the landscaping on the sidewalks on both sides of road. For roads along the river, in order to ensure the clear vision of landscape and the good ventilation above the river, small arbors and short shrubs will be combined with lawn to create a wide visual space.

5 Supporting works

(1) Bus stations and barrier-free facilities

Bus routes and stops shall be provided along the roads of the Project as required by the urban function zones. Generally, the bus stop shall be provided at about every 500m, which shall be close to the crossings and shall be over 50m from the tangent point of the crossing curb to avoid the impact of parked bus on the traffic capacity at the crossing and help the bus that is too late to change lanes to park on the side through interweaving; if the bus stop can be provided both at the front and the back of the crossing, it is preferred to provide the stop at the back of the

crossing; the specific location will be determined with the public transport management authority in the next design stage.

Blind walk way for the eyesight disabled shall be provided on the sidewalk of the road to guide the eyesight disabled to walk by using the touch of sole of the foot. Blind walk way shall be continuous laid along the road segment; barrier-free facilities shall be laid 0.25~0.5m away from the green belt or the border tree pit. The blind walk way shall be 0.30m in width.

(2) Road traffic safety and management facilities

Design of traffic safety facilities mainly include: traffic signs, markings, channelized traffic guide of level crossing, etc. Traffic signs plane layout of the Project shall strictly conform to Road Traffic Signs and Markings (GB5768-2009) and relevant standards. Perfect safety facilities like traffic signs, markings, safety barriers, sight guide and anti-glare mesh shall be provided to ensure the normal road use and vehicle running safety, in short, following the principle of minimizing traffic accident.

(3) Road lighting works

Street lights shall be provided in the project area, and arranged as per the principle of comfort, energy saving and beautiful.

(4) Slow-moving traffic

Slow-moving traffic, also known as non-motorized traffic, refers to means of transportation with travel speed no more than 15km/h, including walking and non-motor vehicle traffic.

Facilities and measures provided for slow-moving traffic in the Project include the following: pedestrian crossing, pedestrian crossing protection zone; design for the road traffic facility of slow-moving traffic system, namely, design of traffic markings, signs and traffic signals control facilities; and bench on roadsides.

Items not to be funded by the World Bank loan within the scope of assessment include:

Guang'an Port-Qianfeng Avenue, with a total length of 1,600m and width of 24m, which is invested by local government and is proposed to be constructed in 2015.

3.2.2 Wastewater interceptor component

1 Service scope of wastewater interceptors

The starting section of the wastewater interceptors for the Project will be laid along the proposed road or riverbank and connected to the existing wastewater interceptors. The ending section of wastewater interceptors will be laid along the South and North Binhe River after being connected to the existing wastewater interceptors, then it will be constructed along the Guihua 1st Cross Road after integrating at this road and collect the wastewater along the road and finally connect to the WWTP in Qianfeng District and Western Jeans Industrial Zone. According to the terrain conditions of Qianfeng District, it is high in the middle and low on both sides, so the wastewater system there is divided into the south and north divisions. The service scope of wastewater interceptors includes the old downtown, industrial parks and the south area of

new downtown of Qianfeng District.

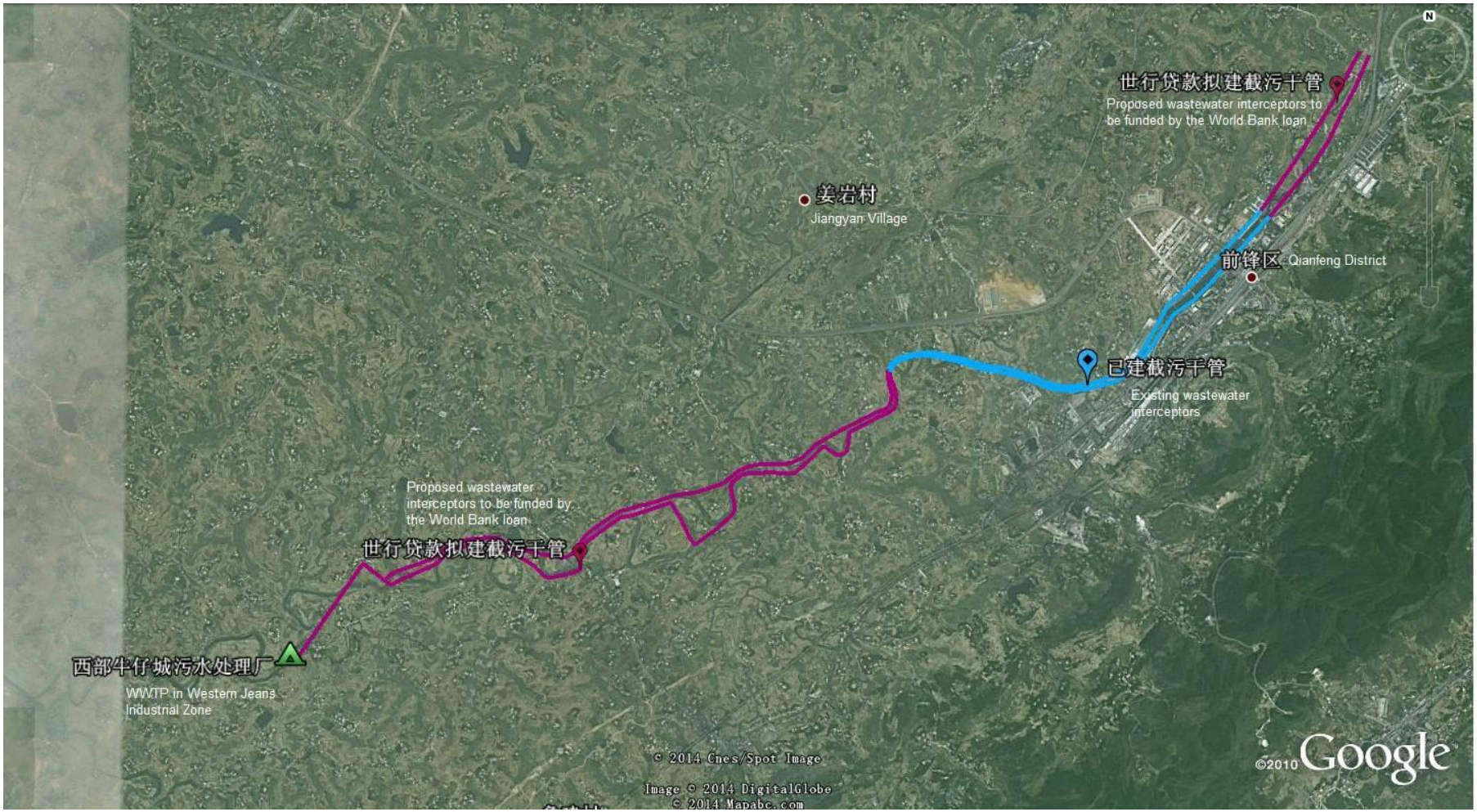


Figure 3.2.2-1 Location Diagram of Wastewater Interceptors

2. Drainage system

Wastewater interceptors of the Project adopt rain sewage diversion system, which has two types, namely, “completely separate system reform” and “intercepting type separating system reform”.

Complete separating system reform includes the separating system reform of urban road drainage network and the community drainage network; one major reform task is to add another new drainage system, allowing rainwater and sewage to discharge into different drainage system.

While maintaining the combined system pipeline of the built up areas, the intercepting type separating system reform is to lay on either side of Luxi River a wastewater interceptor from the downstream outlet of the combined system pipeline (the upstream pipeline on either side is still wastewater interceptor), and to set up catchpit to collect the wastewaters from the combined system pipeline of the built up areas before they flow into the downstream wastewater interceptor and transport them to WWTP for disposal.

According to the town planning and current situation of Qianfeng District, completely separate system reform is adopted to the current industrial park and the intercepting type separating system reform is used for the design of the old downtown of Qianfeng District.

3. Technical standard

Pipe roughness coefficient: reinforced concrete pipe: n = 0.014, steel pipe: n = 0.010;

Design fullness: sewage pipe shall be calculated as slack flow, and maximum design fullness shall refer to the Table below:

Table 3.2.2-1 Maximum Design Fullness for pipes

Pipe diameter	Maximum Design Fullness
d200～d300	0.6
d400～d500	0.65
d600～d1000	0.75
d1200～d1800	0.8

Minimum and maximum design flow rate: in order to ensure that solid waste can be washed away by wastewaters, the design of the pipeline slope shall ensure that the minimum flow rate of wastewaters is no less than 0.65m/s below the maximum fullness of pipeline and the maximum flow rate for non-metal pipeline is 5.0m/s.

Minimum overburden soil depth and maximum buried depth: buried depth of pipeline shall safeguard it from the current and future possible harm to pipeline facilities; generally, the minimum overburden soil depth above the top of pipe under MV lane shall be no less than 0.7m. Moreover, it is not proper for burying pipe too deep, or it not only results in too high a construction cost, but pretty high operation and maintenance costs. Generally buried depth of pipe shall be within 8~9m.

Manhole arrangement: manholes shall be provided at pipe junction, pipe

bends and where pipe diameter or pipe slope changes, where there is water fall, and at regular interval along straight pipe section (for sewage pipe the maximum interval shall be 40~100m, and 50~120m for combined pipe).

Determination of specific discharge: specific discharge of sewage surface is 0.40 L / S·ha.

4 Plan layout of wastewater interceptors

The starting point section of the wastewater interceptors shall be laid along the proposed road or riverbank, connecting to the existing wastewater interceptors. The ending section of wastewater interceptors will be laid along the South and North Binhe River after being connected to the existing wastewater interceptors, then it will be constructed along the Guihua 1st Cross Road after integrating at this road and collect the wastewater along the road and finally connect to the WWTP in Qianfeng District and Western Jeans Industrial Zone. The total length of wastewater will be 13,440m and the pipe diameter will be d500~d1200. The both sides of wastewater interceptors to be laid on Guihua 1st Cross Road will intersect the Luxi River and it will be designed in the inverted siphon form. Reinforced concrete wastewater pipes shall be used for wastewater interceptors to be laid under the existing roads and proposed roads, while steel pipes shall be used for wastewater interceptors to be laid under the river.

Table 3.2.2-2 Quantities of Wastewater Interceptor Works

Table 3.2.2-2 Quantities of Wastewater Interceptor Works

North Binhe Road					
SN	Name	Specification	Unit	Qty.	Remarks
1	Reinforced concrete wastewater pipe	d400	m	455	
2	Reinforced concrete wastewater pipe	d1000	m	2251	
3	Reinforced concrete wastewater pipe	d1000	m	1433	
3	Reinforced concrete wastewater pipe	d1000	m	409	
Section A of South Binhe Road					
SN	Name	Specification	Unit	Qty.	Remarks
1	Reinforced concrete wastewater pipe	d400	m	242	
2	Reinforced concrete wastewater pipe	d800	m	254	
3	Reinforced concrete wastewater pipe	d800	m	63	
4	Reinforced concrete wastewater pipe	d1000	m	1486	
5	Reinforced concrete wastewater pipe	d1000	m	371	
Section B of South Binhe Road					

SN	Name	Specification	Unit	Qty.	Remarks
1	Reinforced concrete wastewater pipe	d400	m	40	
2	Reinforced concrete wastewater pipe	d800	m	358	
Section C of South Binhe Road					
SN	Name	Specification	Unit	Qty.	Remarks
1	Reinforced concrete wastewater pipe	d400	m	236	
2	Reinforced concrete wastewater pipe	d800	m	1696	
2	Reinforced concrete wastewater pipe	d800	m	424	
Guihua 1st Cross Road					
SN	Name	Specification	Unit	Qty.	Remarks
1	Reinforced concrete wastewater pipe	d400	m	59	
2	Reinforced concrete wastewater pipe	d1200	m	200	
3	Reinforced concrete wastewater pipe	d1500	m	335	
4	Steel Pipe	DN800	m	200	River crossing pipe
5	Steel Pipe	DN1000	m	200	River crossing pipe
Starting section of the wastewater interceptors in north side					
SN	Name	Specification	Unit	Qty.	Remarks
1	Reinforced concrete wastewater pipe	d400	m	140	
2	Reinforced concrete wastewater pipe	d600	m	800	
3	Reinforced concrete wastewater pipe	d800	m	460	
Starting section of the wastewater interceptors in south side					
SN	Name	Specification	Unit	Qty.	Remarks
1	Reinforced concrete wastewater pipe	d400	m	133	
2	Reinforced concrete wastewater pipe	d500	m	1195	

5. Drainage destination of wastewater interceptors

The starting section of the wastewater interceptors shall be laid along the proposed road or riverbank, connecting to the existing wastewater interceptors. The ending section of wastewater interceptors is laid along the South and North Binhe River after being connected to the existing

wastewater interceptors, then it is constructed along the Guihua 1st Cross Road after integrating at this road and collects the wastewater along the road and finally extends to the WWTP in Qianfeng District and Western Jeans Industrial Zone.

3.2.3 Landscape reconstruction works

1 Luxi River status quo

Luxi River, as a tributary of Qujiang River, is located in Qianfeng District, Guang'an and flows through the new downtown and old downtown from east to west.Luxi River is winding and narrow with serious sediment deposition, gentle gradient and poor discharge capacity. The flood occurs every 2 to 5 years according to flood discharging capacity.In case of rainstorm, nearly 30,000 *Mu* farmlands on both banks will be turned into a world of waters and be flooded up to 2-3 days, threatening local industry, agriculture, people's lives and property.At present, the poor flood control system at Qianfeng section of Luxi River threatens the people in Qianfeng District, and the comprehensive treatment works for Luxi section was initiated by Qianfeng Water Affairs Bureau in 2013.

2 Landscape reconstruction works location and status quo

The Luxi River reconstruction works site is located at a transitional zone between the new downtown and old downtown and outside of the industrial park (i.e. extending northward from the intersection of New Guang'an-Qianfeng Highway and Zhanqian Road to Xiangyang-Chongqing Railway and undercrossing Luxi River Railway Bridge). The project site is about 1,230m in length, covering a total area of about 50,000m^2.

At present, the existing embankments in the works area are mainly the vertical block stone hard embankments. They are rather steeper and poor in safety.All bridges within the design scope are old bridges with simple styles, coarse materials, no characteristics and attractive colors.The existing plants are mainly willows, and ficus microcarpa, bougainvillea, sweet osmanthus and cinnamomum pedunculatum scattered at both banks. Plant distribution is of no sense of hierarchy and color and poor in diversityIt is unlikely to create the plant landscape with higher ornamental value and ecological value.

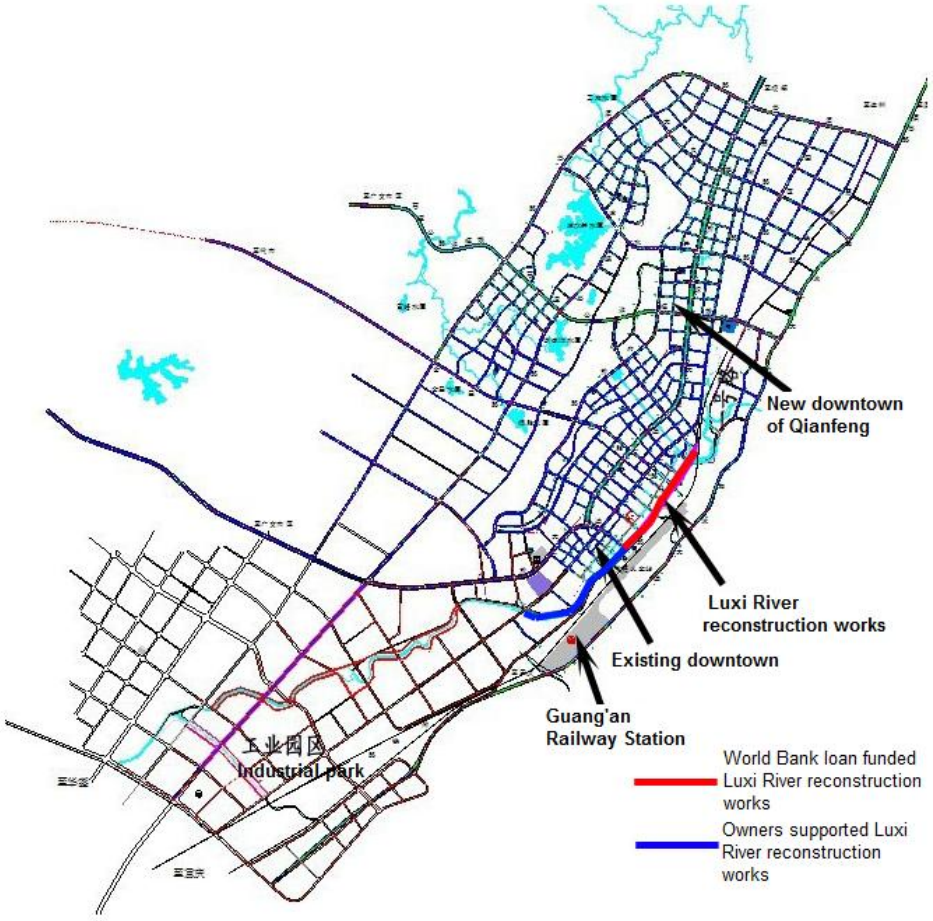


Figure 3.2.3-1 Location Diagram of Luxi River Landscape Reconstruction Works

3. General layout of landscape renovation works

The belt-like landscape renovation works located on the banks of Lvxi River is 1,230m long and covers 4.5hm^2, where the landscaping is mainly carried out. The general layout of landscape renovation works is shown in Attached Diagram 6, which is realized by:

① Organizing the sightseeing system for walkers and bicyclists, paving 8,000m^2 of pervious concrete footpath along garden ornaments like pavilions and pergolas;

② Arranging theme and personal spaces for reading, exercise and calligraphy at nodes and open areas, with 750m^2 of grass planted and 1,500m^2 designed and the theme highlighted with sculptures;

③ Utilizing ecological bulkhead on the west side to weaken the hard landscape and make the perfect transition to the waterscape of Lvxi River with 1,000m^2 of underwater platform constructed;

④ Planting the arbors, shrubs and grass in combination and highlighting the theme trees and ornament trees to create 3.3hm^2 of landscape area decorated with shrubs, ors, grass and flowers;

⑤ Equipping with services such as bicycle shed; and

⑥ Providing facilities such as floating stages and small dams to offer the convenience of entertainment for nearby residents.

2 Vertical arrangement

The vertical landscape arrangement along the banks of Lvxi River is generally based on the plan and the proposed elevation of surrounding roads. A certain drainage slope is maintained on site, where the rainwater is drained into Lvxi River by making use of local terrain or into urban drainage system through nearby road gully. The landscape is mainly created in the principle of balancing the cut and fill to ensure that the excavated earth and rock could be utilized locally within the landscape renovation works. The soil required for vegetation construction may be obtained from the surplus topsoil stripped in the road works.

3 Vegetation layout

The landscape is arranged in garden style, for which the arbors, shrubs and grass are planted in combination and the theme trees and ornament trees are highlighted. The following plants are selected for the landscape configuration: arbors with trunk diameter ⩾12cm and crown diameter up to 300cm, such as cinnamomum camphora, gingko, acacia and osmanthus; small arbors with crown diameter up to 200cm and height of 250cm, including flowering and colored-leaf trees like red marple, Chinese Redbud, Prunus lannesiana, malus halliana and pomegranate; globose shrubs in beautiful form, including pittosporum tobira, lorpetalum chindensevar.rubrum and sabinachinensiscv. kaizuka; shrubs for the creation of large ground landscape, such as fatsia japonica, ligustrum vicaryi and var.variegata d'ombr.; cover plants including iris germanica, coleus blumei and begonia; and lawn plants including festuca arundinacea and ryegrass. The well-proportioned combination of various plants contributes to the beauty of flowers in three seasons and keeps trees stay green all year long.

3.2.4 WWTP receiving wastewater from wastewater interceptors

The wastewater interceptors are laid along North and South Binhe Road and then built along Guihua 1st Cross Road after the wastewater interceptors come together at Guihua 1st Cross Road, and finally enter the WWTP of Qianfeng District of Guang'an City and Western Jeans Industrial Zone.

The WWTP of Qianfeng District and Western Jeans Industrial Zone will be constructed by the self-raised funds of United Envirotech Ltd. (Guang'an), which will be commenced by the end of 2014 and put into operation by the end of 2015.

1) WWTP site

WWTP of Qianfeng District of Guang'an City and Western Jeans Industrial Zone is located at Group 5, Jingwan Village, Qianfeng District.

2) Service scope of WWTP

WWTP of Qianfeng District of Guang'an City and Western Jeans Industrial Zone receives wastewater collected by the wastewater interceptors along Luxi River, with scope of service consistent with that of the wastewater interceptors along Luxi River, i.e., old downtown and industrial park in Qianfeng District and the southern area of new downtown of Qianfeng.

3) WWTP inflow and drainage scheme

WWTP of Qianfeng District, Guang'an and Western Jeans Industrial Zone receives wastewater collected by the wastewater interceptors along North and South Binhe Road.

The starting point section of the wastewater interceptors shall be laid along the proposed road or riverbank, connecting to the existing wastewater interceptors. The ending section of wastewater interceptors will be laid along the South and North Binhe River after being connected to the existing wastewater interceptors, then it will be constructed along the Guihua 1st Cross Road after integrating at this road and collects the wastewater along the road and finally extends to the WWTP of Qianfeng District and Western Jeans Industrial Zone.

4) Wastewater Treatment Capacity

The short term capacity (2020) of WWTP is 60,000m^3/d, and long term (2030) capacity is 100,000m^3/d. WWTP of Qianfeng District, Guang'an and Western Jeans Industrial Zone is located in the south of Qianfeng Industrial Park. The works shall be constructed in two phases (Phase 1 and Phase 2), and phase 1 project shall be constructed in two stages. At present, the first stage of Phase 1 is in progress, with construction capacity of 20,000m^3/d, including municipal wastewater of 10,000m^3/d and industrial wastewater of 10,000m^3/d, which may meet the requirements for initial development of the Industrial Park. When the Industrial Park forms a certain scale and achieves the requirements for water quantity of WWTP, the second stage of Phase 1 will be implemented.

5) Inflow and Effluent Wastewater Quality

The quality of processed wastewater can meet Class 1A standard of *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002)*. See the table below:

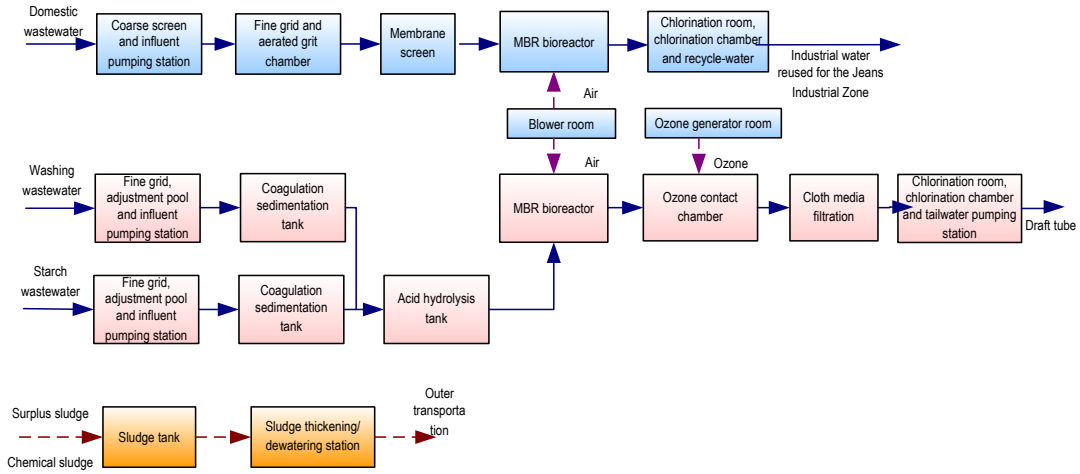
Table 3.2.4-1 Predictions on Designed Inflow and Effluent Wastewater Quality

Category of Wastewater	COD_{cr}	BOD_5	SS	NH_3-N	TN	TP	pH	Chromaticity (Times)
Municipal wastewater	≤300	≤150	≤200	≤35	≤45	≤5	7~9	
Starch wastewater	≤12200	≤1550	≤8250	≤15	≤40	≤15	11	≤5000
washing wastewater	≤240	≤20	≤65	≤11	≤15	≤3	7	≤40
Effluent quality	≤50	≤10	≤10	≤5(8)	≤15	≤0.5	7~9	≤30

6) Process and scale

The WWTP of Qianfeng District, Guang'an City and Guang'an western Jean Industrial Zone adopts "Membrane Bio-Reactor (MBR)" process. MBR is a new type of wastewater treatment system combining membrane separation technology and biological treatment technology. It is a new water treatment technology with combination of membrane separation unit and biological treatment unit. The membrane component replaces the secondary sedimentation tank to maintain a high concentration of activated sludge and

reduce the area occupied by wastewater treatment facilities, and the sludge quantity is reduced by keeping low sludge load. Membrane separation equipment immersed in the aerobic biological tank is mainly used to intercept the activated sludge and macromolecule solids in the groove. Therefore, the concentration of activated sludge (MLSS) in the system may be increased to 10,000mg/L and solids retention time (SRT) may extend more than 30 days. With such a high concentration system, the volume of biological reaction tank may be reduced and refractory materials may degrade by continuous reaction in the treatment tank.



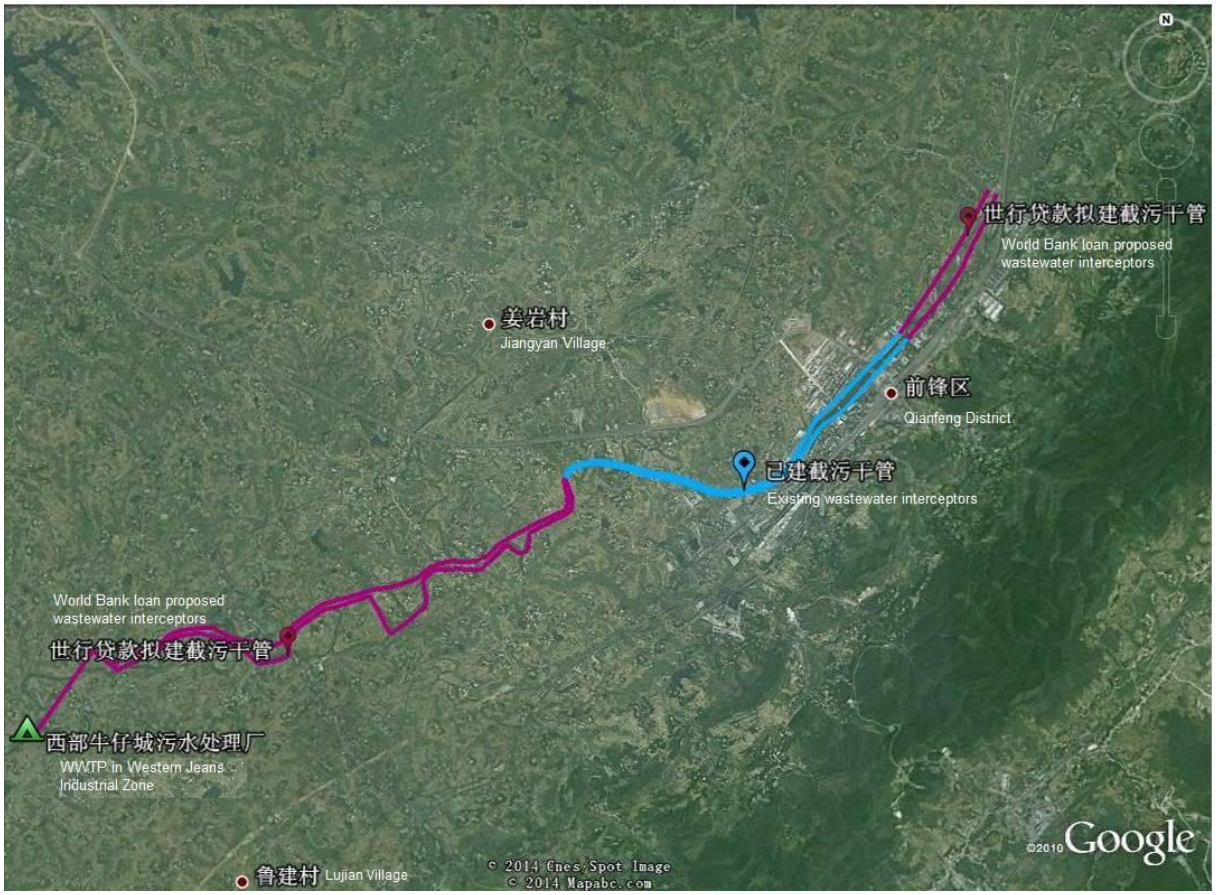


Figure 3.4.2-1 Location Diagram of WWTP

3.3 Project Occupied Area and Earthworks/Stoneworks

1 Project occupied area

The Project covers a total area of 52hm^2, mainly involving farmland, forest land, grassland and rural homestead, etc.

2 Earth work

For road works, evacuation volume of the Project is 56.22×10^{4}m^3, filling volume 55.28×10^{4}m^3, the volume to be transported in 0.94×10^{4}m^3, including stripping topsoil 5.79×10^{4}m^3 without waste soil generated.

For wastewater interceptor works, evacuation volume of the Project is 2.54×10^{4}m^3, filling volume 2.5×10^{4}m^3, including stripping topsoil volume 0.21×10^{4}m^3 without waste soil generated.

For landscape reconstruction works, evacuation volume of the Project is 2.68×10^{4}m^3, filling volume 3.62×10^{4}m^3, the volume to be transported out 3.62×10^{4}m^3, including stripping topsoil volume 0.36×10^{4}m^3 without waste soil generated.

For WWTP, evacuation volume of the Project is 3.5×10^{4}m^{3}m^3, the total volume of filling 6.6×10^{4}m^3, the volume to be transported in 0.36×10^{4}m^3 from other project sites in the industrial park.<

Temporary transfer can keep the earth and stone balance in the industrial park.

3.4 Construction Organization

3.4.1 Main raw and auxiliary material consumption

Local building materials required by the Project, mainly including gravels, asphalt and rubble (block) stone, is ordered at the legitimate stockyards in Qianfeng District or Guang'an City. Transport distance doesn't exceed 5km from the producing area to the site. The owner of the stockyard shall bear the responsibilities for water and soil loss prevention during the process of sand and stone production.

Cements, steels and other auxiliary materials are ordered or purchased in Qianfeng.

3.4.2 Construction process and methods

(1) Road Works

Construction preparation work is necessary for the successful implementation and timely completion of main works. "Water and Electricity Supplying, Road Connecting and Construction Site Leveling" shall be completed before commencement. The follow-up work shall be carried out after the construction preparation:

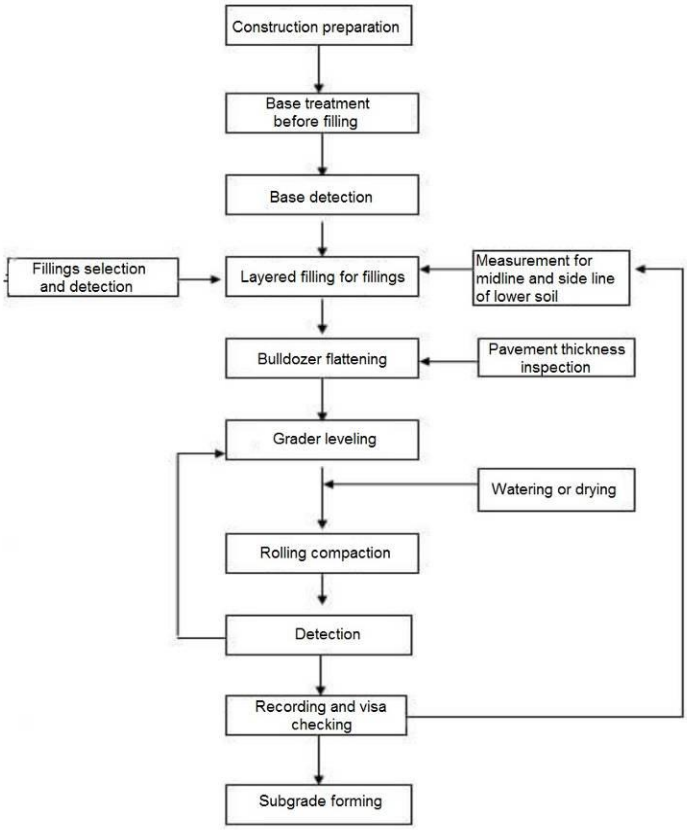


Figure 3.4.2-1 Subgrade Construction Process of Road Works

Subgrade works: mechanical means are more dominant than manual means. Excavation works is provided with bulldozers or excavators at multiple working faces and supported by scrapers, loaders and dumper trucks for transportation to filling section. Loaders or bulldozers are used in filling works as well as manual leveling and compaction by layers. The cuttings and slopes are mainly mechanically excavated and the slope protection is manually executed. In order to make sure the desired stabilization and protection effects of slope, the excavation is performed from up to the bottom while the protection is executed. The quit excavation shall be applied to slope provided with retaining wall, namely, discontinuous excavation at the retaining wall to avoid landslide or collapse.

Pipeline works: various pipe (i.e., rainwater and wastewater pipes) networks beneath the road are constructed simultaneously with the road works by means of excavation of slope without protection. Shallow buried pipe networks are conventionally constructed by manual means and supported by mechanical means, in normal sequence from up to the bottom.

Pavement works: the works mainly including paving asphalt concrete is commenced after the pipeline works and subgrade construction. The pavement process is as follows: clean the base → distribute asphalt oil layer → transport qualified concrete → push against the back wheel of dumper to roll the paver → the paver moves forward while unloading → pave and compact for shaving and tamping, and iron the plate as per thickness and camber requirements → compact with roller and finally perform the landscaping and the installation of ancillary works.

Bridge works: the construction technology of the Medium Bridge 1 on the

Industrial Avenue: prefabrication and lifting for the simply supported beam; without occupation of the river course, it is convenient to work on the abutments.

(2) Wastewater interceptors works

Wastewater interceptors are laid along both sides of Luxi River for the construction range. Rain and wastewater pipe network is also laid along roads. The construction method for pipe network laying is as follows:

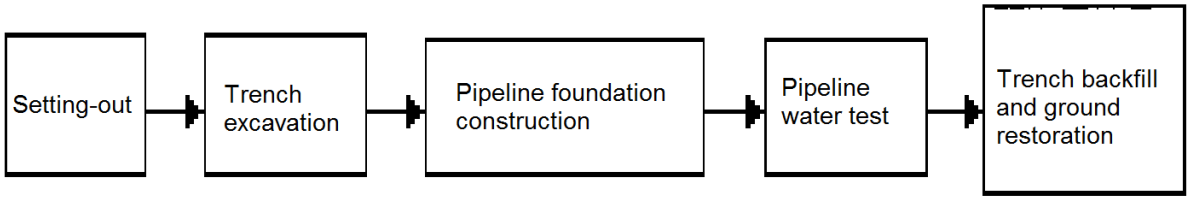


Fig. 3.4.2-2 Construction Process of Pipe Network Works

(3) Landscape reconstruction works

The construction procedures of landscape reconstruction works are shown as follows:

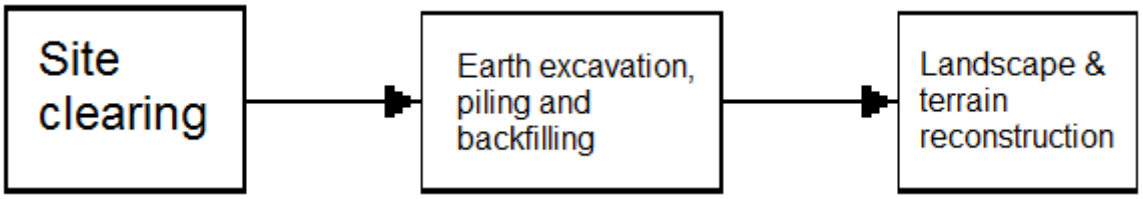


Fig. 3.4.2-3 Construction Process of Landscaping Works

(4) WWTP works

The Non-World Bank load funded WWTP in Qianfeng District of Guang’an City and Western Jeans Industrial Zone will be constructed within the assessment scope for receiving wastewater collected by the wastewater interceptors along North and South Binhe Road. The construction method of the WWTP is shown as follows:

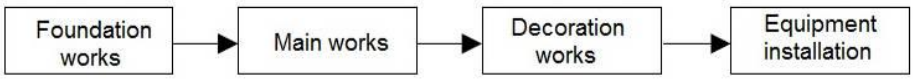


Figure 3.4.2-4 WWTP Construction Process

3.4.3 Temporarily Acquired Land

1 Camps on construction site

As the Project is located in urban area, the housing used for construction management is mainly rented residential housing; furthermore, a few of prefab houses are built as construction camp on site to reduce the new construction area, the new environmental impact and the water and soil loss.

Five construction camps are built according to the construction conditions. The

production area for construction are mainly the concrete mixing point, temporary material yard, processing yard and so forth; it is preliminarily estimated that temporary production is required according to the project components and features. The living quarter includes 1.22hm^2 of land for stacking materials and other purposes and a temporary land of 0.81hm^2 will be occupied except for the land occupation for the road.

2 Construction access

Located in the downtown area of Qianfeng District, the Project mainly involves the planning area of Qianfeng Industrial Park and Qianfeng New City. The South Binhe Road, North Binhe Road, Industrial Avenue and wastewater interceptors constitute the parts of road and pipe networks within the Industrial Park. The landscape renovation works of Lvxi River is located in the middle constructed area, while there have been relatively developed roads in the Qianfeng District and Industrial Park, requiring no new construction access.

Only the pavement of wastewater interceptors along the planned 1st Cross Road to the WWTP after the wastewater interceptors come together are considered, but the planned 1st Cross Road has not been built and the time is to be determined to build such road. For the transportation of materials and the earth and rock required for the construction of wastewater interceptors, a temporary construction access being 1,500m long and 3m wide will be built along the pipeline for easy construction of wastewater interceptors.

3.4.4 Construction period and schedule

The construction of the Project is planned to be started January 2015 and completed in October 2019, with a total duration of 58 months. The construction schedule of the Project is as follows:

Table 3.4.4-1 Implementation Schedule of the Project

Item		Construction Contents	2015				2016				2017				2018				2019			
			Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.	Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.	Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.	Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.	Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.
Road and ancillary works	North Binhe Road	Construction preparation																				
		Underground pipeline works																				
		Subgrade works																				
		Protection works																				
		Pavement works																				
		Landscaping works																				
	South Binhe Road	Construction preparation																				
		Underground pipeline works																				
		Subgrade works																				
		Protection works																				
		Pavement works																				
		Landscaping works																				
	Industrial Avenue	Construction preparation																				
		Underground pipeline works																				
		Subgrade works																				
		Protection works																				
		Pavement works																				
		Landscaping works																				
Wastewater Interceptor Works	Roads not in the plan of the Project	Construction preparation																				
		Excavation, installation and backfilling																				

Item		Construction Contents	2015				2016				2017				2018				2019			
			Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.	Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.	Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.	Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.	Jan. – Mar.	Apr. – Jun.	Jul. – Sep.	Oct. – Dec.
	Under North Binhe Road	Excavation, installation and backfilling																				
	Under South Binhe Road	Excavation, installation and backfilling																				
Landscape renovation works		Site cleaning and topsoil stripping																				
		Earth works																				
		Street furniture and pavement																				
		Planting																				

3.5 Engineering Analysis

3.5.1 Major environmental impacts during the construction period

1. Analysis on pollution production link during the construction period

Adverse environmental impact of the Project is mainly reflected in the construction process, and the environmental impact assessment of the Project focuses on environmental impact link analysis for different kinds of constructions.

(1) Road works component

Road works and its ancillary works are constructed over the same period in an orderly manner, with construction process as follows: route determination, land acquisition, demolition and relocation → construction site development, materials (earth/stone) transport and mechanical operations → subgrade and trench construction (subgrade, trench excavation and other earthworks/stoneworks) → pavement works construction → pipeline construction (welding, repairing, patching , interface corrosion resistance, etc.) → subgrade and trench overburden backfill → traffic engineering (landscaping works and construction of related facilities). The analysis on the pollution production link of road works is as follows:

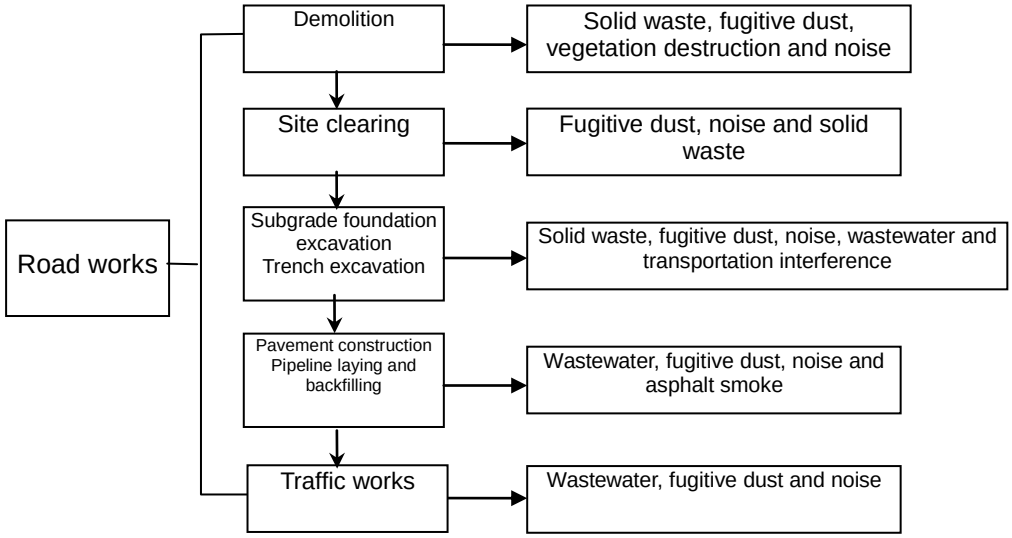


Figure 3.5.1-1 Pollutants Generation Points Diagram of Road Works Construction

(2) Wastewater interceptor component

In general, the construction process of wastewater interceptors is as follows: construction preparation → survey and setting-out → trench excavation → side trimming and bottom clearing → wastewater and rainwater pipe foundation concrete casting → wastewater and rainwater pipe installation → pipe socket pouring and junction protective band plastering→ closed water test for wastewater well and

sampled closed water test for rainwater inspection well → upper trench backfilling → manhole, well cover and well grate installation → ending. The analysis on the pollution production link of wastewater interceptor works is as follows:

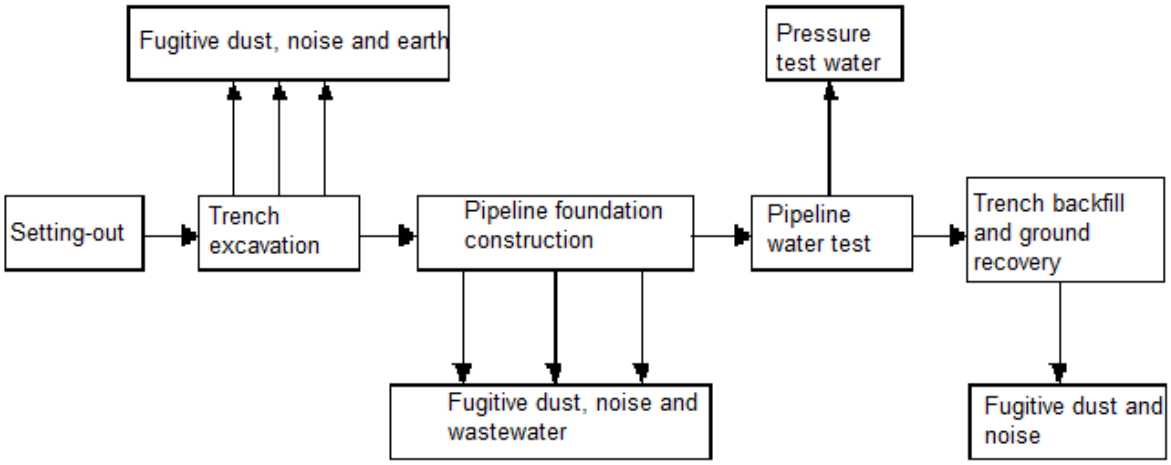


Figure 3.5.1-2 Pollutants Generation Points Diagram of Wastewater Interceptor Works

(3) Landscape reconstruction component

The construction process of landscape works includes generally: construction preparation (provide mechanical equipment, perform onsite surveys on vertical control and prepare all temporary construction facilities)→ site clearing (clear residual waste or domestic waste on the site, clear weeds, preserve standing timbers and shrubs as much as possible)→ earth evacuation→ earth stacking (or temporary stacking)→earth transferring and backfilling→ landscape & terrain reconstruction.

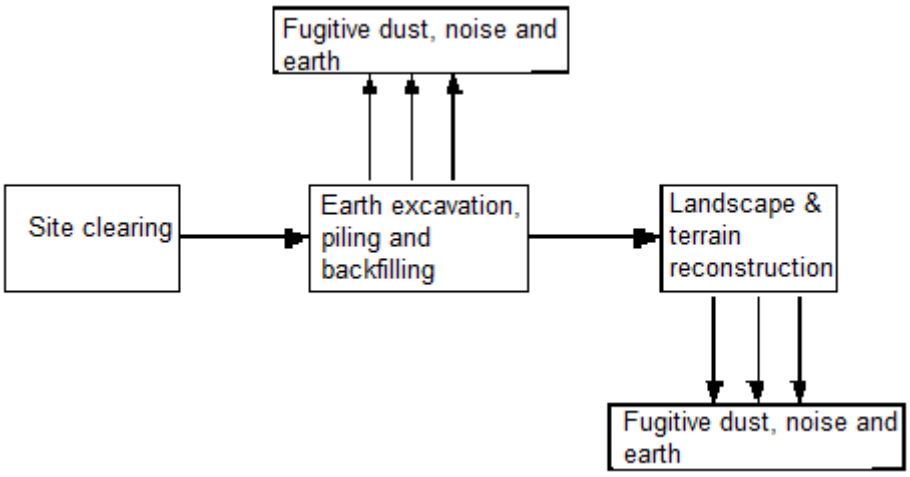


Figure 3.5.1-3 Pollutants Generation Points Diagram of Landscape Reconstruction Works

2. Analysis on pollution sources during the construction period

See the table below for major environmental impacts during the construction period:

Table 3.5.1-1 Summary of Environmental Impact of the Project during the Construction Period

Environmental Factor		Item Type	Impact Property	Environmental Impact
Ecological environment		All items	Short-term, reversible and unfavorable	Permanently and temporarily occupied land for the project impacts nearby cultivated land, forest land, grassland, etc.; Surface vegetation is easy to be damaged in the process of excavation, filling and borrowing during project construction, which will increase regional water and soil loss; Construction activities such as excavation destroy the ecological environment of animal habitats, and various construction behaviors disturb wild animals and forced them to leave their original habitats.
Acoustic environment		All items	Short-term, reversible and unfavorable	Construction machinery and construction vehicles are the main noise sources. The noise generated by construction machinery during construction impacts the surrounding acoustic environment. The noise at the earthworks stage is mainly from the loader and transport vehicles.
Air environment		Fugitive dust during the construction period	Short-term, reversible and unfavorable	Fugitive dust is produced due to soil cement mixing, concrete mixing and vehicle transport during construction.
		Asphalt smoke	Short-term, reversible and unfavorable	Asphalt smoke is produced as a result of pavement.
Water environment	Surface water	All items	Short-term, reversible and unfavorable	Flushing wastewater in the construction area is the main wastewater pollution source during the construction period. Construction personnel produce domestic sewage during construction. Pigging and pressure test discharge wastewater upon pipeline installation.
	Groundwater	All items	Short-term, reversible and unfavorable	Bridge and wastewater interceptors construction exert slight impact on groundwater level. Groundwater quality is impacted by surface water quality.
Solid waste		Demolition waste	Short-term, reversible and unfavorable	Solid waste generated by demolition mainly includes abandoned buildings slag, waste wood, plastic, metal, domestic waste, etc.

Environmental Factor	Item Type	Impact Property	Environmental Impact
	Domestic waste	Short-term, reversible and unfavorable	It mainly relates to the small amount of domestic waste produced by the construction team.
	Road spoil	Short-term, reversible and unfavorable	Excavation will generate spoils. If stored improperly, it may result in water and soil loss, blockage of drainage channels or landscape destruction due to rainwater leaching, thereby impacting the environmental health in the project area.

(1) Analysis on the characteristic of ecological impact

Ecological impact during the construction period is mainly reflected in project area, vegetation destruction, water and soil loss, etc. The land occupied during the construction period is mainly used for construction machinery, temporary construction site and sediment storage yard. The construction of wastewater interceptors, roads and the whole industrial park will destroy the existing vegetation and farmland system, cause damage to the vegetation and reduce crop production, which may have a certain impact on the local residents' income. In addition, because of the project area of road works with large terrain variation and large earthworks/stoneworks, construction will produce water and soil loss, which may aggravate regional water and soil loss.

(2) Analysis on the characteristic of impact on acoustic environment

Various types of machinery, including loader, excavator, bulldozer, concrete mixer, vibrators and heavy crane, will be used for road excavation, pipeline construction, bridge laying and WWTP construction on the construction site. Such machinery is the main source of construction noise. Besides, a large number of transport vehicles will be used for earth allocation and equipment and material transportation during construction. These transport vehicles, especially heavy trucks, feature high noise radiation intensity, so their frequent drive will produce greater interference on the construction site, construction access road and the surrounding environment of existing roads. Please see the table below for noise source intensity and distance attenuation of commonly used construction machinery based on the existing monitoring statistics.

Table 3.5.1-2 Source Intensity of Commonly Used Construction Machinery

Machinery Type	Model	Distance from the Test Point to Construction Machinery (m)	Maximum Sound Level Lmax (dB)
Wheel loader	ZL40	5	90
Wheel loader	ZL50	5	90
Grader	PY160A	5	90
Vibratory roller	YZJ10B	5	86
Dual wheel vibratory roller	CC21	5	81
Three-wheel roller	/	5	81

Machinery Type	Model	Distance from the Test Point to Construction Machinery (m)	Maximum Sound Level Lmax (dB)
Tire roller	ZL16	5	76
Bulldozer	T140	5	86
Hydraulic wheel excavator	W4-60C	5	84
Paver (England)	fifond311 ABG CO	5	82
Paver (German)	VOGELE	5	87
Generating unit (2 sets)	FKV-75	1	98
Impact drill machine	22	1	87

(3) Analysis on the characteristic of impact on air environment

The pollution to ambient air during the construction period of the Project is mainly from: a. fugitive dust produced by soil cement mixing, concrete mixing and vehicle transport during construction; and b. asphalt smoke produced by asphalt-concrete mixing process and pavement.

(4) Analysis on the characteristic of impact on surface water environment

The impact is mainly reflected as evaporating, emitting, dripping or leaking waste oil from the construction machinery and a small amount of oily wastewater produced after the outdoor construction machinery being washed by rainwater in the construction area, as well as the impact on water quality by the domestic sewage and domestic waste produced in the residential area of site construction personnel, for example, being discharged into the surface waters by rainwater.

Domestic sewage is mainly from the daily life of construction personnel, and the main pollutants include CODcr, BOD5, etc.

Pigging and pressure test discharge wastewater upon wastewater interceptors and other pipeline installation, and slurry and wastewater are produced during the construction of crossing works.

(5) Analysis on the characteristic of impact on groundwater environment

Construction wastewater and domestic sewage may impact the groundwater during the construction period. If untreated and discharge at will, it will have an impact on the surface water quality, which in turn may impact the groundwater quality. New bridge works is involved in the Project. In addition, earth excavation impacts the groundwater during bridge pier construction, and wastewater interceptor construction precipitation impacts the groundwater as well.

(6) Analysis on the characteristic of impact on solid waste

The Project involves demolition of buildings and structures within the engineering land acquisition range, with a demolition area of 96,807m^2. The solid waste during the construction period mainly includes construction waste (including the waste produced by demolition) on the construction site and a small amount of domestic waste produced by the construction team. Demolition of the Project will generate 6.58 × 10^4m^3 of solid wastes, which mainly contain abandoned buildings slag, waste wood, plastic, metal, domestic waste, etc.

In addition, excavation will generate spoils, which may be temporarily stored in the construction site. If stored improperly, it may result in water and soil loss, blockage of drainage channels, landscape destruction or secondary fugitive dust pollution under the action of wind due to rainwater leaching, thereby impacting the environmental health in the project area.

3.5.2 Major environmental impact factors during the operation period

1. Analysis on pollution production link during the operation period

The adverse impacts are mainly caused by road works during the operation period. The operation of wastewater interceptor works and greening works has positive impacts on the environment.Therefore, EIA attaches importance to the analysis of environmental impacts of road works component.

(1) Road works component

The environmental impact during the operation period mainly includes traffic noise and automobile exhaust impact of road transport component and the impact of road rainfall runoff on water environment. The following figure describes the main environmental impact link and its environmental impact characteristics during the operation period of the Project:

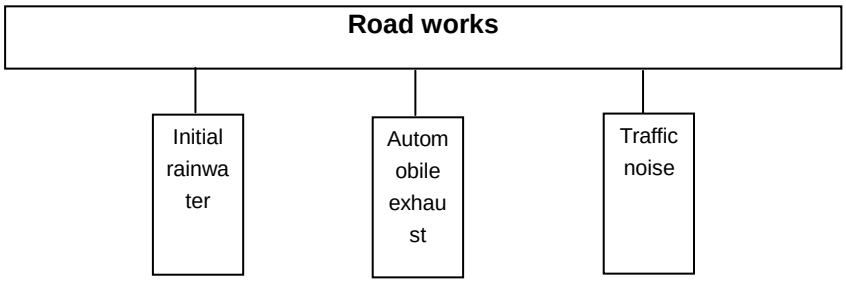


Figure 3.5.2-1 Environmental Impact Characteristics Diagram of Road Works during Operation Period

The road works improves the regional transportation environment, but traffic noise will exert a certain impact on the proposed residential area close to the road after the completion of the road.

(2) Wastewater interceptor component

Upon the completion of wastewater interceptors, domestic wastewater and production wastewater, collected in the old downtown and industrial park of Qianfeng District, the south part of Qianfeng District new urban area, is transported into the WWTP in Qianfeng District and Western Jeans Industrial Zone for centralized treatment. The water quality of surface water and underground water of Qianfeng District will be improved, thus bringing positive effects on the environment.

(3) Landscape reconstruction works

Landscape reconstruction works will improve the living environment and life quality, and the construction of landscape works also

improves the landscape quality of Qianfeng District.

2 Analysis on pollution sources during operation period

See the table below for major environmental impacts during operation period:

Table 3.5.2-1 Major Environmental Impacts of the Project during Operation Period

Links and Factors		Item Type	Environmental Impact
Ecological environment		Road Works Landscape works	The water and soil loss is caused by the side slope and landscape works slope protection upon completion of the Project.
Acoustic environment		Road works	During the operation period, main noise sources are the airflows caused by moving vehicles and friction between tires and pavement, etc.; the noise is produced due to parts of motors, cooling system, exhaust system and drive system; the noise is caused by the vibration of the high-speed moving automobiles due to the smoothness of the pavement.
Air environment		Road works	Automobile exhaust mainly includes air leakage in crankcases, volatile fuel oil, in addition, most THC and almost all NO_2, CO is discharged from the exhaust pipes.CO comes from the incomplete combustion of fuel, mainly depending on air-fuel ratio and the uniformity of various fuel distributions in the cylinder, while NO_2 is generated by excessive oxygen and nitrogen in the cylinder with high temperature and pressure. THC comes from cylinder wall quenching effect and the incomplete combustion of mixed gas.Unleaded gasoline has been used, so lead impact may be ignored. Automobile tire moving raises the dust on the road surface, resulting in secondary fugitive dust.
Water environment	Surface water	Road works	In early stage of road works, the rain has little impact on the rivers Road construction requires a large area of land leveling, which may impact the drainage path and pattern of natural waters within the scope of construction.
	Groundwater	Wastewater interceptors and wastewater pipe network works	Under normal operating conditions, it will not impact the groundwater quality, but may impact the groundwater environment in case of leakage of pipe network.
Solid waste		Other items	Street refuse is regularly collected to the waste transfer station and finally to Guang'an landfill for treatment.

- Road Works

(1) Ecological landscape impact

During the preliminary stage of operation, since vegetation coverage fails to satisfy the design requirements, subgrade and slope projects have impacts on water and soil loss in rainy season.

(2) Road traffic noise

Noise pollution sources mainly include traffic noise during the automobile operation. Automobile noise mainly includes the noise from the motors during the operation and other noise caused by airflows, exhaust system, friction between the tires and pavement for the moving automobiles. Noise is produced by the vibration of high-speed moving automobiles due to the smoothness of the pavement.According to the results of *Highway Traffic Noise Emission Test*, the average radiated noise level is determined for various vehicles at different speeds, as shown in the following table.

Table 3.5.2-2 Average Radiated Noise Level for Various Vehicles

Vehicle Type	Computational Formula
Small vehicle	$12.6+34.73\lg V_S$
Medium-sized vehicle	$8.8+40.48\lg V_M$
Large vehicle	$22.0+36.32\lg V_L$

Note: s, m and l at the lower right corner represent small vehicle, medium-sized vehicle and large vehicle, respectively;

V represents the average driving speed for the vehicle, in km/h.

Vehicle classification standard is shown in the table below:

Table 3.5.2-3 Vehicle Classification Standard

Vehicle Type	Total Mass of Vehicle
Small vehicle	＜3.5t
Medium-sized vehicle	＞3.5t to 12t
Large vehicle	＞12t

Note: small vehicles usually include small truck, car and wagon with no more than 7 seats, etc.

Large vehicles usually include container car，trailer, machine shop truck, motor bus with more than 40 seats and lorry, etc.;

Medium-sized vehicles usually include other vehicles, which are classified based on similar vehicles, excluding medium-sized truck and passenger car (with 7 – 40 seats), agricultural tricycle and quadricycle and other large and small vehicles.

According to the design, the proportion of large, medium-sized and small vehicles in the Project is 1:1.2:1.5, with day/night coefficient of 8:2.The average radiated noise level for various vehicles is shown in the table below.

Table 3.5.2-4 Table of Average Radiated Noise Level for Various Vehicles Unit: dB(A)

Description	Average Radiated Noise Level for Large Vehicle		Average Radiated Noise Level for Medium-sized Vehicle		Average Radiated Noise Level for Small Vehicle	
	Day	Night	Day	Night	Day	Night
Industrial Avenue	83.7	83.7	77.6	77.6	71.6	71.6
North Binhe Road	69.2	69.2	61.5	61.5	57.8	57.8
South Binhe Road	69.2	69.2	61.5	61.5	57.8	57.8

(3) Automobile exhaust gas emission

Air pollutants mainly cover automobile exhaust, which mainly impacts some area of both sides of the road and bridge where is 60~90m away from the road centerline. The surrounding air quality within the project area is good at present, and moreover, the implementation of road greenbelt may reduce the impact of automobile exhaust on the crops and residents on both sides of the road to a large extent.

See the table below for single motor vehicle emission coefficients.

Table 3.5.2-2 Pollutant Emission Coefficients of Single Motor Vehicles (National IV Standard) Unit: g/km per vehicle

Vehicle Model and Pollutant Type		Emission Coefficient
Small vehicle	CO	1
	NO_2	0.1
Middle-sized vehicle	CO	1
	NO_2	0.2
Large vehicle	CO	1.5
	NO_2	3.5

(4) Characteristic of impact on surface water

Pollution on nearby waters during the operation of road works is mainly reflected as road runoff and gasoline leakage and engine oil pollution on road surface in case of poor vehicle maintenance status, vehicle failure or accident. The road runoff generated after the rainfall may be discharged directly into the river or natural waters, which will result in a slight pollution on waters. Therefore, it is considered to discharge the initial rainwater after being collected for precipitation in the design.

Road construction requires a large area of land leveling, which may impact the drainage path and pattern of natural waters within the scope of construction.

(5) Solid waste

The solid waste during road operation mainly includes a small quantity of transport materials being thrown to the ground during vehicle driving and street refuse.

- **Wastewater interceptors and pipe network component**

Wastewater interceptors and wastewater pipe network will not impact the environment under normal operating conditions. When the wastewater interceptors and wastewater pipe network are completed, the domestic sewage within the Industrial Park will be effectively collected, and domestic wastewater is collected by WWTP for centralized treatment.The Project will avoid or reduce the domestic sewage entering into the nature waters or permeating into ground water along agricultural irrigation ditches; therefore, its operation has a positive impact on quality of surface water and ground water within the affected area of the Project.

If leakage of wastewater interceptors and wastewater pipe network occurs, the wastewater may seep into the ground to pollute the groundwater. According to analogy investigation, if the pipeline breaks, the wastewater may seep into the ground and gradually spread to pollute the groundwater under normal circumstances. The rule is that the closer to the pipeline damage location, the longer and more severe the leakage will be. Therefore, early discovery and early actions are the key to prevent environmental risks.

- **Landscape reconstruction works**

Multiple aesthetic factors like plant-specific lines, colors and seasonal changes will be used for landscape reconstruction works to form a strong characteristic with different tree species, ornamental period and configuration, and in addition, fit with street lamps, flower beds and garbage bins to form colorful streetscape. The rational allocation of landscape will increase the beauty of the city and beautify city appearance.In addition, the construction of landscape works is characterized by the function of urban ecological green lung, thus improving the regional ambient air quality.

4 Alternative Analysis and Planning Compatibility Analysis

4.1 "With Project" or "Without Project" Scenario

When compared with the "Without Project" scenario, the economic, environmental and social benefit of the Project seems to be versatile.

Qianfeng District serves as the material distribution center and labor service center of CDB area, through which Xiangyang-Chongqing Railway passes and in which Guang'an Railway Station is located, with convenient transportation. The administrative region of Qianfeng District not only has the national industrial platform GETDZ, having special national policy support, which is useful for attracting industrial transfer and developing medium-high end industries, but also has the Qianfeng Industrial Park. The total industrial output value of the two industrial parks makes up 1/3 of that for the city as a whole. Thus, as the only industrial area in the central downtown, Qianfeng has become the pioneer of the whole city in industrial development. As for the regional advantages, Qianfeng is not located in the transition zone of Sichuan and Chongqing and it doesn't have the portal regional advantages as Huangying, Linshui and Wusheng do, with few advantages in low-end competition, however, supported by the national ETDZ policy, existing industrial foundation and the traffic node advantages, Qianfeng has lots of advantages to be the Sichuan-Chongqing medium-high end cooperation platform and the demonstration window for modern service industry. So the Project is intended to grasp this good opportunity to implement the relevant government spirits, construct the municipal roads in the new downtown of Qianfeng District and the infrastructures of Light Textile Industrial Park, perfect urban infrastructures, enhance the function to provide urban services, improve people's living quality and adapt to the develop-the-west strategy for all-round progress of national socio-economic development and social undertakings.

Moreover, the construction of Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area not only can provide the basic material conditions for carrying on the industrial transfer tasks from home and abroad and accelerating the socio-economic development, but also can provide demonstration and reference for underdeveloped areas in western China to facilitate the scientific development and fumble new development strategies with the support of central cities, and it also serves as the useful practice on fumbling the new mode for integrating urban and rural development and coordinating the regional development.

Additionally, the Project is an inevitable choice for improving the opening up image and investment attraction effect of the demonstration area. However, it's still growing on the construction and development way and the supporting infrastructures, comprehensive supporting production factor services and other hard environments are inadequate when compared with other areas. In addition, the competition on attracting foreign investment becomes extraordinarily fiercely since the nationwide ETDZs at all level have intensified the opening up and publicity. In order to play a role in the massive industrial transfer of the coastal development area and achieve real investment attraction effects, in addition to the police environment, supporting industrial facilities, transportation and logistics conditions and labor costs, the investor will pay

more attention to the comprehensive service level and comprehensive supporting infrastructures of the ETDZ. According to the existing construction and development of the Demonstration Area, efforts must be exerted to the tangible environment and the supporting infrastructures and public services of the Demonstration Area shall be upgraded to improve the opening up image and increase the attraction to and enhance the confidence of the foreign investors. Thus, the infrastructure construction of the Demonstration Area takes on a high priority in the regional development.

It is clearly stated in the *Overall Construction Scheme for Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area* that the construction will be mainly focused on Qianfeng, Zaoshan and Guang'an Port. Additionally, the Central Business District and Logistics Park will be constructed and the trade and logistics service platform connecting Chongqing and radiating the CDB areas will be established as well. In addition, the construction of the Project will improve the infrastructures of Qianfeng District and it meets the need to actively carry on the industrial transfer of the central downtown of Chongqing and Liangjiang New Zone.

Since the constructed roads of Qianfeng District are mainly concentrated in the central district, with the approval of *Overall Construction Scheme for Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area* and Guang'an Qianfeng District being approved to be established by the State Council in February 2013, it meets unprecedented development opportunities and an increasing number of enterprises settling in Qianfeng, which makes the available land in the constructed area be in such a deficiency. Therefore, South Qianfeng Industrial Park and North Qianfeng New Downtown Area become the key development areas.

The roads to be constructed in the Project are mainly located in the southeast of Qianfeng, which is the integrated industrial development area of Qianfeng District. The proposed South and North Binhe Road are located in both sides of Luxi River, which starts from the proposed road and ends with the constructed South and North Binhe Road, is the key component of the internal road network of the Light Textile Industrial Park; the proposed Industrial Avenue, connected to the Guang'an-Qianfeng Avenue proposed in 2014-2016 and existing roads, is the key component of the road network of the Light Textile Industrial Park, and it plays a significant role in completing the road network and improving the road and traffic network structure of the Light Textile Industrial Park. After the completion of roads in the Project, the urban traffic network structure and the traffic condition for enterprises and residents along the roads will be will be greatly improved, and the construction of the Project meets the need to improve the urban road and traffic network structures. With the construction of the Project, the transportation among areas of Qianfeng Industrial Park will be greatly improved.

The wastewater interceptors of South and North Binhe Road are mainly laid in the Qianfeng Industrial Park, which is engaged in the development of light textile, shoemaking and automobile making industries. Though the pollution in those production processes is not as serious as that in steel, petroleum and other heavy industries, the wastewater produced in light textile industry will influence the residential environment, cause serious environmental pollutions to the whole industrial park and do harm to the health of residents. After the construction of wastewater interceptors, the wastewater from the old downtown,

Qianfeng Industrial Park and the south area of new downtown of Qianfeng will be connected and discharged to the WWTPs in Qianfeng District of Guang'an City and Western Jeans Industrial Zone for treatment, which shall not be discharged at will until it meets the Class I category A standard in the *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002). In addition, the water quality of Luxi River will be greatly improved and it will play a significant role in improving the living environment, reducing environmental pollution and ensuring the health of residents.

To sum up, Qianfeng will be faced with multiple opportunities and enter into the "Golden age" of development acceleration in the next 5 years. On the one hand, as the significant base of "National Western Demonstration Area Embracing Industrial Transfer", Qianfeng meets the opportunity of embracing the massive industrial transfer; on the other hand, Chengdu-Chongqing Economic Zone takes on a high priority in the national develop-the-west strategy, so Qianfeng District certainly will meet the opportunity of massive regional development. Therefore, it is urgent to accelerate the construction of municipal roads in the new downtown of Qianfeng District and the supporting works of Light Textile Industrial Park, which satisfies the requirements of *Zoning Plan of Qianfeng District of Guang'an City (2013-2030), Overall Planning for Qianfeng Industrial Park of Guang'an Economic & Technical Development Zone in Guang'an City (2011-2020) and is essential and feasible.*

4.2 Alternative Analysis of Road

The road network structure of the Park has been planned and the road orientation and width all have been determined, so the alternative analysis will be made only to the works for Industrial Avenue intersecting Luxi River.

Two options will be considered in this case, namely, intersecting with normal simply supported girder bridge and intersecting with two-hole frame bridge, the section of which is provided for water flowing.

Option I: Intersecting the river course with 1×25m small prestressed box girder, which is reasonable and technologically feasible, and both sides of the river course shall be paved for protection. The abutments are located on the edges of other than on the river course, and the box girder can be precast nearby the bridge site, which is erected by hoisting, convenient for construction, with low costs.

Option II: Intersecting the river course with 12m two-hole frame bridge, which is reasonable and technologically feasible, but if cast-in-place construction is performed on the frame bridge as a whole, the construction period will be long and the river course will be occupied for a long time, which is unfavorable for the normal flood discharge in rainy season and flood discharging period. In addition, the holes of frame bridge can be maintained simultaneously, which can be completed within the river course, with high construction organization and costs.

Via comprehensive alternative analysis, Option 1, intersecting the river course with 1×25m small prestressed box girder, is recommended as the engineering scheme for Industrial Avenue intersecting Luxi River.

4.3 Alternative Analysis of WWTP

The WWTP in Qianfeng District of Guang'an City and Western Jeans Industrial

Zone will be constructed by the self-raised funds of United Envirotech Ltd. (Guang'an), which will be commenced by the end of 2014 and put into operation by the end of 2015. However, the WWTP is now under design, and only the plant site has received alternative analysis.

Site 1: Group 5, Jingwan Village

For the status quo of site 1, it is located on the south side of the Industrial Park, downstream of Luxi River and adjacent to Luxi River.

Site 2: Group 5, Lujian Village

For the status quo of site 2, it is located on the south side of the Industrial Park, downstream of Luxi River and about 2km from Luxi River.

Table 4.3-1 List for Alternative Analysis of Plant Site

SN	Item	Site 1	Site 2
1	Traffic	Convenient	Convenient
2	Influent condition	Near to the wastewater interceptors along Luxi River, with convenient influent condition	Far from the wastewater interceptors along Luxi River, without convenient influent condition
3	Drainage condition	Convenient for discharging into the Luxi River	Far from Luxi River, long draft pipe required to be provided for discharging into Luxi River
4	Land area	With large area of available land	With large area of available land
5	Demolition	Nearly without demolition	With numerous residents, facing a number of demolition
6	Site	Flat	Flat
7	Comprehensive analysis	Better	Common

According to the above analysis, the land areas of the sites are limited due to the terrain in terms of the land area and site conditions. However, considering from socio-economic benefits, municipal development and environmental protection, Site 1 is more suitable for the construction of WWTP in Qianfeng District of Guang'an City and Western Jeans Industrial Zone. Therefore, Group 5, Jingwan Village is selected as the WWTP site in the design.

5 Existing Environment investigation and assessment

5.1 Physical Environment

1 Geographic location

Located in the east of Sichuan Province, Guang'an City is called as "Portal of East Sichuan", the east and south of which is on Dianjiang County, Changshou County, Yubei District and Hechuan City of Chongqing City; the west of which is adjacent to Pengxi County of Suining City and Jiangling District and Gaoping District of Nanchong City; and the north of which is on the boundary of Peng'an County of Nanchong City and Quxian County and Dazhu County of Dazhou City. The geographic coordinates is 105°56′ - 107°18′E, 30°01′ - 30°50′N, 130km wide from the east to west and 90km long from south to north, covering an area of 6344 km^2, of which 8.2% is for plain, 66.2% is for hills and 25.6% is for mountains, covering an area of 520km^2, 4200km^2 and 1624km^2 respectively. Moreover, Guang'an is identified as the secondary transportation hub of 3 provincial junctions and one of the 12 regional secondary transportation hubs by Sichuan Provincial People's Government, which is also the nearest city from CDB to Chongqing and located in the Chongqing One-Hour Economic Cycle.

Additionally, Qianfeng Industrial Park is next to Qianfeng County, one of the small provincial pilot counties and it has a straight-line distance from downtown of Guang'an of 17km, where Class I highway of Qianfeng District of Guang'an City traverses; Xiangyang-Chongqing Railway passes through the Industrial Park, 1km from Guang'an Railway Station, with a haul distance of 150km from Chongqing Caiyuanba Railway Station; nonstop highway is available to Chongqing and Chengdu, 100km from Chongqing Jiangbei Airport and 280km from urban area of Chengdu.

2 Landform

In general, Huangying Mountain, in the east of Qianfeng District, is the highest area with the maximum altitude of 1123m, then is the south of Guantang County and the lowest area is Qujiang River in the west with a minimum altitude of 99m. The altitude is mainly in 99 ~ 300m and 300 ~ 360m and the whole district is flat and the area with a gradient of less than 10% makes up 54% of that of the district as a whole, being classified as shallow hills, composed of Jurassic sandstone and mudstone, in steamed-bread and reversed pan bottom arch shape, with wide and slight ravines, which a normal width of 70 ~80m, length of 3500 ~ 4000m and a gradient ratio of 2‰ ~ 3‰.

Middle mountains under minor tectonic erosion located in the area of Huaying Mountains and distributed in Guixing, Qianfeng, Xiaojing, Longtan, Guanghui, etc. They are 500m-1123m above sea level with relative height difference of about 600m and broken rock mass due to the effect of Huayingshan Fault Belt. Under the influence of mining activities and the development of underground karst, they mainly consist of Permian, Triassic carbonatite, sand, mud, shale and carbonaceous shale intercalated with coal, forming the steep rock strata. The mountains are the highest at the bottom of Sichuan Basin with high and precipitous terrain, peaks rising one above the other in the distance, incised valleys developed

into “V” shape. Geological disaster, in particular surface collapse, manifests itself well and carbonatites are corroded to form trough valley, showing “One Mountain, One Valley and Two Ridges” or “One Mountain, Two Valleys and Three Ridges” landform and karst landform like karst caves.

3 Geology

Guang’an City is located on the eastern edge of Middle Sichuan Fold Belt of Neocathaysian Sichuan Subsidence Zone, the east of which is adjacent to East Sichuan Fold Belt. As for regional geological conditions, the proposed area is located on the north footwall of Huaying Mountain Fold Belt, the tectonic movement of the northeast of which is weak all the time. The fault on the western end is more than 9km from the proposed area, so the regional structure of the proposed area is stable, without massive adverse geological events, enjoying excellent geological conditions, suitable for construction.

As for seismic conditions, Guang’an City is located in Middle Sichuan Fold Belt, the differential movement on the base of which is weak and it is an integrated plate. As shown in historical seismic data, destructive earthquake with a magnitude of over 5 never happens in the district, so the seismic qualification of the proposed area is stable.

4 Climate and weather

The Industrial Park is located in wet subtropical monsoon climate area, where low mountains, hills and river valleys with an altitude of less than 600m are distributed, with mild climate and abundant heat and precipitation; the four seasons are district, with an average annual temperature of 16~18℃ over years and maximum temperature of 41.2℃; the heatstroke prevention period is from July to September, the minimum temperature is -4.5℃, while the warming period is from December to the next February; the maximum air pressure is 979.2mPa, while the minimum air pressure is 976.9mPa; the average annual fog day is 31.5~78.5 days and the sunshine

duration is 1356.9 hours; the wild is slight and in low speed and the magnitude of maximum wind force is VII, the average annual relative humidity is 80~85% over years, while the average annual precipitation is 1075~1260mm over years, with the maximum annual precipitation of 2732.3mm (1983) and the minimum annual precipitation of 594.5mm (1969); the annual precipitation is mainly concentrated in May to October, covering 80% of the annual precipitation; the average monthly precipitation is 220~260mm and may up to 577~773mm; the season with heavy precipitation intensity is as same as that with integrated precipitation, which is mainly in June to September, during which the annual evaporation is near to the annual precipitation; the annual evaporation intensity is 1052~1351.6mm, of which the monthly evaporation intensity of June to September makes up 42.8~46.9% of the annual evaporation; the precipitation intensity is heavy (reached 188.20mm on September 5, 2004) and rainstorm seldom happens, which is the induction factor for lots of geological disasters.

The dominate wind direction there is NE~NNE, with a frequency of 25.3%, the secondary dominate wind direction is SW~SSW, with a frequency of 11.9% and the annual calm wind frequency is up to 33%.

The average annual wind speed is 1.1m/s and the average month wind speed varies in the range of 0.9~1.4m/s, of which the variation in spring is great and that in winter is mild.

5 Biological resources

(1) Plants

The Industrial Park is located in wet subtropical monsoon climate area, with mild climate, abundant heat and precipitation, fertile soil and convenient irrigation, which are suitable for the growing of subtropical plants. Since the land there is mostly used as farmhouse, no natural vegetation is covered, which is substituted by a large number of cultivated vegetation and farmland, without rare plants. Farmland ecological system is dominated in the regional environment, with high land utilization rate and developed agricultural industry. The land is mostly used for farmland, then for residential area.

(2) Animals

Since the area is lacking of native vegetation, large wild animals and rare animals are scarcely seen. There are dozens of wild mammals in the area, which mainly are small rodents. Moreover, dozens of amphibious reptiles survives there, including fejervarya limonocharis, rana nigromaculata, bufo gargarizans, lygosoma maculatum, zaocys dhumnades and beauty ratsnake.

Since forest groups and bird habitats are lacking, the quantity and species of bird is limited. The common birds include sparrow, lark, magpie, finishing magpie and motacilla cinerea and migrant birds include cuckoo and spring swallow.

There are lots of rivulets and gullies and the common wild aquatic animals is dominated by fish, including crucian, eel, carp and crab.

No rare plants and animals under special protection lives in the area.

6 Water resource

(1) Surface water

In Guang'an City, with a dense network of rivers, the river system is well developed. Huaying Mountain ridge is taken as the watershed of surface runoff, with the Jialingjiang River Basin in the west and Yulin River Basin in the east.The above rivers flow into the Yangtze River, and Jialing River system and Qujiang River system are included in the Jialingjiang River Basin within the area.

Jialing River system - The main stream flows into Guang'an at Shigu Township, Yuechi County; it bends to the SE direction and flow out of this area at Hejiaxi, Zhenjing Township on the south side of Wusheng County. The tributaries within this area mainly include Ji'an River, Changtansi River, Qingxi River, Xinglong River and Fuxing River.Qujiang River system - The main stream flows into Guang'an at Xiaoxi, Guang'an District; it bends to the south direction along the west side of Huaying Mountain and flow out of this area at Sailong Township, Yuechi County.The tributaries within this area mainly include xixi River, Xinmin River, Luodu River, Linxi River, Mengxi River, Tuhe River, Longtan River and Lvxi River.

Qujiang River, as the tributary of Jiangling River and the secondary tributary of Yangtze River, has the drainage area of 11,165km^{2}Qujiang River is located at the northeast boundary of Sichuan Basin.Two tributaries, i.e. Bahe River and Zhouhe River, are included in the upstream of Qujiang River, and both originate at the southern foot of Daba Mountains.Guang'an section of Qujiang River is located between Liangtan and Sijiutan, and the hydrological condition is directly affected by Sijiutan.Total length of the main stream of Qujiang River within Guang'an region is 134km with 18.5m natural head, 0.16‰ average gradient, 300-500m average width and an average discharge of 753m^3/s over years.The average flow during dry season is 40m^3/s (considering the impacts of upstream power station).The functions of water body are drinking water, flood discharge, shipping and industrial and agricultural water.

Lvxi River, as the tributary of Qujiang River, originates at Dingjiashan Caobachang, Qipai Village, Guixing Town, Guang'an District (with an altitude of 880m), then flows through Xinqiao Township, Daishi Town, Guang'an District and Lushi Town and Yongxing Town, Huaying City, and finally flows into Qujiang River at Yongba Village, Guantang Town, Guang'an District with a total length of 49km. The length is 44.3km within the region; with drainage area of 192km^2.The functions of water body are flood discharge, irrigation, pollution discharge and power generation.

The low mountains appear at the 10km upstream of Lvxi River. The above river flows into the shallow hill areas at Wanchangwan Chushanqu, Qianfeng Town, Guang'an District with 668.6m natural head, 13.64‰ average gradient, average discharge of 1.95m^3/s over years, annual average runoff volume of 6,151×10^4 m^3 and average runoff depth of 3.2m over years.

The length of Lvxi River from Qianfeng Town to Shuimo Village,

Daishi Town (Xinqiao WWTP) is 10km. Along the way, Gaotan River, Yongxing River, Caojia River and Qingfeng River flow into Lvxi River, with an average flow of 3.8m^3/s.The length, from Shuimo Village to the junction where Lvxi River flows into Qujiang River, is 29km. Along the way, Hujia River, Manxu River, Liaojia River. Xiao'erqiao River flow into Lvxi River.During average water period, the flow at the junction, where Lvxi River flows into Qujiang River, is 8.93m^3/s, with abundant water volume.

Figure 5.1-1 River Water System in Qianfeng District

(2) Underground water

The assessed area belongs to simple hydrogeological zone of Central Sichuan Fold Belt with simple type underground water and poor resources.The groundwater of the assessed area is divided into two categories according to the water-bearing media and occurrence condition, namely, clastic rock pore-fissure water and bedrock fissure water.

(1) Clastic rock pore-fissure water

The groundwater in east and south of the industrial park is classified as red bed confined water from the clastic rock pore-fissure water. The spring discharge is generally 0.003-0.277L/s and yield of single well is less than 100t/d, which is classified as water yield lacking area according to the water yield property.

The supply, runoff, discharge of such groundwater is related with the spatial distribution and hydraulic connection of water-bearing formation and the landform and terrain of the distribution area. The water-bearing formation is exposed as parallel strip in N-NE direction and deflects to the syncline side under the ground, forming the multi-layer artesian slope formation. The groundwater of the proposed area does not have a uniform regional direction and is supplied mainly by atmospheric precipitation; all natural groundwater exposures, manual wells, springs and pools are the discharge and circulation approaches of such groundwater.

(2) Bedrock fissure water

The groundwater in the west of the industrial park is classified as weathered zone network fissure water from the bedrock fissure water. The spring discharge is generally is less than 0.1L/s, classified as the area lacking of water yield according to the water yield property.

The bedrock fissure water is mainly supplied by the atmospheric precipitation and surface water infiltration; the supply condition is controlled by factors such as fissure development degree, landform and terrain features, precipitation and surface water distribution.

The bedrock fissure water is discharged in the relatively low-lying area.The drainage form mainly is little spring; the dripping and moisture are also involved, but they cannot form the stream.

The bedrock fissure water does not have a uniform regional direction. After supplied at higher position, it reaches the water-bearing zone and towards the low-lying areas along the weathered fissures, flows out of the ground in nearby gullies; some water can flow into remote gullies or rivers, but the distance of water motion is relatively short due to the water-bearing zone development affected by the terrain.

7 Land Use Status of Guang’an City

(1) Overview of residential land status

The existing residential land is mainly distributed in the old town area of Qianfeng and Daishi area, i.e. Qianfeng Town and Daishi Town.In general, the existing residential buildings have the notable feature of township construction, such as small development scale, poor architectural style, incomplete living supporting facilities and inadequate greenbelt. Some residential buildings are built by the residents.However, in the North New Area of Qianfeng, some commercialized residential buildings are constructed based on the overall planning, with higher standard for construction quality, supporting facilities, greenbelt, etc.

The existing residential land covers an area of 143.49ha, accounting for 19.49% of total urban construction land, and the residential land per capita is 32.32m^2/person.

(2) Overview of land for public management and service facilities

Land for public management and service facilities accounts for 3.24% of total urban construction land, lower than the national standard (5.0-8.0%). Per capita index of about 5.37m^2/person is lower than the national standard (5.5m^2/person). For administrative land and land for medical treatment and public health, per capita index of administrative land (0.7m^2/person)and land for medical treatment and public health (0.28m^2/person) are lower than the standard specified in *Code for National Public Facilities Planning* (hereinafter referred to as “Code”). For land for education and scientific research, per capita index of 4.39m^2/person is higher than the standard specified in the Code.No cultural and sports facilities and social welfare facilities are built in Qianfeng District.

(3) Overview of land for commercial and service facility

The existing land for commercial and service facilities in Qianfeng District covers an area of 18.64ha, accounting for 2.53% of urban construction land.At present, commercial and service facilities are mainly provided at the first floor of buildings or in non-scale commercial centers and markets.

(4) Overview of industrial land

The existing industrial land, occupied by municipal Qianfeng Industrial Park, covers an area of 246.99 ha, accounting for 33.54% of total urban construction land.At present, some industrial enterprises have resided on both sides of Guang’an-Qianfeng Avenue, with a certain scale. The industrial park gradually extends along Shixi Road and Xiangyang-Chongqing Railway to the north. Main roads and municipal facilities are under construction.In considering that the construction of Qianfeng Industrial Park is still at the initial stage, the construction scale shall be expanded.

(5) Overview of land for logistics and warehouse

The existing land for logistics and warehouse covers an area of 12.93 ha, accounting for 1.76% of total urban construction land. It is distributed around Guang’an Railway Station of Xiangyang-Chongqing Railway, as the interchange station for railway logistics.

(6) Overview of land for road and traffic facilities

Land for road and traffic covers an area of 87.22 ha, accounting for 11.31% of total urban construction land.It is in serious shortage of social parking lots, bus station facilities and transportation pivot facilities, etc. in the urban area.

(7) Overview of land for utilities

The existing land for utilities covers an area of 6.07, accounting for 1.37% of total urban construction land.The utilities basically meet the current demands of urban development , but the inadequate reserve capacity, especially on water facilities, drainage facilities and gas facilities, restricts urban rapid development and introduction of construction projects to a certain extent.

(8) Land for greenbelt and squares

The existing land for greenbelt and squares covers an area of 16.3 ha, accounting for 2.21% of total urban construction land. Per capita index for greenbelt and squares is 3.67m^2/person, lower than the national standard (10m^2/person). It is inconsistent with the orientation of “landscape garden city” of Qianfeng District as planned, so the construction of park greenbelt shall be accelerated.

8 Mineral Resources

Guang’an City is rich in mineral resources, such as coal, limestone and petroleum, salt brine and pyrite.Up to the present, proven raw coal reserves are 7.5 X 10^8 t, with the recoverable reserves of 4.87 X 10^8t. At present, annual output is up to 8 X 10^6t, with high quality and calorific capacity; the rock salt 5800 X10^8 t, and the salt bed is distributed widely, with larger thickness, good quality, intactness, good stability of the salt formation top, and easy to perform the solution mining work; in theory, natural gas reserves are 6000 X 10^8 m^3. The proven reserves are 3000 X 10^8m^3 in 2009, and Guang’an has become a large mono-block gas field. The exploitable yield of limestone is 300 x 10^8t, and gypsum mine 3.8 X 10^7t.

Guang’an is national commodity grain base, lean pig produces base, hybrid rice Seed production base and high quality orange base and characteristic agricultural base in Sichuan.

In addition, Guang’an is the hometown of Comrade Deng Xiaoping, the general designer of the reform of opening up. The provincial scenic area - Huaying Mountain is located in Guang’an, with unique natural, cultural and tourism resources.

5.2 Socio-economic Overview

5.2 Socio-Economic Conditions

5.2.1 Socio-economic status of Guang’an City

Located in the east of Sichuan Basin, being one of the seventeen prefecture-level cities under the jurisdiction of Sichuan Province, Guang’an is not only the hometown of Comrade Deng Xiaoping, the general designer of the reform of opening up and the socialist modernization, but also the significant part of the Chengdu-Chongqing Economic Zone, called as “Portal of East Sichuan”. In July 1998, Guang’an City was founded, having jurisdiction over Guang’an District, Yuechi County, Wusheng County and Qianfeng District, administrating Huangying City. In February 2013, Qianfeng District was established, covering an area of 6344km^2, with a total population of 4.7 million. Guang’an is located in the zone that Sichuan Basin begins to transit to the surroundings, high in the east and low in the west. The hilly area is located in the middle and west, while the parallel gorges and low mountain areas are located in the east. The altitude is from 185m to over 1700m. Qujiang River passes through the middle of city from the north to the south, while Jiangling River passes through the west of the city from the north to the south. With abundant agricultural resources and being rich in grain, oil, pig, cocoon and fruit, Guang’an is honored as the national grain production base, the lean-type live pig base and the Realm of Silk. The mineral resources are also abundant, with over 20 varieties of minerals such as coal, iron, limestone and petroleum,

with large storage and high grade.

In 2011, the gross output value of the whole city was CNY 65.6 billion, with an annual average increase of 15%. The general financial budget revenue was doubled, with an annual average increase of 24.2%. The gross industrial output value of enterprises over designated size reached CNY 90 billion, and GETDZ was successfully upgraded to the national economic and technological development zone and the industrialization ratio was increased to 40.2% from 28.6%. As one of the significant national and provincial red tourism destination, the construction of Zaoshan Modern Logistics Industrial Park in Guang'an was commenced, through which the service industry realized an annual average increase in added value of 11.5%. The cumulatively completed fixed asset investment across the nation reached CNY 131.57 billion, with an annual average increase of 27.1%; the completed total investment in urban and rural construction reached CNY 24.91 billion; the urban area was increased by 55km^2; and the urbanization ratio was increased by 9.4%. The endowment insurance trial coverage for urban and rural residents reached 80% and the old enjoying the rural minimum subsistence guarantee system were included into the new rural social endowment insurance. The annual average increase of disposable income per capita for urban residents reached 13.2% and the annual average increase of net income per capita for farmers reached 14.3%.

5.2.2 Socio-economic status in Qianfeng District

The areas affected by the Project involve Qianfeng Town and Xinqiao Township in the downtown area of Qianfeng District. In Feb. 2013, Qianfeng District was founded upon the approval of National Development and official reply of People's Government of Sichuan Province.Qianfeng District mainly relies on the original Qianfeng Town, under the jurisdiction of Guang'an District, Guang'an City before Feb. 2013.

When the project team conducted the investigation on the economic statistics of Qianfeng District, the statistical yearbook in 2013 of Guang'an District was collected, excluding relevant materials in 2013 of Qianfeng District.The statistical yearbook in 2013 contains the relevant statistics in 2012 of Guang'an District, including economic conditions of Qianfeng Town and Xinqiao Township.

Table 5.2.2-1 List of Socio-Economic Conditions of Qianfeng District (Project Affected Area) (2012)

	Indicator		Qianfeng District
Population	Total population (10,000 persons)		125.7
	Male (10,000 persons)		65.6
	Female (10,000 persons)		60.1
	Nonagricultural population (10,000 persons)		29.7
	Labor resources (10,000 persons)		57.3
Cultivated land	Total cultivated area (1,000ha.)		43
	Paddy field (1,000ha.)		
	Dry land (1,000ha.)		
	Grain output (10,000 tons)		50
Output value	GDP (CNY 100,000,000)		219.5
	Primary industry	Output value (CNY 100,000,000)	32.9
		Proportion (%)	14.9
	Secondary industry	Output value (CNY 100,000,000)	117.1

	Indicator		Qianfeng District
		Proportion (%)	53.3
	Tertiary industry	Output value (CNY 100,000,000)	69.5
		Proportion (%)	31.8
	Per capita GDP (CNY)		25494
Income	Disposable income per capita for urban residents (CNY)		21642
	Net income per capita for rural residents (CNY)		6915

Based on the statistical yearbooks of Guang'an District, in 2012, overall GDP of Guang'an District reached CNY 21.96 billion, with a yearly increase of 14.1%, in which, the primary industry increased CNY3.29 billion with a rise of 4.8%, the second industry grew by CNY 11.71 billion with an increase of 18.6%, the tertiary industry rose by CNY 6.95 billion with an increase of 11.2%.The proportion of three industries is 15.0∶53.3∶31.7.The annual per capita net income of rural residents CNY 6,915, increased by CNY 895 against that last year. The disposable income per capita for urban residents reached CNY 21,642, increased by CNY 3,232 against that last year.The percentage of consumption expenditure of rural residents on food in the total consumption expenditure is 35.6%, while 16.4% for urban residents.

Seen from the statistical yearbook in 2013 of Guang'an District, the existing farmland area of Qianfeng Town was 11,629 *mu* at the end of 2012, and the sown area of crops was 31,453 *mu,* with grain output of 9,707t. The rural per capital net income was CNY 7,331.In 2012, the annual grain output of Xinqiao Township was 6,777t, and per capita net income of rural residents was CNY 7,137.

Based on the government work reports of the First People's Congress of Qianfeng District in Aug. 2013, from Jan., to Jun. 2013, the GDP of Qianfeng District reached CNY 5.38 billion, with a yearly increase of 11.5%, in which, the added value of the primary industry, the second industry and the tertiary industry was CNY 460 million, CNY 4.27 billion and CNY 0.65 650 million, with an increase of 3.1%, 13.0% and 9.0%, respectively. The value-adding proportion of three industries is 8.6：79.4：12.0.In the first half of 2013, the local public financial revenue of Qianfeng District reached CNY 115 million, with an increase of 18.1%. Total social fixed assets investment was CNY 3.78 billion, with an increase of 38.9%.The rural per capita income was CNY 4,191, increased by 12.5%; and the urban per capita disposable income was CNY 13,044, increased by 10.2%.The growth rate of the regional gross output value and total social fixed assets investment ranked the first in Guang'an City.

5.2.3 Physical cultural resources

1 Daliang Fortress

Daliang Fortress located in Daliang Village, Xiaojing Township northwest of Qianfeng downtown area is a protected district-level cultural relic. At the end of South Song Dynasty (in the middle of 13th century), it is built on the mesa southeast of Qujiang River to resist the Mongolian army. There are only several gates left now and a natural village around with a population of about 800.

Daliang Fortress is about 40km from the downtown area of Guang'an City, 10km from existing downtown area of Qianfeng and will not be greatly affected by the construction activities of the Project.

Curved stone of the cultural relic protection unit established in 1980

South gate of Daliang Fortress

2 Tomb

According to the *Resettlement Action Plan of Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area*, a number of tombs are included in the land area of Qianfeng Industrial Park, which are ordinary rural tombs and the specific quantity statistics is shown as follows:

Table 5.2.3-1 Summary of Tombs in Expansion Works of Qianfeng Industrial Park

County (District)	Township/Neighborhood Office	Village/Neighborhood Committee	Tomb (Nr.)
Qianfeng District	Xinqiao Township	Gaofeng Village	5
		Jingwan Village	63
Subtotal			68

5.3 Environmental Quality Status

5.3.1 Ecological environment status

1 Land utilization status

The project is located at the central downtown of Qianfeng. The main planning area involved in the Project is Qianfeng Industrial Park and the planning area of new city of Qianfeng.

(1) Qianfeng Industrial Park

This assessment covers the whole Qianfeng Industrial Park and the planned downtown area of Qianfeng District. In accordance with the *Overall Plan of Qianfeng Industrial Park of Guang´an District, Guang´an City (2011-2020)* (November, 2011), by 2020, the planned area will cover Danwan Village, Xinqiao Village, Lujian Village, Houqiao Village of Xinqiao Township to the south, Xinqiao Energy & Chemical Industry Concentration Area to the west, Yanshi Village, Lianmeng Village, Qianfeng Village, Longtang Village of Qianfeng

Town to the east, and Daya Village, Lishi Village, and Suoluo sub-district office of Daishi Town to the north, with an total area of 23.86km^2.

Table 5.3.1-1 Status of Land Use of Municipal Qianfeng Industrial Park Unit: hm^2

SN	Name of Land		Land Area(hm^2)	Proportion of Land
	Industrial land		246.77	80.6
1	In which	Category I industrial land	0	0
		Category II industrial land	190.3	62.2
		Category III industrial land	56.47	18.5
2	Land for logistics and warehouse		0	0
3	Land for road and traffic facilities		47.13	15.4
		Land for municipal roads	47.13	15.4
	In which	Land for traffic stations	0	0
	Land for utilities		1.97	0.6
4	In which	Land for supply facilities	1.97	0.6
		Land for safety facilities	0	0
5	Land for greenbelt and squares		10.2	3.3
	In which	Park greenbelt	10.2	3.3
		Protection greenbelt	0	0
		Land for squares	0	0
6	Total construction land		306.07	100
7	Waters		47.89	
8	Farming and forest land		2031.64	
9	Total proposed land area		2385.6	

(2) Planning area of new city of Qianfeng

In accordance with the *Regulatory Plan of Qianfeng New City of Guang'an (2030)*, the total area of the planning area of new city of

Qianfeng is 1,649.29hm^2, in which, the proposed urban construction land is 1371.73hm^2.The existing land is mainly used as farmhouse, farmland, natural forest and water system; the existing residential land is mainly distributed in the old downtown; and existing land for warehouse of 12.9hm^2 mainly is located around Guang'an Railway Station of Xiangyang -Chongqing Railway.

Figure 5.3.1-1 Land Use Status in the Area

In order to ensure the connection between the Overall Plan of Qianfeng Industrial Park and the Regulatory Plan of Qianfeng New City, it is necessary to further adjust the former so that it will be generally oriented at the optimization of spatial layout and the reduction of construction land.

2 Existing ecological environment quality

The proposed industrial park of the Project features low hills, and the overall terrain is relatively flat. The area with the gradient of less than 10% accounts for 54% of the overall industrial park. It consists of sandstone of Jurassic System, and presents steamed bread shaped hills and reversed pan bottom shaped arc hills, with wide and gentle valley. The main plants within the area include crops and shrubs; there are no rare and endangered animals with ordinary biodiversity; and the area mainly shows plain, shallow hills and countryside farmlands.


Environmental Status on both Sides of Proposed Binhe Road

Environmental Status on both Sides of Proposed Binhe Road

Environmental status of Proposed Industrial Avenue

The Project is located in Qianfeng District. At present, the project area is mostly located in the rural area, and the natural vegetation is basically artificial vegetation with simple ecosystem in the project area. Through the investigation, the Project area does not involve any culture relic protection site, natural reserve, forest park, water-source reserve and other ecologically sensitive areas.

1 Existing plant resources of the project area

The terrain within the area is relatively gentle. The majority of exiting land is used for agriculture, and main crops include rice and vegetables.Due to the influence of human activities, most areas are covered by secondary forest and open forest.Most ridges and bank slopes are covered with ulberries, camptotheca acuminata decne and willows, and surrounded by bamboos (mountain bamboo, mottled bamboo and ma bamboo), hemp willow, fruit trees (such as citrus reticulate, peach, apple, pear and loquat).For cultivated vegetation, main crops include oilseed rage, wheat and cabbage; main economic fruit trees are citrus reticulate and peach etc.There are many kinds of trees, including 80 kinds of arbors, 60 kinds of shrubs and 10 kinds of bamboos.The arbors mainly include pinus massoniana, cunninghamia lanceolata, cupressus funebris, fir tree, poplar, Erythrina variegata Linn, swamp Mahogany, camphor tree, quercus and phoebe zhennan; bamboos mainly include mountain bamboo, yellow bamboo, gelidocalamus aunulatus, mottled bamboo, pleioblastus amarus and phyllostachys pubescens, and shrubs mainly include rubus simplex and pyracantha fortuneana.The farmland, bushes, bamboo forest, orchard are mainly included within 300m range on both sides of the road central line.The crops in the farmland mainly include rice, wheat, corn, tubers and oilseed rape.

2 Existing regional animal resources

According to the historical data, the assessed area enjoys 4 classes, 26 orders and 71 families of vertebrates, of which 1 order, 2 families and 7 species are amphibians, 3 orders, 9 families and 16 species are reptiles, 16 orders, 43 families and 124 species are birds and 6 orders, 12 families and 23 species are beasts.

The amphibians are mainly distributed in the existing farmland, with dominant species such as bufo gargarizans gargarizans and fejervarya limnocharis. Rhacophorus leucomystax and rana omeimontis are common in hill secondary forest and shrub. The reptiles are mainly distributed in

grass and shrub, while tortoise and soft-shelled turtle are distributed in the stream. However, the animals in the assessed area are greatly influenced by human activities, some are tend to inhabit on the farmland that is more suitable for human production activities, especially for the reptiles, for instance, lizard and various colubridae families and species such as mandarin ratsnake, beauty ratsnake and zaocys dhumnades can inhabit on farmland and in grass and brush. As for birds, Passeriformes are dominated and birds with a wide variety include ardeidae, anatidae, turdidae and fringillidae. The assessed area is free of large wild beasts due to the frequent human activities. However, mustelidae and rodent animals such as mustela sibirica, lepus capensis, house mouse and other common species are distributed in the trees, shrub and farmland in low mountain and hilly areas.

3 Existing living aquatic resources

According to historical data, the river enjoys 5 phyla, 32 families, 60 genera and 215 species of hydrobiontic algae, of which 7 families, 18 genera and 47 species are cyanophyta, 1 families, 1 genus and 3 species are cryptophyta, 9 families, 22 genera and 131 species are bacillariophyta, 2 families, 3 genera and 8 species are euglenophyta and 13 families, 16 genera and 26 species are chlorophyta. According to the status survey, diatom takes on a high priority among the plants in the river of this area. The river is free of large aquatic tracheophyte formation and national or local listed aquatic protected plants, but mainly include equisetum arvense, ranunculus sceleratus, humulus japonicas, alligator alternanthera, roegneria pendulina and cynodon dactylon.

The zooplankter includes 3 phyla, 4 classes, 16 orders, 30 families, 56 genera and 77 specifies, of which 2 classes, 10 orders, 12 families, 19 genera and 29 specifies are protozoa, 1 class, 2 orders, 10 families, 24 genera and 34 specifies are trochelminthes and 1 class, 4 orders, 8 families and 13 genera are arthropod. The dominant species are trochelminthes and protozoan includes 17 rhizopodiums (maximum), 12 ciliatas and 14 crustaceas.

Benthic invertebrates include 4 phyla, 7 classes, 12 orders, 21 families, 23 genera and 24 specifies, of which 9 are insecta (maximum) and 8 are mollusc.

The assessed area enjoy 82 species of fishes, which are divided into 5 orders, 14 families and 62 genera, of which 4 families, 50 genera and 63 specifies are cypriniformes and 4 families, 6 genera and 12 specifies are siluriformes.

With the rapid development of society and economy and the operation of Qianfeng Industrial Park, the long-term existing river ecological system is damaged, which makes the hydrobiont and fishes lose their original living environment and subject to great threaten and a number of fishes decrease sharply and some even disappear. Through field investigation and interview with the local residents, the fishes are yearly decreasing due to the water pollution of City moat and Luxi River.

5.3.2 Existing acoustic environment quality

1 Investigation on existing acoustic environment quality within the area

At present, National Highway G304 and Xiangyang-Chongqing Railway cross through the area; in addition, National Highway G304 exerts noise pollution impact on Group 3, 6, 7, 8, Chunlei Village, and the traffic volume is: 78 vehicles/h for large vehicles, 42 vehicles/h for medium-sized vehicles/h and 48 vehicles/h for small vehicles, respectively.Xiangyang-Chongqing Railway is trunk railway with the traffic volume of 76 vehicles/day for passenger cars and 72 vehicles/day for trucks. Furthermore, the overlap section of Xiangyang-Chongqing Railway and the proposed Industrial Avenue is about 1km. Xiangyang-Chongqing Railway exerts great noise impacts on the sensitive points within the area, such as Eli Village, Suzhai Village and Jijian Village.

Based on the filed investigation, there are mainly the original landform on both sides of North and South Binhe Road, with villages scattered. The areas are free of intensive noise source and mainly include noise from social life, with excellent acoustic environmental quality. Some sections of Industrial Avenue belong to the existing road, which is mainly suitable for heavy goods vehicles, with poor acoustic environmental quality. The rural area involved by other sections of Industrial Avenue is free of intensive noise source and mainly include noise from social life, with excellent acoustic environmental quality.

2. Existing acoustic environment monitoring

A. Road Works

(1) Standards and specifications

Environmental Quality Standard for Noise (GB3096-2008);

Acoustics--Measurement Method of Environmental Noise (GB/T3222-94);

Technical Specification for Environment Monitoring (Noise)

(2) Implementation plan

1) Instrument

B&K2238 sound level meter shall be used for monitoring the existing environmental noise and all instruments shall pass the test of metrological verification authority and shall be calibrated before or after each measurement.

2) Time and method

The noise source there is mainly from highway traffic. During the monitoring, the equivalent sound level monitored in a time period during the day and night respectively for 1h with integrating sound level meter will present the equivalent sound level of the existing environmental noise for the assessed area during the day and night.

3) Measurement and assessment value

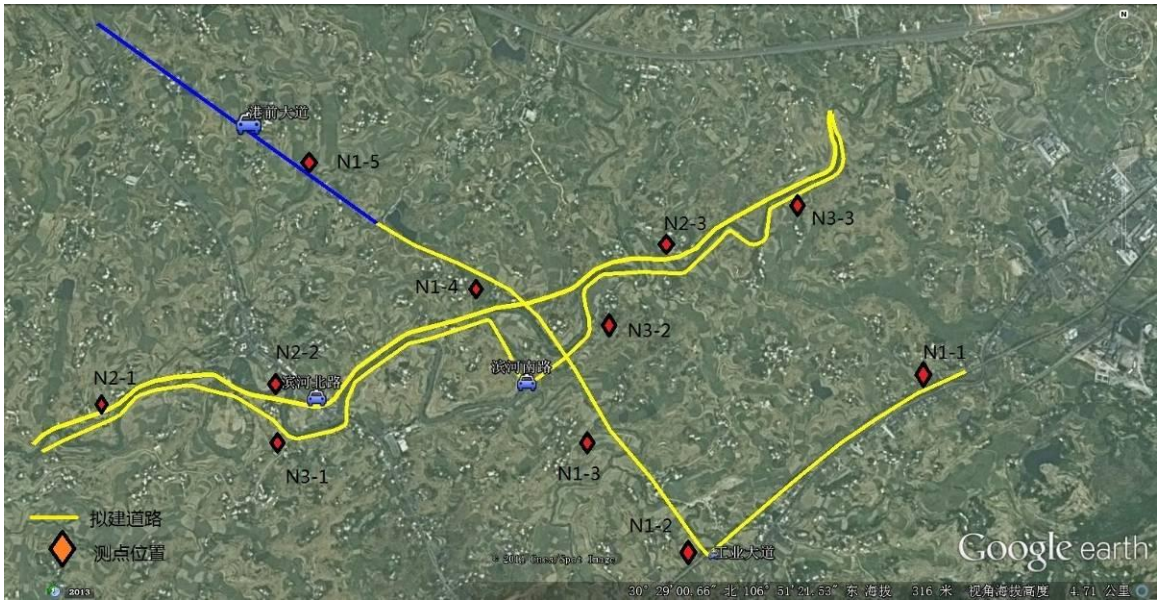
The environmental noise is measured to be continuously equivalent sound level A, which is considered as the assessment value.

4) Monitoring time and frequency

The monitoring time is from July 1, 2014 to July 3, 2014, at a.m.9:00 ~ 20:00 and p.m. 22:00 ~ 23:30, each time period once.

5) Monitoring point arrangement principle

It is required to select the typical sensitive areas and provide monitoring points at the area that is nearest to the proposed road after demolition and the category 4 and 3 functional zones after road completion. The details are shown in the figure below.



6) Monitoring results

According to the relevant provisions in the *Environmental Quality Standard for Noise* (GB3096-2008), combined with the highway assessment in *Technical Guidelines for Environment Impact Assessment—Acoustic Environment*, it is required to select the typical sensitive areas in order to perform existing acoustic environment monitoring. The detailed monitoring results are as follows:

Table 5.3.2-1 Monitoring Results of Existing Acoustic Environment

Road	Number of Target	Name of Target	Function	Mileage	Location of Monitoring Point	Locational Relation with Right of Way of the Proposed Road (m)			Locational Relation with Xiangyang-Chongqing (m)		Existing Value (dBA)		Background Value (dBA)		Standard Value (dBA)		Compliance Status		Main Noise Sources
						Location	Distance	Height Difference	Distance	Height Difference	Day	Night	Day	Night	Day	Night	Day	Night	
Industrial Avenue	N1-1	Youjiayuanzi, Group 4, Chunlei Village	Residence	K0+180~+360	1m in front of the 1st row of residential houses	On the right side	25	3			45.8	38.2			65	55	Yes	Yes	①
Industrial Avenue	N1-2	Ancient Yejiayuanzi, Group 5, Xinqiao Village	Residence	K1+320~+420	1m in front of the 1st row of residential houses	On the right side	130	-3			46.6	39.4			65	55	Yes	Yes	①
Industrial Avenue	N1-3	Luojiayuanzi, Group1, Yongxin Village	Residence	K1+320~+420	1m in front of the 1st row of residential houses	On the left side	26	-1			43.1	38.5			65	55	Yes	Yes	①
Industrial Avenue	N1-4	Yujiayuanzi, Group 5, Suzhai Village	Residence	K1+500~+560	1m in front of the 1st row of residenti	On the left side	36	-1	106	-7	57.4	54.1	43.8	39.6	65	55	Yes	Yes	①②

Road	Number of Target	Name of Target	Function	Mileage	Location of Monitoring Point	Locational Relation with Right of Way of the Proposed Road (m)			Locational Relation with Xiangyang-Chongqing (m)		Existing Value (dBA)		Background Value (dBA)		Standard Value (dBA)		Compliance Status		Main Noise Sources
						Location	Distance	Height Difference	Distance	Height Difference	Day	Night	Day	Night	Day	Night	Day	Night	
					al houses														
Industrial Avenue	N1-5	Daijiayuanzi, Group 5, Eli Village	Residence	K1+680~+820	1m in front of the 1st row of residential houses	On the right side	100	4	44	-5	64.1	60.7	44.9	41.5	70	55	Yes	5.7	①②
Industrial Avenue	N1-6	Pujiayuanzi, Group 3, Eli Village	Residence	K1+940~K2+000	1m in front of the 1st row of residential houses	On the right side	93	5	155	-2	54.3	50.9	42.3	40.7	65	55	Yes	Yes	①②
Industrial Avenue	N1-7	Groups 1 and 2, Jijian Village	Residence	K2+720~K3+260	1m in front of the 1st row of residential houses	On the left side	70	-4	33	4	64.7	61.6	45.2	41.9	70	55	Yes	6.6	①②
North Binhe Road	N2-1	Group 2, Jingwan Village	Residence	K0+200~+260	1m in front of the 1st row of	On the left side	6	1			42.7	37.2			65	55	Yes	Yes	①

Road	Number of Target	Name of Target	Function	Mileage	Location of Monitoring Point	Locational Relation with Right of Way of the Proposed Road (m)			Locational Relation with Xiangyang-Chongqing (m)		Existing Value (dBA)		Background Value (dBA)		Standard Value (dBA)		Compliance Status		Main Noise Sources
						Location	Distance	Height Difference	Distance	Height Difference	Day	Night	Day	Night	Day	Night	Day	Night	
					residential houses														
North Binhe Road	N2-2	Group 7, Chunlei Village	Residence	K0+560~+720	1m in front of the 1st row of residential houses	On the left side	23	-4			45.5	39.4			65	55	Yes	Yes	①
North Binhe Road	N2-3	Group 3, Chunlei Village	Residence	K0+720~+960	1m in front of the 1st row of residential houses	On the left side	116	-2			54.2	51.5	44.6	40.3	65	55	Yes	Yes	①③
North Binhe Road	N2-5	Group 4, Gaofeng Village	Residence	K2+500~+600	1m in front of the 1st row of residential houses	On the left side	6	1			44.3	39.1			65	55	Yes	Yes	①
North Binhe Road	N2-6	Group 4, Yongxing Village	Residence	K2+800~+920	1m in front of the 1st	On the left side	14	1			45.2	41.4			65	55	Yes	Yes	①

Road	Number of Target	Name of Target	Function	Mileage	Location of Monitoring Point	Locational Relation with Right of Way of the Proposed Road (m)			Locational Relation with Xiangyang-Chongqing (m)		Existing Value (dBA)		Background Value (dBA)		Standard Value (dBA)		Compliance Status		Main Noise Sources
						Location	Distance	Height Difference	Distance	Height Difference	Day	Night	Day	Night	Day	Night	Day	Night	
					row of residential houses														
South Binhe Road	N3-1	Group 1, Jingwan Village	Residence	K0+120~+520	1m in front of the 1st row of residential houses	On the right side	60	-3			42.7	37.2			65	55	Yes	Yes	①
South Binhe Road	N3-2	Group 6, Chunlei Village	Residence	K0+860~K1+060	1m in front of the 1st row of residential houses	On the right side	13	-2			45.5	40.6			65	55	Yes	Yes	①
South Binhe Road	N3-3	Group 8, Chunlei Village	Residence	K1+120~+200	1m in front of the 1st row of residential houses	On the right side	15	0.5			60.6	52.7	44.5	41.2	65	55	Yes	Yes	①③
South Binhe	N3-6	Group 2, Yongxing	Residence	K0+440~+700	1m in front of	On the right	30	1			43.1	37.4			65	55	Yes	Yes	①

Road	Number of Target	Name of Target	Function	Mileage	Location of Monitoring Point	Locational Relation with Right of Way of the Proposed Road (m)			Locational Relation with Xiangyang-Chongqing (m)		Existing Value (dBA)		Background Value (dBA)		Standard Value (dBA)		Compliance Status		Main Noise Sources
						Location	Distance	Height Difference	Distance	Height Difference	Day	Night	Day	Night	Day	Night	Day	Night	
Road		Village			the 1st row of residential houses	side													

Note: ① indicates the noise of social activities; ② indicates the noise of Xiangyang-Chongqing Railway; ③ indicates the noise of national highway G304.

According to site investigation and the status monitoring result, the noise status is 42.7~64.7dBA during the day and 37.2~61.6dBA at night. Two sensitive areas in Daijiayuanzi, Group 5, Eli Village as well as Groups 1 and 2 of Jijian Village are apparently affected by railway noise due to close to Xiangyang-Chongqing Railway; the noise status is 64.1~64.7dBA during the day (up to the standard) and 60.7~61.6dBA at night (exceeding the standard by 5.7~6.6dBA). Group 3 and Group 8 of Chunlei Village are affected by highway noise due to close to National Highway G304, with high noise level at present.

Other sensitive areas are located in the countryside, where no intensive noise source exists and noise mainly comes from social activities. The noise status is 42.7~60.6dBA during the day and 37.2~54.1dBA at night, both meeting the standard.

B Wastewater interceptor works

Wastewater interceptors are laid under South Binhe Road and North Binhe Road, with the acoustic environment investigation result consistent with that of Binhe Road. According to the status monitoring result, the noise status is 42.7~60.6dBA during the day and 37.2~52.7dBA at night, with excellent acoustic environmental quality.

C Landscape renovation works

The river course where the landscape renovation works is located is under construction; in the later stage of the works, it is key to create green landscape; for now, the noise mainly comes from engineering construction and social activities and the sensitive areas on both sides are the residential buildings along the streets of Qianfeng Town, where stores are arranged on the first floor and the housing on the 2-6 floors. According to the status monitoring result, the noise level is 54.8dBA during the day and 48.3dBA at night, complying with the requirements of category 2 area, so the existing acoustic environment is generally preferable

5.3.3 Existing air environment quality

1 Section arrangement

Considering the functional division of the assessed area and combined with the features of the ground wind field, 4 monitoring points are provided in the assessment.

Table 5.3.3-1 Monitoring points

No. of Monitoring point	Location
1#	Zhujia Village Primary School
2#	Residential area in Qianfeng Town
3#	Honghui Village Primary School of Qianfeng Town
4#	Jingwan Village
5#	Daishi Town
6#	Suzhai Village

(2) Monitoring factors

PM_{10}、SO_2、NO_2

3) Monitoring time

The sampling time is from July 2, 2014 to July 4, 2014.

PM_{10}, SO_2 and NO_2 monitoring continues for 3 days, in which PM_{10} is subject to daily average value monitoring and the daily sampling time shall not be less than 12 hours and SO_2 and NO_2 are subject to average hour value monitoring and sampling shall be made 4 times and each for 1 hour, with a frequency of 2:00 ~ 3:00, 8:00 ~ 9:00, 14:00 ~ 15:00 and 20:00 ~ 21:00.

Table 5.3.3-2 Statistics of Existing Air Environment Monitoring Results
Unit: mg/m^3

Monitoring Factors	Monitoring Date	Monitoring Time	1#	2#	3#	4#	5#	6#	Standard
SO_2	July 2, 2014	02:00~03:00	0.011	0.007	0.011	0.012	0.007	0.009	0.5
		08:00~09:00	0.01	0.009	0.012	0.012	0.008	0.007	0.5
		14:00~15:00	0.007	0.007	0.009	0.008	0.007	0.007	0.5
		20:00~21:00	0.011	0.008	0.013	0.008	0.008	0.007	0.5
	July 3, 2014	02:00~03:00	0.011	0.01	0.007	0.007	0.016	0.01	0.5
		08:00~09:00	0.011	0.007	0.01	0.011	0.01	0.007	0.5
		14:00~15:00	0.008	0.012	0.008	0.01	0.007	0.012	0.5
		20:00~21:00	0.008	0.011	0.007	0.011	0.007	0.011	0.5
	July 4, 2014	02:00~03:00	0.007	0.007	0.01	0.01	0.01	0.011	0.5
		08:00~09:00	0.007	0.01	0.009	0.007	0.011	0.011	0.5
		14:00~15:00	0.01	0.007	0.008	0.01	0.012	0.014	0.5
		20:00~21:00	0.007	0.007	0.01	0.007	0.012	0.01	0.5
	Daily Average		0.009	0.0085	0.0095	0.0094	0.0096	0.0097	0.15
NO_2	July 2, 2014	02:00~03:00	0.02	0.009	0.013	0.012	0.006	0.005	0.2
		08:00~09:00	0.01	0.018	0.005	0.011	0.005	0.016	0.2
		14:00~15:00	0.008	0.009	0.008	0.006	0.006	0.008	0.2
		20:00~21:00	0.005	0.005	0.007	0.005	0.008	0.01	0.2
	July 3, 2014	02:00~03:00	0.014	0.008	0.008	0.006	0.016	0.008	0.2
		08:00~09:00	0.008	0.009	0.009	0.018	0.015	0.015	0.2
		14:00~15:00	0.007	0.014	0.005	0.011	0.012	0.009	0.2
		20:00~21:00	0.01	0.008	0.007	0.015	0.019	0.008	0.2
	July 4, 2014	02:00~03:00	0.012	0.011	0.005	0.005	0.016	0.008	0.2
		08:00~09:00	0.009	0.015	0.008	0.005	0.006	0.005	0.2
		14:00~15:00	0.016	0.016	0.008	0.009	0.02	0.005	0.2
		20:00~21:00	0.007	0.011	0.008	0.006	0.009	0.01	0.2
	Daily Average		0.0105	0.0111	0.0076	0.0091	0.0115	0.0089	0.08
PM_{10}	July 2, 2014	PM_{10}	0.087	0.103	0.1	0.065	0.098	0.048	0.15
	July 3, 2014	PM_{10}	0.073	0.104	0.107	0.098	0.071	0.111	0.15
	July 4,	PM_{10}	0.123	0.133	0.137	0.093	0.121	0.13	0.15

Monitoring Factors	Monitoring Date	Monitoring Time	1#	2#	3#	4#	5#	6#	Standard
	2014								
	Daily Average		0.0943	0.1133	0.1147	0.0853	0.0967	0.0963	0.15

According to the monitoring results in the table above, the indicators of each monitoring point within the air assessment scope are up to the standard and satisfy the related standard of Class II standard in the *Ambient Air Quality Standard* (GB3095-1996), so the ambient air quality of the assessed area is excellent.

5.3.4 Existing surface water environment

1 Water system overview

The Project mainly involves Luxi River, which feeds into Yangtze River water system and is the primary tributary of Qujiang River drainage, with river length of 47km and drainage area of 183km^2.Luxi River is a left bank tributary of Qujiang River.Having its source in Caobachang of Guixing Town within Guang'an region of Huaying Mountain and with low mountains lying 9km upstream, it flows out of mountains at Wanchangwan of Qianfeng Town and into shallow hill area. Meeting Liaojia River at Wangjia Pass of Daishi Town, it flows southwards and bends westwards and feeds into Qujiang River at Huilongqiao, of Huilong Town.Luxi River has drainage area of 183km^2, drainage line of 47km and slope of river of 14.9‰.

Figure 5.3.4-1 Status Quo of Luxi River

2 Existing drainage of Qianfeng

In the Industrial Park, there are 36040m of wastewater pipelines with diameter of d500~d800, 38740m of storm water pipelines with diameter of d600~d1500; the drainage pipe network is in the charge of Qianfeng Housing Urban-Rural Development Bureau.

And there is one wastewater interceptor section with diameter of d800 in Qianfeng Industrial Park; it has been finished in the end of 2012 by laying along the completed North and South Binhe Road.

Since no wastewater treatment plant has been set up in the Qianfeng District, the domestic waste from old downtown is untreated or simply treated before being discharged into Luxi River; wastewater from the production of enterprises settled in the Park is pre-treated to meet the Class I standard in *Integrated Wastewater Discharge Standards* (GB8978-1996) before discharge.

3 Existing surface water environment quality assessment

For this EIA, Chengdu Centre Testing International Corporation is entrusted to monitor the current situation of surface water within works area.

1) Section design

Four monitoring sections are arranged on Luxi River.

Table 5.3.4-1 Surface Water Monitoring Section

Section No.	Surface Water	Section Location
1	Luxi River	500m upstream of Qianfeng section of Luxi River
2		Position of proposed Industrial Avenue over crossing Luxi River
3		100m downstream of the WWTP of Energy & Chemical Industry Concentration Area
4		500m before Luxi River feeding into Qujiang River

2) Water quality factor

pH value (dimensionless), COD, BOD_5, NH_3-N, Phosphorus (in P), Zn, As, Hg, Cr (VI), Cd, Pb, fecal coliform, cyanide, fluoride, volatile phenol and petroleum.

3) Monitoring Time

Sampling time: 2014

CODcr, BOD5, NH_3-N, petroleum, pH, SS, NH_3-N (in N), TP (in P): monitored for three consecutive days and once per day.

Zn, As, Hg, TN, Cr (VI), Cd, Pb, fecal coliform, cyanide, volatile phenol and petroleum: monitored for one day.

Table 5.3.4-2 Surface Water Monitoring Results

Monitoring Factors / Monitoring Sections	Sampling Time	Chemical Oxygen Demand (COD_{Cr})	Five-Day BOD (BOD5)	NH_3-N	Petroleum	pH	TP
1#	7.2	11.20	3.1	0.073	ND	7.87	0.04
	7.3	10.30	3	0.062	ND	7.43	0.02
	7.4	11.90	2.9	0.056	ND	7.36	0.03
Average		11.13	3	0.063667	ND	7.553333	0.03
Class III Standard in (GB3838-2002)		20	4	1	0.05	6~9	0.2
Out of Specification		No	No	No	No	No	No
2#	7.2	12.8	3	0.119	ND	7.34	0.11
	7.3	11.7	3.1	0.133	ND	7.68	0.13

	7.4	11.6	2.9	0.108	ND	7.54	0.14
Average		12.03	3	0.12	ND	7.52	0.13
Class III Standard in (GB3838-2002)		20	4	1	0.05	6~9	0.2
Out of Specification		No	No	No	No	No	No
3#	7.2	13.9	3.3	0.05	ND	7.46	0.1
	7.3	12.8	3.1	0.045	ND	7.24	0.11
	7.4	13.3	3	0.042	ND	7.47	0.14
Average		13.33	3.13	0.05	ND	7.39	0.12
Class III Standard in (GB3838-2002)		20	4	1	0.05	6~9	0.2
Out of Specification		No	No	No	No	No	No
4#	7.2	15.8	3.5	0.036	ND	7.57	0.13
	7.3	14.4	3.1	0.028	ND	7.82	0.14
	7.4	13.9	3	0.042	ND	7.78	0.14
Average		14.7	3.2	0.04	ND	7.72	0.14
Class III Standard in (GB3838-2002)		20	4	1	0.05	6~9	0.2
Out of Specification		No	No	No	No	No	No

It is known from above table that water environment quality of Luxi River is good, all water quality indexes satisfy the requirements of category III water body in *Environmental Quality Standard for Surface Water* (GB3838-2002).

5.3.5 Existing groundwater environment

1 Groundwater status

Qianfeng District is located in Central Sichuan Fold Belt simple hydrogeological zone; the groundwater of the assessed area is divided into two categories according to the water-bearing media and occurrence condition, namely, clastic rock pore-fissure water and bedrock fissure water. It is an area of poor and simple type groundwater source.The majority of residents in Qianfeng District take the water from Longtan River as their domestic water and the interview and survey shows that only a few residents take water from the self-drilled well.

2 Groundwater status monitoring

1) Monitoring point

According to the flow direction of groundwater within the assessed area and the proposed geological location for site selection, three monitoring points are set within the proposed area for this groundwater status monitoring.See the table below for details.

Table 5.3.5-1 Location of Groundwater Status Monitoring Point

No.	Description
1	Shuangshi Village, Qianfeng Town

No.	Description
2	Suzhai Village, Xinqiao Township
3	Jingwan Village, Xinqiao Township

2) Monitoring indicators

The groundwater monitoring items include pH, TH, TDS, sulfate, chloride, Fe, nitrate, NH_3-N, volatile phenol, cyanide, fluoride, Zn, As, Hg, Cr (VI), Cd, Pb and fecal coliform.

3) Monitoring period

One day, for once.

4) Existing groundwater quality monitoring and the assessment results

The existing groundwater quality monitoring of the proposed EIA was performed on July 5, 2014 and the monitoring results are shown in the table below.

Table 5.3.5-2 Groundwater Monitoring Results Unit: mg/L

Monitoring Factors / Monitoring Point Location	pH	TH	TDS	Sulfate	Chloride	Fe	Nitrate	NH_3-N	Volatile Phenol	Cyanide	Fluoride	Zn	As	Hg	Cr (VI)	Cd
1#	7.63	324	520	88.9	21	ND	5.17	ND	ND	ND	0.3	ND	ND	ND	ND	ND
2#	7.24	311	506	107	15.7	ND	4.58	0.02	ND	ND	0.4	ND	ND	ND	ND	ND
3#	7.36	180	458	40.6	7.57	0.05	0.91	0.02	ND	ND	0.2	ND	ND	ND	ND	ND
Class III Standard in (GB/T14848-93)	6.5~8.5	≤450	≤1000	≤250	≤250	≤0.3	≤20	≤0.2	0.002	≤0.05	≤1.0	≤1.0	≤0.05	≤0.001	≤0.05	≤0.01
Up to standard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

It is known from above table that the monitoring performed in farmers' wells in Shuangshi Village, Suzhai Village and Jingwan Village shows good groundwater quality in Qianfeng District, all water quality indicators meeting Class 3 Standard of GB/T14848-93.

2 Formation and geology

Middle mountains under minor tectonic erosion located in the area of Huaying Mountains and distributed in Guixing, Qianfeng, Xiaojing, Longtan, Guanghui, etc.They are 500m-1123m above sea level with relative height difference of about 600m and broken rock mass due to the effect of Huaying Mountain Fault Belt. Under the influence of mining activities and the development of underground karst, they mainly consist of Permian, Triassic carbonatite, sand, mud, shale and carbonaceous shale intercalated with coal, forming the steep rock strata.The mountains are the highest at the bottom of Sichuan Basin with high and precipitous terrain, peaks rising one above the other in the distance, incised valleys developed into "V" shape. Geological disaster, in particular surface collapse, manifests itself well and carbonatites are corroded to form trough valley, showing "One Mountain, One Valley and Two Ridges" or "One Mountain,

Two Valleys and Three Ridges" landform and karst landform like karst caves.

5.3.6 Investigation and assessment of existing solid waste

There is no landfill in Qianfeng District and only one domestic waste transfer station is available; the wastes produced are transferred to Guang'an Pu'an Waste Disposal Plant for treatment. Pu'an Waste Disposal plant is located in Pu'an Town of Yuechi County, at a distance of about 50km from Qianfeng District and with landfilling capacity of 300 tons/day.

In Qianfeng District, about 40 tons of domestic waste is transferred, collected and disposed every day. The waste is collected in two ways, for the street refuse, it will be collected to the waste yard with the waste truck from Environmental Health Office; for the bagged waste along the back streets or alleys, it will be collected to the transfer station with handcart by the waster collecting personnel from the Environmental Health Office and then delivered to the Guang'an Pu'an Waste Disposal Plant.

5.3.7 Status quo of infrastructure and industrial enterprises

1 Existing water supply works

There are two water plants in Qianfeng Town District, namely Qianfeng Water Plant and Hedong Water Plant.Qianfeng Town Water Plant was built in 1994 using the self-raised fund by local government and the project subsidy; with current water supply capacity of 5000m^3/d and source in Longtan River, it provides services for Qianfeng Town.

Table 5.3.7-1 List of Water Plants in the Downtown

SN	Name of Water Plant	Design capacity (10,000m^3/d)	Actual Water Supply Capacity (10,000m^3/d)	Water Source	Remarks
1	Qianfeng Town Water Plant	0.3	0.5	Longtan River	
2	Hedong Water Plant	1	0	Longtan River	
Total		1.5	0.5		

Built in 1994 and located beside CNPC's oil tank in Qianfeng Village of Qianfeng Town, Qianfeng Town Water Plant was designed with water supply capacity of 3000m^3/d and water pressure of 0.4~0.45MPa. With the completion of new Qianfeng District, urban water demand increased sharply and the water was far from enough to meet the need at one time, making the water plant operate in the state of overload to reach maximum water supply of about 5000m^3/d.

Located in Baiyangwan Village of Qianfeng Town, Hedong Water Plant was commenced in 2011 and completed in October 2013, with capacity of 10,000 m^3/d.This plant is now in the stage of commissioning and has not been put into operation. It is planned to begin operations by the end of 2014.

2 Existing water drainage works

(1) Existing drainage pipe network

The old downtown of Qianfeng District mainly relies on the combined storm water and wastewater system while the countryside on the open channel drainage and scattered drainage.

According to site investigation and the date provided by the management committee of industrial park, there are wastewater pipelines of 36040m with diameter of d500~d800 and storm water pipelines of 38740m with diameter of d600~d1500.The wastewater interceptor works is under construction in Qianfeng Industrial Park and wastewater interceptors have been laid along the completed North and South Binhe Road.

(2) Existing drainage of Qianfeng Industrial Park

Since no wastewater treatment plant has been set up in the Qianfeng District, the domestic waste from old downtown is untreated or simply treated before being discharged into Luxi River; wastewater from the production of enterprises settled in the Park must be pre-treated to meet the Class I standard in *Integrated Wastewater Discharge Standards* (GB8978-1996) before discharge.

3 Existing environmental health works

There is no landfill in Qianfeng District and all the wastes are transferred to Guang'an Pu'an Waste Disposal Plant for treatment. Pu'an Waste Disposal plant is located in Pu'an Town of Yuechi County, at a distance of about 50km from Qianfeng District and with landfilling capacity of 300 tons/day.The Environmental Health Office of Qianfeng District is responsible for sweeping and keeping clean the trunk and sub-trunk roads within the 0.8million m^2 urban area and transferring and disposing over 40 tons of daily domestic waste.

4 Existing power supply works

There is one thermal power plant, Guang'an (Daishi) Thermal Power Plant, in Qianfeng District, with installed capacity of 2400 MW, and four power transformation facilities of 110kV and above with total capacity of 2531.5MVA, i.e, 500kV Guang'an Huangyan Substation with capacity of 1500MVA, 220kV Daishi Substation with capacity of 240MVA, 220kV Jinxing Substation with capacity of 540MVA and 110kV Qianfeng Substation.

5 Existing gas supply works

There are Φ108 MP natural gas pipelines along Guang'an-Qianfeng Avenue in central urban area. The gas is supplied by Xinqiao Gas Terminal Station with source mainly from 19# natural gas well in Da'an Town of Guang'an and Moxi Gas Field of Suining in central Sichuan.

6 Existing road works

Existing roads are arranged in square grid pattern and the main roads include Guang'an-Qianfeng Highway, Guang'an-Qianfeng Avenue, Wenyi Road and Zhongxing Street.Main roads extending from the downtown are Guang'an-Qianfeng Highway and Shixi Highway.At present, there is low

traffic volume in downtown with good traffic condition in general.Existing Guang'an-Qianfeng Highway running east to west through the extent of planning has two-way four lanes and road width of 23m; Shixi Highway running south to north through the downtown has two-way four lanes and road width of 7.5m; other roads have poor quality and many of them have sand aggregate pavement and mud pavement.

6 Environmental Impact Prediction and Assessment

6.1 Environmental Impact Prediction and Assessment during the Construction Period

6.1.1 Ecological impact prediction and assessment during the construction period

1 Impact of land occupation

World Bank loan funded project covers an area of 46.69hm^2 in total, including permanently occupied land of 40.71hm^2 and temporarily occupied land of 5.98hm^2, in which permanently occupied land involves cultivated land of 16.49hm^2, forest land of 7.37hm^2, grassland of 2.68hm^2, rural homestead of 7.45hm^2 and other land of 6.72hm^2; and temporarily occupied land involves cultivated land of 2.71hm^2, forest land of 1.48hm^2, grassland of 0.63hm^2 and other land of 1.16hm^2. The other land refers to bare land due to the impact from surrounding construction. See the table below for the occupied area of the project.

Table 6.1.1-1 Statistics of Occupied Area of the Project Unit: hm^2

Occupation Character	Item		Total	Cultivated Land	Woodland	Grassland	Residential Land	Other land
Permanent	Road works	Industrial Avenue	15.40	7.04	4.03	1.72	2.61	
		North Binhe Road	9.92	3.78	1.37	0.61	1.42	2.74
		South Binhe Road A	4.59	1.83	0.65	0.27	1.34	0.5
		South Binhe Road B	1.01	0.25	0.10	0.02	0.36	0.28
		South Binhe Road C	5.29	2.01	0.99	0.06	1.12	1.11
	Landscape renovation	Landscaping	3.3	1.16	0.17		0.42	1.55
		Square and footpath	1.2	0.42	0.06		0.18	0.54
	Subtotal		40.71	16.49	7.37	2.68	7.45	6.72
Temporary	Wastewater interceptor works	Pipeline construction area	0.65	0.35	0.13	0.06		0.11
		Temporary soil storage area	0.93	0.37	0.19	0.08		0.29
		Construction access area	0.45	0.24	0.09	0.04		0.08
	Road works	Temporary soil storage area for construction	3.14	1.39	0.85	0.36		0.54
		Temporary construction area	0.81	0.36	0.22	0.09		0.14
	Subtotal		5.98	2.71	1.48	0.63		1.16
Total			46.69	19.20	8.85	3.31	7.45	7.88

The permanent occupation of land mainly changes the land function and the land occupied by the Project is all the planned construction land.

According to the overall plan of Qianfeng District, the ecological agriculture, economical agriculture and ecological forestry such as high quality rice, characteristic planting and livestock breeding are mainly distributed in other towns and townships, therefore the land occupation of project is in line with the plan of land utilization and will not influence the development of regional agriculture and forestry.

Guang'an Port-Qianfeng Avenue covers 6.4ha., mainly as cultivated land and forest land. Earth and stone excavation is about 45,000m^3, filling 16,000m^3 and spoil 29,000m^3. All of these are used for Park construction and spoil ground is not separately arranged.

WWTP of Western Jeans Industrial Zone is located in the south of the Industrial Park, near Xinqiao WWTP that has been put into operation. The project covers about 200*mu* and rural ecological environment of the proposed site is currently given the first place.

2. Impact on terrestrial plants during the construction period

The infrastructure construction in the industrial park will inevitably bring some damage to the regional ecological environment, which will change the existing land-use type and cause the surface vegetation to disappear. Moreover, rolling of various motor vehicles, activities of construction personnel and piling of earth and stone will also cause more serious damage and impact to the vegetation. As the construction continues, some plant species within the scope of land requisition will disappear and the vast majority of plant species will be greatly reduced, so the regional biodiversity will be affected hereby. However, all damaged vegetation types are common types in the assessed area, without national key protected rare or endangered plants and wild plants. Therefore, the construction of the base has little impact on the flora and vegetation type, which will not lead to the disappearance of the existing species and vegetation types in the region. After the construction period, the vegetation will be gradually restored through landscape construction, and it will make up the loss for plant species diversity. See the table below for impact on vegetation during the construction period.

Table 6.1.1-1 Impact Factors on Vegetation during the Construction Period

SN	Construction Link	Reason for Impact	Impact Range
1	Artificial excavation	Directly destroy the vegetation of the excavation zone	3m from both sides of the excavation zone
2	Backfill	If the backfill procedure is violated, the topsoil will suffer serious loss	10m from both sides of the site
3	Mechanical operation	Crush the vegetation on the construction site	Construction site
4	Temporary sheds for machinery storage	Some short-term temporarily occupied land will destroy the vegetation	Some area

According to the statistics for the type of occupied land, the Project occupies permanent occupied forest land of 7.37ha. and grassland of 2.68ha. The forest land in the region is greatly impacted by human activities, mainly for pinus massoniana, cypress, vitex trifolia and coriaria sinica. The community structure is relatively simple. Although certain forest lands are occupied for road construction, the distribution of vegetation types and community structure of forest plants will not be changed.

In accordance with ecological restoration measures of soil and water conservation plan, in addition to the road surface, buildings and structures and hardened protective measures, the vegetation of the land occupied for construction will be restored. Please see the table below for specific number. It is unable to fully recover the original ecological environment in the region by artificial vegetation, but it may compensate the regional ecological environment, so the regional vegetation will not be greatly impacted.

Table 6.1.1-2 Statistics of Vegetation Restoration Measures during the Construction Period

No.	Item	Unit	Road Works Area		Wastewater Interceptor Works Area		Landscape Reconstruction Works Area		
			Main Road Works Area	Temporary Construction Area	Pipeline Operation Area	Construction Access Road Area	Square Footpath Area	Landscaping Area	Subtotal
I	Garden-style landscaping								
1.1	Roadside trees	Plant	4356						4356
1.2	Large arbors	Plant						563	563
1.3	Small arbors	Plant						773	773
1.4	Ball shrub	Plant						227	227
1.5	Shrub and grass flower landscaping	hm2	0.92						0.92
1.6	Lawn landscaping	hm2	2.64					250	252.64
II	Slope landscaping								
2.1	Grass sowing by spraying seeds	hm2	13.88						13.88
III	Vegetation restoration								
3.1	Grass seed sowing	hm2		3.95	1.58	0.45			5.98
3.2	Number of grass seeds	kg		395	158	45			598
IV	Grass brick						0.08		0.08

3. Impact on terrestrial animals during the construction period

The direct impact on terrestrial animals during the construction period is mainly from group activities of construction personnel and disturbance on animals during construction; while the indirect impact refers to the damage to vegetation and soil due to the construction of industrial enterprises, resulting in the loss of some terrestrial animal habitats. However, no important activity trace of mammals, amphibians and reptiles is found in the construction area, and the main animals are relatively small number of small mammals, small common birds and frogs and common lizards, which are in small number and have strong ability of migration. Therefore,

the sustenance of such animals will not be impacted during the construction period. It is worth noting that the main mammal in the construction area is rodents, with many types and in large quantities, most species of which are harmful to the agriculture and forestry on different levels, especially the mouse. Due to the condense population and abundant foods during QETDZ construction, such mammal may breed in high density and some species may spread to the surrounding places, which may lead to large number and high density of mice in the surrounding places of the construction area. Therefore, the construction unit must conduct construction camp health and protection work in accordance with the requirements of the environmental management plan.

4 Impact on aquatic organisms during the construction period

Luxi River is mainly involved in the Project. The Industrial Avenue may directly across Luxi River, so piles are not required to be arranged in the water, which causes little disturbance to the river bottom. The construction of landscape reconstruction works of Luxi River is mainly conducted on the river embankment, without wading works. The embankment on both sides of the river is improved with cofferdam construction method during the construction of South and North Binhe Road works, and the wading works will disturb the river sediments of this section and cause certain loss to the regional algae and benthic organisms. But when the project is completed, the original algae will be gradually restored and stabilized.

The wading works will disturb the river sediments of this section and cause certain loss to the regional algae and benthic organisms. But when the project is completed, the original algae will be gradually restored and gradually stabilized. Wading construction will result in muddy water, change the pH value of the regional water, and may destroy the growing environment of some plankton, thereby reducing the biomass within the construction area. In spite of this, it may be basically restored when the construction is completed because the region for wading construction is relatively very small as compared to the entire river area, the plankton features cosmopolitanism and waters has self-purification capacity, and cofferdam construction may minimize the plankton impact range.

Cofferdam construction and pipeline construction on both sides of the river banks will not pose a significant adverse impact on the waters quality and will be less likely to impact the fish in the river. Construction vibration and noise may produce a temporary impact on the fish, but the fish itself may run to other places to avoid being impacted, so the construction will not have a significant impact on the fish. Besides, since no important protective fish and three grounds distribution exist in the river of this section, the impact on the fish caused by the construction is very few.

5. Impact on water and soil loss during the construction period

Subgrade filling, expanding excavation of river course, temporary piling of spoils and waste slag and housing demolition during construction crush the surface vegetation, disturb the topsoil structure and change the existing terrain. New water and soil loss may be caused under the action of gravity, raindrop hit, current scour and other exterior forces.

Concentrated rainfall in the project area will greatly aggravate the water and soil loss during the construction period, so construction in rainy

season shall be avoided as much as possible.

According to the construction characteristic, construction process as well as the characteristic and status quo of water and soil loss in each region of the Project, the factors of impact on water and soil loss in project construction is shown in the table below.

Table 6.1.1-3 Analysis on Factors of Impact on Water and Soil Loss in Project Construction

Construction Behavior	Reason for Impact	Major Impact Links	Impact Degree
Cutting slope excavation, embankment filling and pipeline excavation	Earth and stone excavation, soil structure damage, vegetation destruction and bare slope	Slope and spoils	◇◎■
Land reclamation	Disturbance of soil structure due to construction and soil covering	Foundation excavation and soil covering	◇◎□
Spoil area	Surface vegetation destruction, soil structure damage, wastes piling and bare mining slope	Spoil and temporary soil piles	◆◎■
Construction road	Soil structure damage, vegetation destruction and slope change	Earth and stone excavation and filling	◇◎■
Construction site	Vegetation and soil structure damage and exposed surface	New temporary facilities and land-use project construction	◇◎□

Note: ◆ / ◇ ——long/short term; ○/ ◎ ——favorable/unfavorable; ■ /□——serious/general

According to related contents in the *Water and Soil Conservation Plan for the Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area*, the Project may produce a possible water and soil loss of 19,425t and new loss of 16,874t, in which 18,587t water and soil loss may be produced in construction period, with new loss of 16,603t; 837t water and soil loss may be produced in natural recovery period, with new loss of 271t.

The ecological impact on the region due to water and soil loss is mainly as follows:

(1) Surface vegetation destruction has a certain impact on the ecological environment in the project area. Cultivated land, forest land, waters, wasteland and other soil conservation facilities with soil and water conservation function occupied for the construction of main works cover an area of 46.69hm2, and surface vegetation destruction in the project area reduces its percentage of forestry and grass coverage, which will exert some impact on the ecological environment in the project area.

(2) Impact on river course

Some project roads are laid along Luxi River. If the loss water and soil flow into the river along the slope during construction, the river course may be blocked and it may impact the downstream of the dam.

(3) Impact on the project area and surrounding production and living environment. When the construction is conducted in new district of the town and the Industrial Park, protective measures are not taken, so

greater soil and water loss will adversely impact the surrounding production and living environment while impacting the construction schedule.

6.1.2 Acoustic environment impact prediction and assessment during the construction period

1. Noise sources and impact range during the construction period

   Noise during the construction period mainly comes from construction machinery and transport vehicles. According to the actual investigation and analogy analysis, the construction machinery like bulldozer, loader, roller, excavator, dump truck and paver have a greater impact on the environment. See the table below for the maximum test value during the operation of the above construction equipment (noise value at 5m).

Table 6.1.2 -1 Noise Impact Range of Construction Machinery

Noise Level / Construction machinery	Distance (m)							Standard Value (dB(A))		Standard Distance (m)	
	5m	10m	20m	40m	60m	100m	150m	Day	Night	Day	Night
Wheel loader	90	84.0	78.0	72.0	68.4	64.0	60.5	70	55	28	281
Grader	90	84.0	78.0	72.0	68.4	64.0	60.5	70	55	28	281
Vibratory roller	86	80.0	74.0	68.0	64.4	60.0	56.5	70	55	32	177
Dual wheel roller	81	75.0	69.0	63.0	59.4	55.0	51.5	70	55	18	100
Three-wheel roller	81	75.0	69.0	63.0	59.4	55.0	51.5	70	55	18	100
Tire roller	76	70.0	64.0	58.0	54.4	50.0	46.5	70	55	10	56
Bulldozer	86	80.0	74.0	68.0	64.4	60.0	56.5	70	55	18	177
Hydraulic excavator	84	78.0	72.0	66.0	62.4	58.0	54.5	70	55	14	141
Paver	87	81.0	75.0	69.0	65.4	61.0	57.5	70	55	35	199

2. Analysis of environmental impact by construction noise

   (1) If a single construction machinery is used, the noise level at the place where is 35m away from the construction site may achieve the value specified in *Emission Standard for Industrial Enterprises Noise at Boundary* (GB12523-2011) in the day and that is 218m away from the construction site may achieve the standard limit at night. But in the actual construction process, a variety of machines are often used at the same time, so the noise will have a boarder scope of impact.

   (2) The construction noise of the construction noise sensitive point, where is around 5-30m away from the construction site on average, exposes greater impact on the surrounding acoustic environment. The acoustic environmental protection targets along the Project (Xinlei Village, Xinqiao Village, Yongxing Village, Gaofeng Village and Jijian Village, etc.) are substantially 30m within the range of the right of way (ROW). In the daytime, the first row of residential buildings on both sides of the road will produce different levels of impacts and the impact on rest of the residents is particularly obvious at night. Therefore, measures must be strictly taken to minimize the impact of construction noise on the environmental protection target.

(3) When the project is completed, the impact of construction noise will no longer exist, so the adverse impact of the construction noise on environment is temporary.

6.1.3 Atmospheric environment impact prediction and assessment during the construction period

The pollution to ambient air during the leveling and construction of the Project is mainly from: (1) fugitive dust produced by soil cement mixing, concrete mixing and vehicle transport during construction; and (2) asphalt smoke produced by pavement.

1. Fugitive dust from construction

(1) Fugitive dust on the road caused by transport vehicles

The fugitive dust on the road caused by vehicle transport in the construction area accounts for more than 50% of the total dust on the site. The amount of fugitive dust on the road is related to the transport vehicle speed, load capacity, load, contact area of tire and the ground, the amount of road dust and relative humidity. According to the experience of similar projects, the transport vehicle is mostly travelled on an earth road in the construction area during construction, which will produce high-content dust on the road, thereby causing serious fugitive dust on the road. The impact of the fugitive dust caused by soil cement transport vehicles on both sides of the road is more obvious especially in road earth and stone process stage. The fugitive dust pollution due to soil cement transport is the most severe one during the soil mixing process of highway construction, with TSP concentration greater than 10mg/m^3 at 50m away from the downwind area of the roadside and that at 150m away from the roadside greater than 4mg/m^3.

According to similar construction site monitoring, if only watering, without sweeping, is conducted on the road surface on which the vehicles are driving, the dust suppression rate will be 70~80%; while if watering after cleaning, it will achieve 90%. If the watering frequency on the construction site reaches 4~5 times/day, the dust impact distance will be within 20~50m.

(2) Construction fugitive dust

1) Impact of demolition fugitive dust

In the demolition process, the collapse of dry building materials produces a significant amount of fugitive dust pollution due to air operations and wide work surface. The production amount of demolition fugitive dust is connected with demolition volume, construction area, wind speed during construction, demolition construction method and other factors.

Based on the meteorological data, the wind speed in Qianfeng District is small, with dominant wind towards north and annual average wind speed of 1.9m/s, and the wind speed greater than 5m/s rarely occurs. During demolition, dust cloth fence is applied for enclosed construction and watering is conducted for dust fall, so that the impact range of demolition fugitive dust may be controlled in an enclosed area.

2) Impact of fugitive dust from earth, stone and foundation

Construction processes such as foundation excavation, land leveling and subgrade filling will lead to air pollution caused by dust, fugitive dust, etc. in case of strong winds. According to analogy analysis, TSP concentration monitoring result when watering is not conducted for the construction site at fixed time in fine weather is shown in the table blow.

Table 6.1.3-1 TSP Concentration on the Construction Site

Construction Contents	Dusting Factors	Wind Speed (m/s)	Distance (m)	Concentration (mg/m3)
Earth	Handling, transport and site construction	2.4	50	11.7
			100	19.7
			150	5.0
Soil cement	Handling, mixing and transport	1.2	50	9.0

3) Wind fugitive dust on open storage area and exposed site

Due to construction needs, some building materials shall be piled in an open manner and excavated earth and stone on some worksite shall be temporarily piled up, which will produce fugitive dust in dry and windy weather conditions. The fugitive dust volume may be calculated by the empirical formula for dust on the stack yard:

$$Q = 2.1A(V_{50} - V_0)^3 e^{-1.023w}$$

Where: Q—the amount of dust, kg/ton per year;

V50—wind speed at 50m from the ground, m/s;

V0—dusting wind speed, m/s;

W—moisture content of dust particle, %.

V0 relates to particle size and moisture content, and therefore, reducing open storage, ensuring a certain amount of moisture content and decreasing exposed area are effective means to minimize the wind dust. The spread of dust particles in the air is connected with meteorological conditions like wind speed as well as settling velocity of the dust particle itself. Please see the table below for settling velocity of different particles.

Table 6.1.3-2 Settling Velocity of Dust Particles with Different Particle Size

Particle size (mm)	10	20	30	40	50	60	70
Sedimentation velocity (m/s)	0.03	0.012	0.027	0.048	0.075	0.108	0.147
Particle size (mm)	80	90	100	150	200	250	300
Sedimentation velocity (m/s)	0.158	0.170	0.182	0.239	0.804	1.005	1.829
Particle size (mm)	450	550	650	750	850	950	1050
Sedimentation velocity (m/s)	2.211	2.614	3.016	3.418	3.820	4.222	4.624

4) Material transport vehicles will produce a lot of dust on the road and construction site during operation.

According to the historical records, the fugitive dust produced by vehicle travel accounts for more than 60% of the total fugitive dust. Such dust may be calculated by the following empirical formula in completely dry conditions:

$$Q = 0.123\left(V/5\right)\left(W/6.8\right)^{0.85}\left(P/0.5\right)^{0.75}$$

Where: Q—the amount of dust during vehicle travel, kg/km per vehicle;

V—vehicle speed, km/h;

W—vehicle load capacity, t;

P—the amount of dust on road surface, kg/m^2.

The following table shows the amount of fugitive dust of a 10-ton truck under different road cleanliness and different driving speeds when passing the road with a length of 1km. Thus it can be seen that under road cleanliness conditions, the faster the speed is, the greater the amount of fugitive dust will be; while at the same speed, the more dirty the road is, the greater the amount of fugitive dust will be. Therefore, driving speed limit and road clean are effective ways to reduce vehicle fugitive dust.

Table 6.1.3-3 Vehicle Fugitive Dust Under Different Speeds and road cleanliness Unit: kg/vehicle per km

P / Vehicle Speed	0.1	0.2	0.3	0.4	0.5	1
5 (km/h)	0.051	0.086	0.116	0.144	0.171	0.287
10 (km/h)	0.102	0.171	0.232	0.289	0.341	0.574
15 (km/h)	0.153	0.257	0.349	0.433	0.512	0.861
20 (km/h)	0.255	0.429	0.582	0.722	0.853	1.435

In conclusion: TSP pollution is severe during the construction period. During earth handling, transportation and construction and stone transport, the TSP concentration in the ambient air where is 100m away from the construction site reaches 8.8mg/m^3 and that in the ambient air where is 150m away is still as high as 5.0mg/m^3. Therefore, 200m from both sides of the site belongs to the construction impact range. For this reason, if dust prevention measures are not taken during road construction, material handling, mixing and other processes, the produced dust will have a greater impact on and cause pollution to the downwind residents. In particular, when the subgrade is completed but the surface remains unpaved, the construction vehicles will roll up a lot of fugitive dust to cause serious pollution to the surrounding air environment while driving on the road.

(5) Fugitive dust due to material mixing

Three kinds of wastes, soil cement and concrete are easy dusting during mixing. There are two ways of mixing during road construction, i.e., road mixing and station mixing. The Project

applies station mixing, which refers to factory-style centralized material mixing, with concentrated impact of the fugitive dust on ambient air and more likely downwind pollution. But it is easier for manage and dust pollution may be effectively controlled after taking fugitive dust prevention measures.

2. Analysis of impacts of asphalt smoke during the construction period

Besides the fugitive dust, asphalt smoke is another major source of air pollutant caused by asphalt concrete road surface during construction. Purchased commercial asphalt is applied for asphalt concreting of the Project, so mixing plant and mixing point are not arranged on the site. At present, closed mixing process with dust removal facilities is applied for road construction and the asphalt is transported to the paving site with non-heat source or high temperature container. The emission concentration of asphalt smoke is low, which may meet the requirements for maximum allowable emission concentration of asphalt smoke specified in *Integrated Emission Standard of Air Pollutants* (GB16297-1996), and has less impact on the surrounding environment. Based on the related data, the impact distance of smoke pollutants emitted when conducting asphalt pavement is around 100m from the downwind. But according to the construction organization, the asphalt pavement operation time is short and its impact is temporary.

In summary, ambient air pollutants, mainly including fugitive dust on the road caused by transport vehicle and construction fugitive dust, are generated during the construction links like land leveling, subgrade construction, pavement, material transport, handling and mixing and asphalt pavement. Therefore, different levels of impacts on the air environment for the surrounding resident households will be produced during the construction period, but the impact is temporary.

3. Analysis of impacts on air environment at environmental sensitive points

A certain number of residents are distributed within 200m of both sides of urban road and wastewater interceptor works, and some are distributed sporadically in WWTP works area. Fugitive dust, mainly including fugitive dust caused by transport vehicle and construction fugitive dust, is generated during the construction links like land leveling, subgrade construction, pavement, material transport, handling and mixing. During construction, measures like watering for dust fall and enclosure will be taken, construction under windy weather be prohibited and, and construction site be reasonably determined, by which dust impact and pollution level will be significantly reduced. Moreover, the impact cycle during the construction period is short and the impact will disappear along with the completion of construction.

6.1.4 Prediction and assessment of impacts on surface water environment during the construction period

Wastewater during the construction period mainly derives from construction wastewater, domestic sewage produced by construction personnel and wastewater produced by pipe closed water test. The main pollutant of construction wastewater is SS, which may be reused after sedimentation, while that of domestic sewage includes SS, COD and grease, which may be discharged into waters or used as agricultural fertilizer for the surrounding area

upon treatment in sedimentation tank or septic tank. The domestic sewage is prohibited to be directly discharged into nearby waters during the construction period.

1. Construction wastewater: since commercial concrete is used for the construction of the Project and concrete mixing point is not arranged in the construction site, concrete mixing wastewater will not be produced. Thus the production wastewater mainly includes mud wastewater and a small amount of oily production wastewater during the construction period.

   Construction muddy water (produced by the excavation work surface, rain wash, site and construction machinery flushing) is collected according to construction segment. After sedimentation, the upper water shall be reused as much as possible and excessive wastewater may be poured on the spot.

   Cleaning of vehicles and construction machinery will produce oil, which will increase the petroleum concentration in surface water, but the impact is temporary and little. Site wastewater may be reused as construction water as much as possible upon preliminary oil removal and sedimentation. The excessive wastewater may be poured on the spot, but the pouring volume and location shall be controlled to avoid the construction wastewater flowing along the surrounding roads.

   During later construction, curing of concrete ground of water plant and concrete pavement in the plant area produces a small amount of concrete curing wastewater. During concrete curing, thin film or plastic solution may be directly sprayed on the concrete surface, and after solution violation, it will combine with the concrete surface to form a layer of plastic film to separate the concrete and air. In this case, the water in enclosed concrete will no longer evaporate and escape and cement hydration will be completed with the aid of the water in the concrete. Due to the small amount of water consumption, it is completely evaporated. Therefore, special treatment for curing wastewater is not required.

2. Domestic sewage: the domestic sewage during the construction period mainly includes domestic wastewater produced by eating and washing and fecal sewage produced by construction personnel, containing animal and plant grease, detergent and other organic matters. The main components of the domestic sewage during the construction period are shown in the table below.

Table 6.1.4-1 Composition and Concentration of Domestic Sewage during the Construction Period Unit: mg/L

SN	Indicator	High	Middle	Low
1	suspended solids (SS)	350	220	100
2	Biochemical oxygen demand	400	200	100
3	Chemical oxygen demand	1000	400	250
4	Grease	150	100	50

A large number of construction personnel are required for the Project, so a certain amount of sewage is discharged every day. The discharge amount of the domestic sewage produced by construction personnel is calculated as follows:

Qs=(K·q1·V1)/1000

Where: Qs —— discharge amount in the living area, t/d;

q1 —— the total amount of domestic sewage for each person every day, L/(person • day);

V1 —— the number of people in work area, person;

K —— domestic sewage discharge coefficient. It is generally 0.6~0.9, and 0.8 is taken for the Project.

According to this region's economic conditions and work characteristics of the construction personnel, 50~80L/(person • d) is taken as domestic water standard. The number of construction personnel varies a lot depending on the construction volume and difficulty level. Based on the construction scale, the number of construction personnel of roads and bridges pipe network works is calculated as 350 persons, that of wastewater interceptors works as 80 persons and that of WWTP works as 50 persons, so the total discharge of domestic sewage is 19.2t/d~30.7t/d.

3. Because WWTP of Qianfeng District and Western Jeans Industrial Zone is near Luxi River, it is required in the assessment that construction wastewater shall be reused after sedimentation in the sedimentation tank and direct discharge into Luxi River is not allowed. In addition, the domestic wastewater generated by the construction personnel shall be discharged upon treatment in septic tank or used as agricultural fertilizer. In this case, the construction of WWTP component has little impact on the water quality of Luxi River.
4. Leakage and pressure test is required to be performed after the connection of pipe network works like wastewater interceptors, and the water pollutants for pressure test is mainly SS, which may be collected as dust suppression water or landscaping water after sedimentation.
5 The wastewater interceptors are laid along Lvxi River and then built along the planned 1st Cross Road after they come together. There are two crossings along Lvxi River, both of which are arranged along the planned 1st Cross Road. The construction technology of pipeline within the area of Lvxi River is pipe jacking, which has little impact on the water quality of river.

6.1.5 Prediction and assessment of impacts on groundwater environment during the construction period

The Project mainly includes new road works, wastewater interceptor works and WWTP works, of which the construction in general will not lead to changes in groundwater level and will not block the groundwater flow. Therefore, the impact on groundwater environment during construction is mainly from the following points:

1. The impact on groundwater during construction is mainly from construction wastewater and domestic sewage produced by construction personnel. If such wastewater is not untreated and discharged at will, it will impact the surface water quality, which in turn may impact the groundwater quality. In the Project, the construction wastewater is reused after treatment and domestic sewage is discharged upon treatment in septic tank or used as agricultural fertilizer, which in general will not impact the groundwater

quality.

2. Drainage measures shall be considered for the water burst in the foundation construction process of WWTP. The groundwater burst to be pumped out of the pipe shall be collected by pipes for temporary treatment in sedimentation tank, and the wastewater may be reused as construction water after sedimentation. Due to small WWTP area and the groundwater is not very developed in the plant area, the construction will not impact the groundwater level in the region.
3. The burial depth of pipeline works like wastewater interceptors of the Project is usually at 8~10m. Groundwater depth in some pipe construction section is shallow, so groundwater burst may occur during pipe excavation. Therefore, the principle of “block-based and prevention combined” shall be followed for pipe seepage and leakage during pipeline construction, in order to protect the groundwater environment and prevent groundwater leakage. Before the construction of such pipeline works, it is need to ensure that 0.5m below the bottom of the excavated foundation pit is dewatered during groundwater reduction, so detailed geological and hydrogeological survey on pipe landfill is required to be conducted before construction to develop detailed construction waterproof solutions.

6.1.6 Analysis of solid waste impacts during the construction period

The solid waste produced during the construction period mainly includes domestic waste produced by construction personnel and spoils due to excavation.

The Project involves demolition of buildings and structures within the scope of land acquisition, covering an area of 169,179m^2 and basically for the residents of farmers. Construction waste mainly relates to broken bricks, concrete, mortar, pile head and packaging materials, which generate demolition waste of about $11.3\times10^4m^3$. Such construction waste is delivered to Qianfeng District Bureau for Environmental Health for unified treatment.

It is recommended in the assessment to mainly hire the houses of local villagers and residents as construction camps and try not do separate settings. The construction personnel inside the camp is relatively concentrated, by which the domestic waste generated mainly include coal ash, brick slag, glass, plastic, paper and peel, among which most are inorganic substances such as coal ash and brick slag and organic substances like canteen waste, plastic and paper scrap account for a minor part. The domestic waste discharge by the construction personnel is about 0.25kg/(person • day) and the average total construction personnel during the construction period is about 320 persons. The domestic waste discharge by the construction personnel is 80kg/d and total discharge amounts to 124.8t during the construction period.

In addition, excavation will generate spoils. The construction spoils may be temporarily stored in the construction site. If stored improperly, such spoils may result in soil erosion, blockage of drainage channels, landscape destruction or secondary dust pollution under the action of wind due to rainwater leaching, thereby impacting the environmental health in the project area. Upon full earth and stone allocation, the remaining spoils are placed in unused low-lying land in the vicinity of the project area, which may be used for backfill of other open projects.

6.1.7 Analysis of impacts on social environmental during the construction period

1 Impacts of Land Acquisition, Demolition and Relocation

According to the World Bank policy on involuntary resettlement, the Owner prepares *Resettlement Action Plan* (RAP) (July 2014) for land acquisition, demolition and relocation of each component of World Bank loan funded projects.

The impacts of land acquisition, demolition and relocation and contents of resettlement plan are excerpted from RAP. From the impacts of land acquisition, demolition and relocation, we can know that urban road works, wastewater interceptor works and wastewater treatment works have permanently acquired land and demolition impact. See the table below for the impact type of land acquisition, demolition and relocation of each component.

Table 6.1.7-1 Impact Type of Land Acquisition, Demolition and Relocation of Each Component

SN	Components	Permanently Acquired Land	Temporarily Acquired Land	Demolition
I	Urban road	√	X	√
II	Wastewater interceptors	X	X	X
III	Wastewater treatment	√	X	√

It can be seen from the above table that the impacts of land acquisition, demolition and relocation of the Project are focused on the construction of urban road works and wastewater treatment works.

According to the summary of resettlement survey data, the overall condition of impacts of the Project is as follows: land acquisition of the Project involves nine villages, i.e., Longzhen Village and Jijian Village in Qianfeng Town, Qianfeng District and Chunlei Village, Jingwan Village, Xinqiao Village, Gaofeng Village, Yongxing Village, Suzhai Village and Eli Village in Xinqiao Township.

1 Demolition impact:

The project area is substantially located in the rural areas, so only rural residential housing demolition is involved. There are totally 169,179m^2 houses demolished, among which 115,458m^2 are of masonry-concrete structure, 35,983m^2 masonry-timber structure and 10,602m^2 earth-timber structure, 5,201m^2 lumber room structure and 2,287m^2 other structures, affecting 421 households and 1,515 persons.

2 Land acquisition impact:

Permanent acquisition of land of the Project impacts 1,630 persons from 453 households and 319.93*mu* of land is required to be permanently acquired, including cultivated land of 242.33*mu* and non-cultivated land of 77.60*mu*. The acquired cultivated land belongs to collective land, in which paddy field covers 110.5*mu* and dry land 80.89*mu*. Besides, the acquired cultivated land belongs to collective land and state-owned agricultural land. Collective land of

62*mu* is temporarily occupied by the Project except the permanently acquired cultivated land.

3 Impact on tomb relocation:

According to the preliminary survey, location of the tombs will be occupied for construction and 68 tombs are required to be relocated.

2 Analysis of impacts on urban traffic

The impact of construction on the traffic is mainly reflected in that earth piling and road excavation obstruct the traffic and impact the travel, and suddenly increased traffic volume on the transport road impacts travel conditions.

During the project implementation stage, the traffic volume of the roads such as Shixi Road and Provincial Highway 304 within the construction area will be increased, which will disturb the daily travel of residents and internal traffic conditions to a certain extent.

A large number of construction machinery and transport vehicles are required during construction, which will increase the traffic flow along the construction area and produce some interference on regional transportation.

3 Analysis of impacts on the lives of residents

The impacts on the lives of residents caused by the project during construction are mainly from land acquisition, demolition and relocation. The Project covers an area of 46.69hm^2 in total, in which permanently occupied land covers 40.71hm^2 and demolition area 5.98m^2.

According to RAP and *Social Assessment Report*, the main problem during construction is that land acquisition, demolition and relocation cause the original residents lose their land and resettle their homes, and thereby lowering their short-term quality of life. Based on the survey, 169,179m^2 houses will be demolished and 6,072 persons from 1,717 households in the project be impacted by the construction. The project area is substantially located in the rural areas, so only rural residential housing demolition is involved. But with the implementation of resettlement measures, the living or working environment of relocated residents and enterprises will be greatly improved.

Moreover, rural roads, irrigation ditch, power and communication may be obstructed in the construction process, and it is bound to bring impact and inconvenience to the normal life of residents.

4. Analysis of impacts on the landscape

Stacking disorder of waste bricks, woods and stones from demolished houses as well as domestic wastes due to demolition will impact the urban landscape and appearance and bring some visual impact to the surrounding residents.

5. Impacts of construction camps

From the size of the project, we can know that the construction will last for a period of time. The increase in the number of construction personnel may bring some impact to the area where construction personnel are gathered. On the one hand, it may interfere with the health and safety of

local people, and on the other hand, if the living conditions in the construction camp is incomplete with poor sanitary conditions, epidemic disease is likely to rise.

Health risk mainly refers to the risk of infectious diseases such as AIDS and venereal disease brought by a large number of floating populations during the construction period. Unsanitary and unhealthy living habits of the construction personnel might infect local residents or other construction personnel with epidemic disease. Since isolation control measures are not provided on the construction during road construction, it is easy to cause harm to the children lacking of safety consciousness.

6.1.8 Impact of relocation

1 Scope of land acquisition, demolition and relocation

Then construction land for the Infrastructure Project for World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang´an) Demonstration Area involves Qianfeng District and Linshui County of Guang'an City, including 5 towns and townships and 18 villages. The total 1,200.93 *mu* of land permanently acquired includes 903.33 *mu* of cultivated land, affecting 1,717 households and 6,072 persons; there are totally 330,548m^2 rural houses demolished, among which 12,904m^2 are of frame structure, 213,891m^2 masonry-concrete structure, 60,184m^2 masonry-timber structure and 26,734m^2 earth-timber structure, 10,308m^2 lumber room structure and 6856m^2 other structures, affecting 1,125 households and 3,983 persons. In addition, the Expansion Works of Linshui Industrial Park (Infrastructure Project for Chongqing-Guang´an Cooperatively Constructed Electromechanical Industrial Park, Phase 3) will conducted simultaneously with such World Bank funded project and the relocation concerned will be unified with such World Bank funded project; therefore, the influence quantity in kind of the Expansion Works of Linshui Industrial Park will be described in this section. The Expansion Works of Linshui Industrial Park (Infrastructure Project for Chongqing-Guang´an Cooperatively Constructed Electromechanical Industrial Park, Phase 3) involves 3 towns and townships 7 villages. The total 6,316.38 *mu* of land permanently acquired includes 4,738.34 *mu* of cultivated land, affecting 4,717 households and 16,509 persons; there are totally 990,689m^2 rural houses demolished, among which 79,255.18m^2 are of frame structure, 604,320.7m^2 masonry-concrete structure, 148,603.45m^2 masonry-timber structure and 99,068.97m^2 earth-timber structure, 31,702.07m^2 lumber room structure and 27,739.31m^2 other structures, affecting 4,716 households and 16,511persons.

2 Policy frame, compensation standard and resettlement cost estimate

The Resettlement Action Plan of the Project will be prepared in strict accordance with the relevant documents of PRC, Sichuan Province and Guang'an City as well as the requirements in the World Bank Safeguard Policies, OP4.12/BP4.12 Involuntary Resettlement. The resettlement will be implemented in strict accordance with the resettlement compensation standard and resettlement scheme identified in the Plan. As stated in the *Notice of the People's Government of Guang'an on the Issuance of Land Acquisition Compensation and Resettlement Measures* (GAFF [2013] No. 13), the unified annual output of land shall be collected according to the unified annual output standard of land acquisition issued by the People's

Government of Guang'an after the approval of Sichuan Provincial People's Government. The annual output of cultivated land in the affected area of the two project components is determined to be CNY 1880/*mu*; the compensation is made 20 times as much as the output of cultivated land and 10 times as much as that of other lands.

The compensation price is slightly higher than the local relocation price for the housing and structures of the Project, which is CNY 900/m^2 for the frame structure, CNY 830/m^2 for the semi-frame structure, CNY 750/m^2 for the masonry-concrete structure, CNY 550/m^2 for the masonry-timber structure and CNY 150/m^2 for the simplified structure.

The total resettlement cost is estimated to be CNY 370.18 million for the Project, including CNY 272.42 million of basic resettlement cost directly used to compensate the affected people, CNY 70.52 million of taxes and administrative costs and CNY 27.24 million of contingencies.

The total resettlement cost for the Expansion Works of Linshui Industrial Park (Infrastructure Project for Chongqing-Guang´an Cooperatively Constructed Electromechanical Industrial Park, Phase 3) is estimated to be CNY 1.35139 billion, including CNY 921.85 million of basic resettlement cost directly used to compensate affected people, CNY 337.35 million of taxes and administrative costs and CNY 92.18 million of contingencies.

3 Measures and resettlement scheme to minimize the project impact

In Project planning stage while performing plan optimization and comparison, pay as much attention as possible to the impact of the Project on local social and economic environment, and make this a key factor for plan optimization and comparison. To reduce housing demolition and resettlement quantity, the optimal design shall realize different widths at different road sections while basically maintaining the original right of way width, thus to minimize the impact on the socio-economy and people's lives. At the same time, use waste land and state land as much as possible to reduce farmland occupation.

For people to be inevitably affected, the damaged housing shall be rebuilt, compensation shall be made for the land and other properties, and the infrastructure and income shall be restored. The specific resettlement scheme is as follows:

(1) Resettlement scheme for land acquisition

The Project involves 1200.93 *mu* of permanently acquired collective land, including 903 *mu* of cultivated land. As the land acquisition of the Project is mainly caused by road construction, in linear distribution, the majority of affected households will not completely lose their land and the agricultural production of farmers will not be seriously affected by land acquisition. The followings are the resettlement modes for land acquisition:

- Monetary compensation
- Social insurance resettlement
- Skills training
- Employment promotion

(2) Resettlement scheme for housing demolition

For the rural housing acquired in the Project, incomplete supporting facilities, old and aging structures and poor lighting and ventilation conditions and other problems of different levels exist; the supporting conditions around the residential areas are poor, and some affected villages are far away from the urban area, which makes it inconvenient for the villagers to going out; however, the resettlement activity for housing demolition in the Project will create a good chance for the relocated households to improve their housing conditions.

The current alternatives for resettlement community in Linshui project component include: Western New City Resettlement Community Works planned to be constructed in 2 phases, namely Phase 1 and Phase 2 resettlement housings of LETDZ Western New City; Yixin Community and Tongxin Community planned to be constructed simultaneously. The above resettlement areas are close to the urban area, complete with well-developed service facilities and buses for easy travel; the housing type is divided into 70m^2, 105m^2 and 140m^2. The communities are to be constructed by Linshui Yuanfeng Industrial Development Co., Ltd (government-controlled entity) by financing from the Linshui County financial department, the land acquisition will be implemented in June 2015, and the construction will be started in October 2015 and completed in June 2017.

The current alternatives for resettlement community in Qianfeng project component are resettlement housing in Pingqiao Road area and Liujiaoqiu area, which are located in the main downtown of Qianfeng District, with convenient transportation, complete service facilities and the same housing type as that in Linshui County. The land for resettlement community construction has been acquired, which will be constructed by Qianfeng Construction Bureau through financing from Qianfeng District financial department and bank. The site leveling of such area has been finished in July 2014 and the construction will be completed in March 2016.

(3) Women development measures

Small-sum guaranteed loan for women

Enterprises residing in the development zone providing more jobs for women.

Enhancing women’s participation in the administration and discussion of state affairs in grassroot organizations

Women having equal decision-making right in selecting the family resettlement scheme

(4) Resettlement measures for vulnerable groups

In addition to the common assistance and support of the state, the local government takes a series of measures specific to the vulnerable groups of the Project to benefit them through the Project.

For poor households: the poverty of poor households in the project

area is mostly due to lacking of labor skills, so the local government takes the following supporting measures during the implementation of the project: giving priority to such households in skills training, reduction of training fees and recommending jobs.

For the disabled: the local government provides jobs for those who are able to work by entrusting the intermediary agencies to train them for vocational skills and offering labor dispatching posts of the government; for those who are unable to work, the government establishes rehabilitation center and fostering center to help them recover living ability as soon as possible.

For households enjoying the five guarantees: the relocated household with 1 family member will be counted as a two-member family and can select a 70m^2/set resettlement housing; public rental housing and low-rent housing will be provided in the resettlement community, which are equipped with complete service facilities and habitable by bringing the luggage and necessities only. (5) Restoration scheme for affected infrastructures

The affected infrastructures of the Project mainly are the electric power and communication facilities and oil and gas transmission lines. If the restoration is not required in the construction and operation of the Project, the owner shall be compensated directly according to the compensation standard stated in Chapter 5, if required, it shall be restored by the owner after being compensated according to the standard.

(6) Resettlement scheme for associated projects

The associated projects mentioned in the document will be constructed simultaneously with the proposed projects of the World Bank, so the compensation standard for land acquisition and housing demolition of the former shall be the same as that of the latter.

4 Resettlement organization establishment

In order to strengthen the leadership of Infrastructure Project for World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area, leading groups have been set up for Guang'an City, Qianfeng District and Linshui County respectively for the proper implementation of funds and smooth progress of works. The land acquisition, housing demolition and resettlement of the Project are carried out under the leadership of leading groups, where the Employer is responsible for general coordination, surveillance and complaint reception, the department of land and resources, the planning and construction department, the town and township government, the community committee and other departments coordinate the land acquisition, the housing demolition and the allocation of resettlement housings, and the finance bureau at district and county levels raises and distributes the funds required for the land acquisition, housing demolition and resettlement. The working personnel involved in the land acquisition, housing demolition and resettlement shall be trained for specific work so that they could finish their tasks successfully.

5 Consultation, participation and resettlement schedule

The resettlement related departments of the Project and governments at all levels have communicated and consulted for several times with the representatives of affected villages, groups and villagers for their opinions and suggestions. The whole process of land acquisition, housing demolition and resettlement will be performed in the spirit of consultation for the Project.

In December 2013, the Employer and local resettlement related departments organized a survey together with the resettlement experts from Sichuan Fontal Strategic-Consulting Co., Ltd. to collect opinions from local public. The survey is carried out in the forms of interview and questionnaire by sampling among all local relocated households, the sample size is 172 households representing 10% of total numbers. The purpose of such public opinion survey by sampling is to collect and understand the opinions and suggestions of the affected villages, groups and households on the project construction and resettlement.

According to the project schedule, the plan for the land acquisition, housing demolition and resettlement will be coordinated with the plan for project construction. The main activities of land acquisition, housing demolition and resettlement are planned to be performed from December 2013 to June 2016, the specific timing may be subject to the deviation of overall project progress.

6. More job opportunities

More job opportunities may be provided during construction, so a lot of the rural labor forces may work on the construction site during such period.

6.2 Environment Impact Prediction and Assessment during the Operation Period

6.2.1 Prediction and Assessment of Ecological Environmental Impacts during the Operation Period

1. Analysis of impacts on animals and plants during the operation period

   Natural vegetation permanently acquired by the proposed road works will change the land-use nature, but through natural succession or artificial vegetation restoration, it may be gradually restored to secondary vegetation corresponding to the above vegetation characteristics, with quality inferior to that of corresponding native vegetation. When the road is under operation, the construction of the Industrial Park will be stimulated and accelerated, leading to further reduction in native vegetation in the region.

   Continuous occupation of animal habitats due to the construction of road works and Industrial Park forces the animals to find new living environment, which will definitely impact the their feeding, shelter and breeding. However, they all have certain migratory capacity and may gradually transfer to the surrounding neighborhood, while food sources are diversified. Therefore, they will not be greatly impacted by the construction. During the project operation, vehicle exhaust and road dust will form surface runoff along with the rainfall, which may enter into the waters to cause short-term impact on regional water quality, and then to a certain extent impact the normal habitats of fish and benthonic animals.

2. Impacts on ecological landscape during the operation period

   Ecological impacts during the operation period mainly refer to ecological impact on the landscape. After the operation of road works of the Project, the regional land use status will be changed, which will change the original rural hilly landscape into an industrial park. When the project is completed, multiple aesthetic factors like plant-specific lines, colors and seasonal changes will be used for the road being built to form a strong characteristic with different tree species, ornamental period and configuration, and in addition, fit with street lamps, flower beds and garbage bins to form colorful streetscape.

6.2.2 Prediction and assessment of impacts on acoustic environment during the operation period

1. Traffic noise prediction mode

   Road traffic noise prediction is the main basis for reasonably planning road traffic and the layout of buildings on both sides and reducing the impact of traffic noise on the surrounding environment. Noise impact of the project is mainly from roads and many buildings are distributed along the roads. It is suitable to apply Cadna/A software to predict the noise impact of the Project.

   With Cadna/A software, road traffic noise prediction is based on RLS90 mode. According to this mode, the average sound pressure level Lm of the receiving point is the function of road noise radiated sound level $L_{m,E}$ (sound source intensity), which is obtained by the average sound level of

free sound wave of the place where is 25m away from the centerline of the lane when considering the impact of vehicle speed, road gradient and road materials[2]. The road radiated sound level $L_{m,E}$ is expressed by Formula (1):

$L_{m,E}=L_m^{(25)}+D_v+D_{stro}+D_{stg}$ …… (Formula 1)

Where: $L_m^{(25)}$refers to the average sound level of free sound wave of the place where is 25m away from the centerline of the lane; D_v refers to amendment to different maximum speed limit; D_{stro} refers to amendment to different pavement material and D_{stg} refers to amendment to correct the slope of road grade.

2 Determination of prediction parameters

(1) Traffic volume

According to FSR and by means of interpolation, the short term (Year 2020), medium term (Year 2026) and long term (Year 2034) traffic volume of each road are calculated.

Table 6.2.2-1 Traffic Volume Predictions of Each Road Unit: vehicle/hour

Description	Year 2020						Year 2026						Year 2034					
	Big Car		Medium-sized Car		Small Car		Big Car		Medium-sized Car		Small Car		Big Car		Medium-sized Car		Small Car	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Section A of Industrial Avenue	92	20	110	24	137	30	101	22	120	27	150	33	114	25	136	30	170	38
Section B of Industrial Avenue	17	4	21	5	26	6	18	4	22	5	27	6	20	4	24	5	30	7
North Binhe Road	11	3	13	3	17	4	12	3	14	3	18	4	13	3	15	3	19	4
South Binhe Road	10	2	12	3	14	3	10	2	12	3	15	3	11	3	13	3	17	4

According to the traffic volume predictions, the traffic volume in the short term and medium term of the Project is slightly increased, with increment less than 10%. Therefore, only predictions for the short term and medium term are considered in this prediction.

(2) Road parameters

Table 6.2.2-2 Design Parameters of Each Road

SN	Description	Length	Right-of-Way Width (m)	Grade	Design Speed (km/h)	Type of Pavement Structure
1	Industrial Avenue	1420.469	50	Urban trunk road	50	Asphalt concrete
2	North Binhe Road	3830.768	12	Urban branch road	20	Concrete

3	South Binhe Road	Section A	1947.874	18	Urban branch road	20	Concrete
		Section B	358.172	20			
		Section C	2126.588	18			

3 Prediction results

(1) Noise prediction results at sensitive points

Calculation model for the proposed Industrial Avenue, North Binhe Road, South Binhe Road, G304 and Xiangyang – Chongqing Railway is established based on the above mode and parameters. See the table below for traffic noise predictions in 2020 (short term), 2026 (medium term) and 2034 (long term).

Table 6.2.2-3 Traffic Noise Prediction Results (Short Term) Unit: dB(A)

No. of Predicted Point	Predicted Value		Standard Value		Out of Specification	
	Day	Night	Day	Night	Day	Night
N1-1	63.7	61.7	65	55	No	6.7
N1-2	60.2	54.4	65	55	No	No
N1-3	51.5	47.6	65	55	No	No
N1-4	58.2	51.7	65	55	No	No
N1-5	51.0	44.9	65	55	No	No
N2-1	51.4	44.8	65	55	No	No
N2-2	60.2	55.4	65	55	No	0.4
N2-3	50.2	44.4	65	55	No	No
N3-1	52.4	46.7	65	55	No	No
N3-2	52.0	46.4	65	55	No	No
N3-3	49.5	43.5	65	55	No	No

Table 6.2.2-4 Traffic Noise Prediction Results (Medium Term) Unit: dB(A)

No. of Predicted Point	Predicted Value		Standard Value		Out of Specification	
	Day	Night	Day	Night	Day	Night
N1-1	63.9	61.7	65	55	No	6.7
N1-2	60.6	54.7	65	55	No	No
N1-3	51.8	47.7	65	55	No	No
N1-4	58.5	52.1	65	55	No	No
N1-5	58.2	51.7	65	55	No	No
N2-1	51.7	45.3	65	55	No	No
N2-2	60.2	55.4	65	55	No	0.4
N2-3	50.5	44.8	65	55	No	No
N3-1	52.7	47.0	65	55	No	No
N3-2	52.3	46.7	65	55	No	No
N3-3	49.8	43.9	65	55	No	No

Table 6.2.2-5 Traffic Noise Prediction Results (Long Term) Unit: dB(A)

No. of Predicted Point	Predicted Value		Standard Value		Out of Specification	
	Day	Night	Day	Night	Day	Night
N1-1	64.1	61.8	65	55	No	6.8
N1-2	61.1	55.1	65	55	No	No
N1-3	52.0	47.8	65	55	No	No
N1-4	58.8	52.3	65	55	No	No
N1-5	58.2	51.7	65	55	No	No
N2-1	52.1	45.7	65	55	No	No
N2-2	60.2	55.4	65	55	No	0.4
N2-3	50.9	45.1	65	55	No	No
N3-1	53.0	47.3	65	55	No	No
N3-2	52.6	47.1	65	55	No	No
N3-3	50.1	44.3	65	55	No	No

According to the prediction results, when the Project is completed, noise in sensitive spots on both sides of roads will increase to varying degree; of which, noise increase in sensitive spots on both sides of North and South Binhe Road is not obvious, noise level in all sensitive spots meet standard, except that in Group 8 of Chunlei Village which still exceeds standard due to noise impact of national road G304; noise increase at measuring point on both sides of Industrial Avenue is relatively large, of which, Jijian Village is mainly affected by noise of Xiangyang - Chongqing Railway; noise during the day of Class IV area meets standard, while exceeds standard at night, while noise of other spots meet standard both in day and night.

(2) Section prediction and standard distance analysis

Noise value and standard distance for different distances are predicted for the short term after road operation of the Project. See the table below for prediction results.

Table 6.2.2-6 Traffic Noise Predictions at Different Distances of the Trunk Road

Operation Period	Period	Traffic Noise Predictions at Different Distances from the Center Line of the Road dB(A)										
		10	20	40	60	80	100	120	140	160	180	200
Short Term	Day	69.4	65.1	60.4	57.6	56.0	54.8	53.9	53.1	52.5	51.9	51.3
	Night	62.9	58.6	53.3	50.6	49.5	48.3	47.4	46.6	45.9	45.3	44.8
Medium Term	Day	69.7	65.4	60.1	57.3	56.2	55.1	54.2	53.4	52.7	52.1	51.6
	Night	63.2	58.9	53.7	50.9	49.8	48.6	47.7	46.9	46.3	45.7	45.1
Long term	Day	70.0	65.7	60.5	57.7	56.6	55.5	54.6	53.8	53.1	52.5	52.0
	Night	63.5	59.2	54.0	51.2	50.1	49.0	48.0	47.3	46.6	46.0	45.5

Table 6.2.2-7 Traffic Noise Predictions at Different Distances of the Branch Road

Operation Period	Period	Traffic Noise Predictions at Different Distances from the Center Line of the Road dB(A)										
		10	20	40	60	80	100	120	140	160	180	200
Short Term	Day	59.8	55.5	50.8	48.0	46.4	45.2	44.3	43.6	42.9	42.3	41.8
	Night	53.3	49.0	43.7	41.0	39.9	38.7	37.8	37.0	36.3	35.8	35.2
Medium Term	Day	60.1	55.8	57.3	54.5	46.7	45.6	44.7	43.9	43.2	42.6	42.1
	Night	54.0	49.7	44.5	41.7	40.6	39.5	38.5	37.8	37.1	36.5	36.0
Long term	Day	63.7	56.2	50.9	48.1	47.0	45.9	45.0	44.2	43.5	42.9	42.4
	Night	53.9	49.6	44.4	41.6	40.5	39.4	38.4	37.7	37.0	36.4	35.9

Table 6.2.2-8 Standard Distance of Traffic Noise Unit: m

Section	Period	Day		Night	
		Class 4a	Class 3	Class 4a	Class 3
Truck road	Short term	/	28	45	45
Branch road	Short term	/	/	/	/

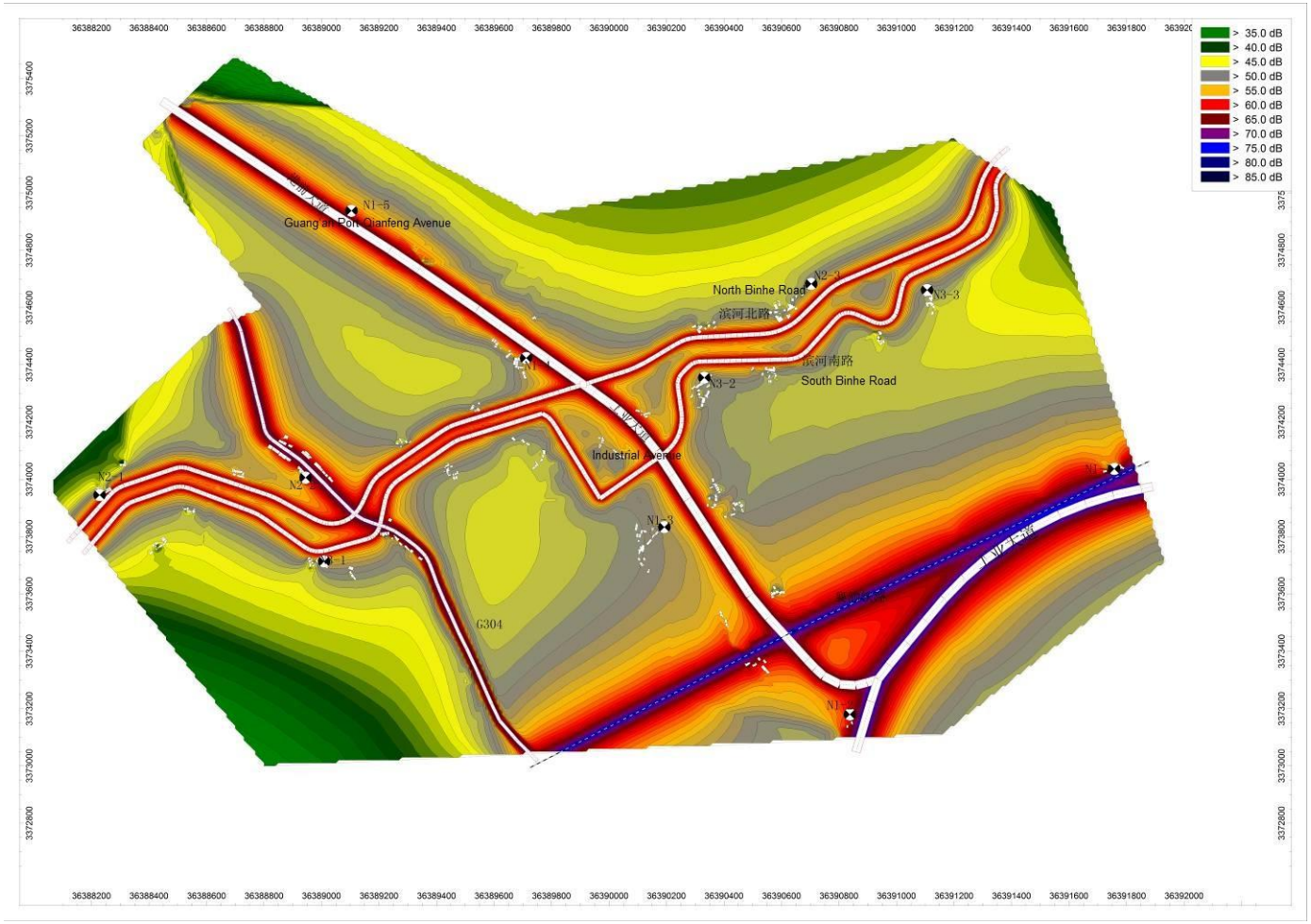


Figure 6.2.2-1 Noise Contours in the Short Term (Day)

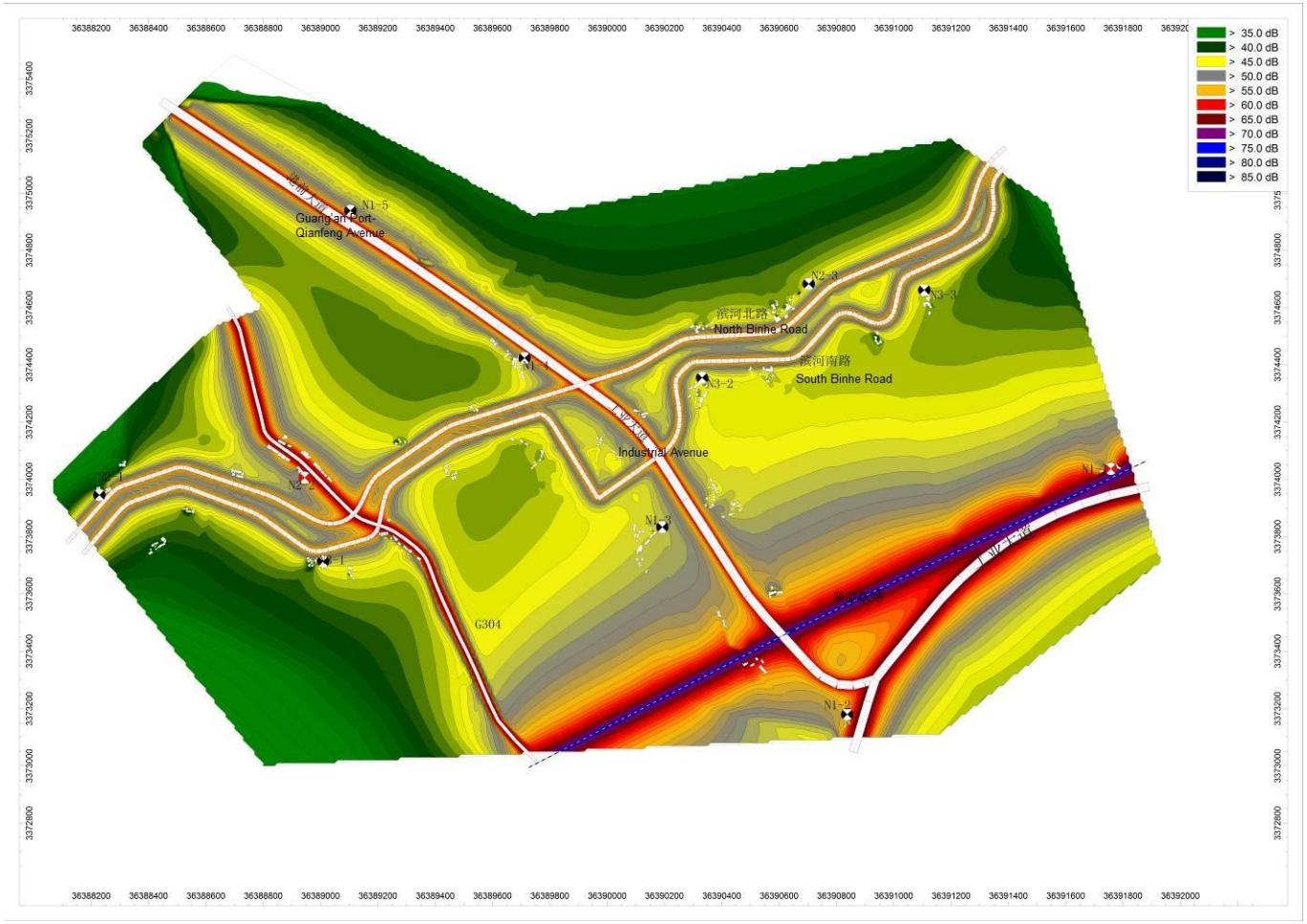


Figure 6.2.2-2 Noise Contours in the Short Term (Night)

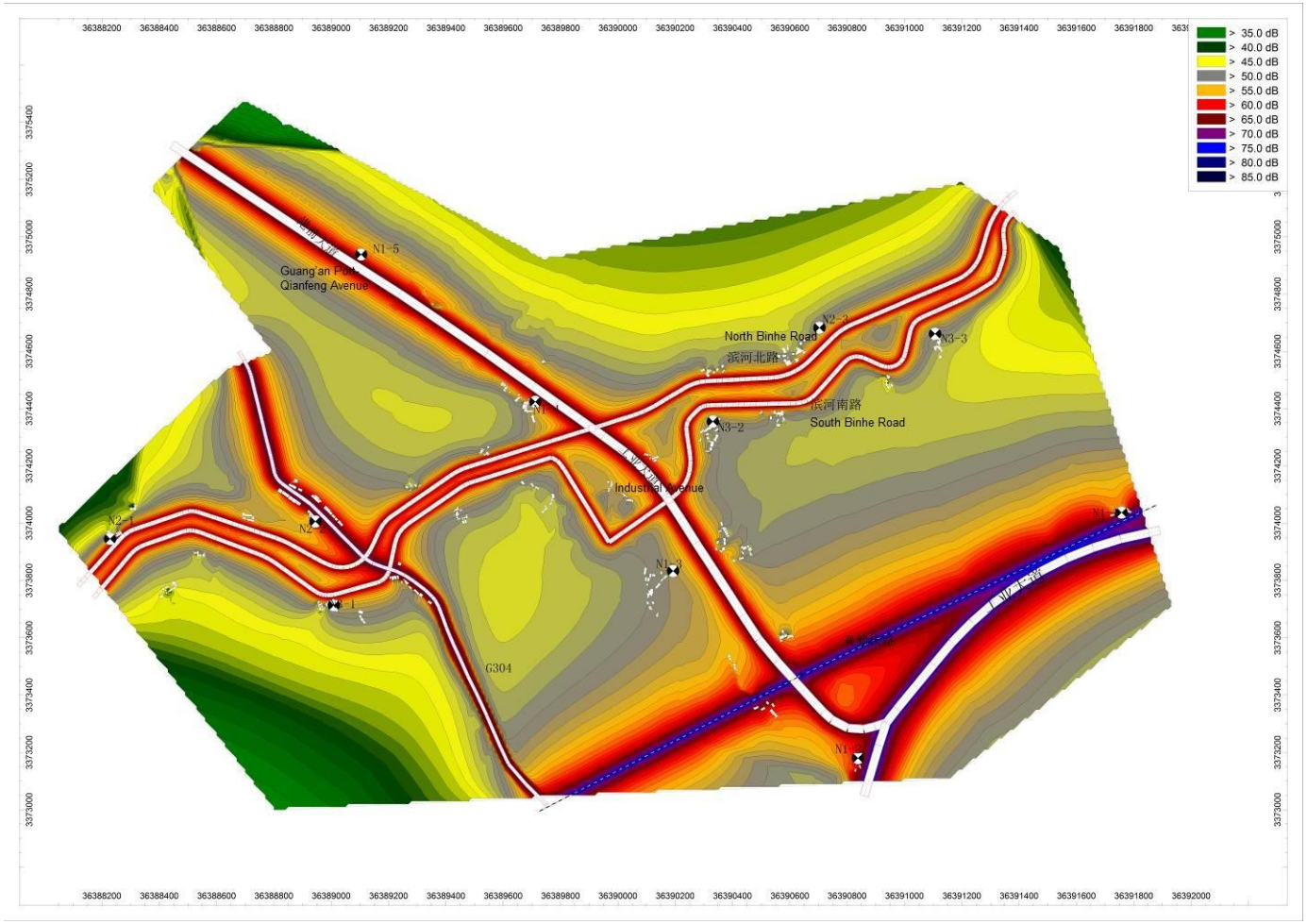


Figure 6.2.3-3 Noise Contours in Medium Term (Day)

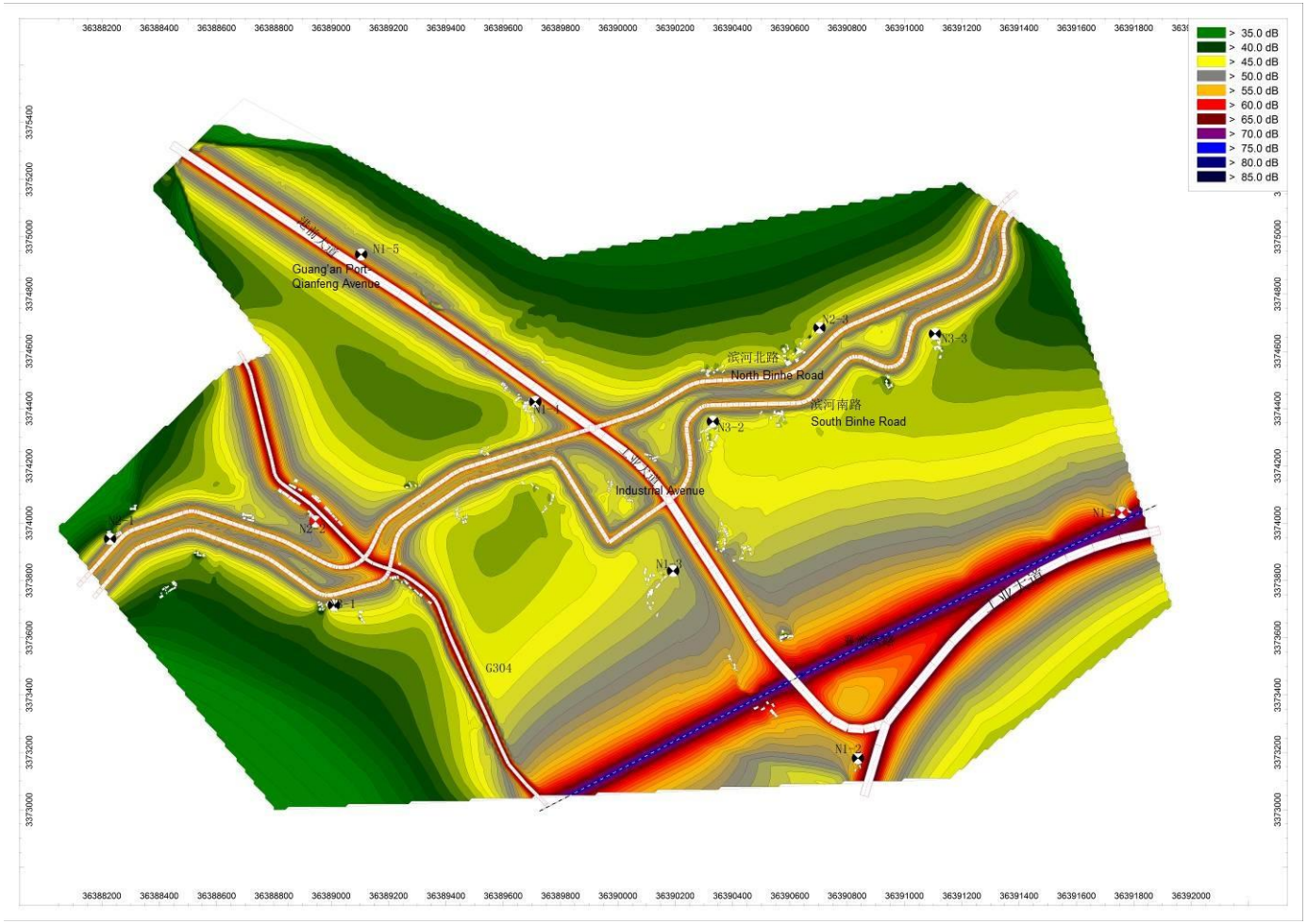


Figure 6.2.2-4 Noise Contours in Medium Term (Night)

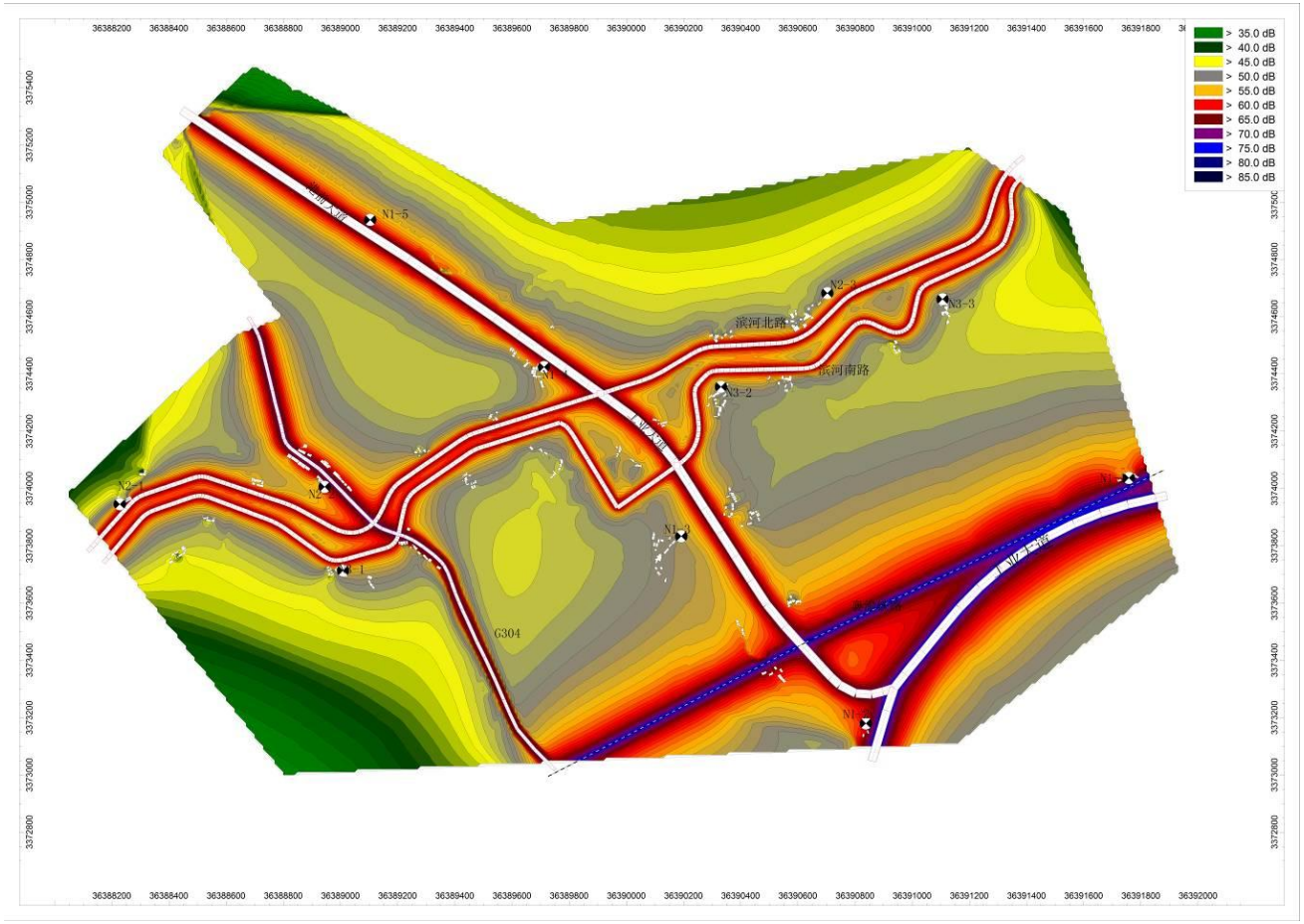


Figure 6.2.2-5 Noise Contours in Long Term (Day)

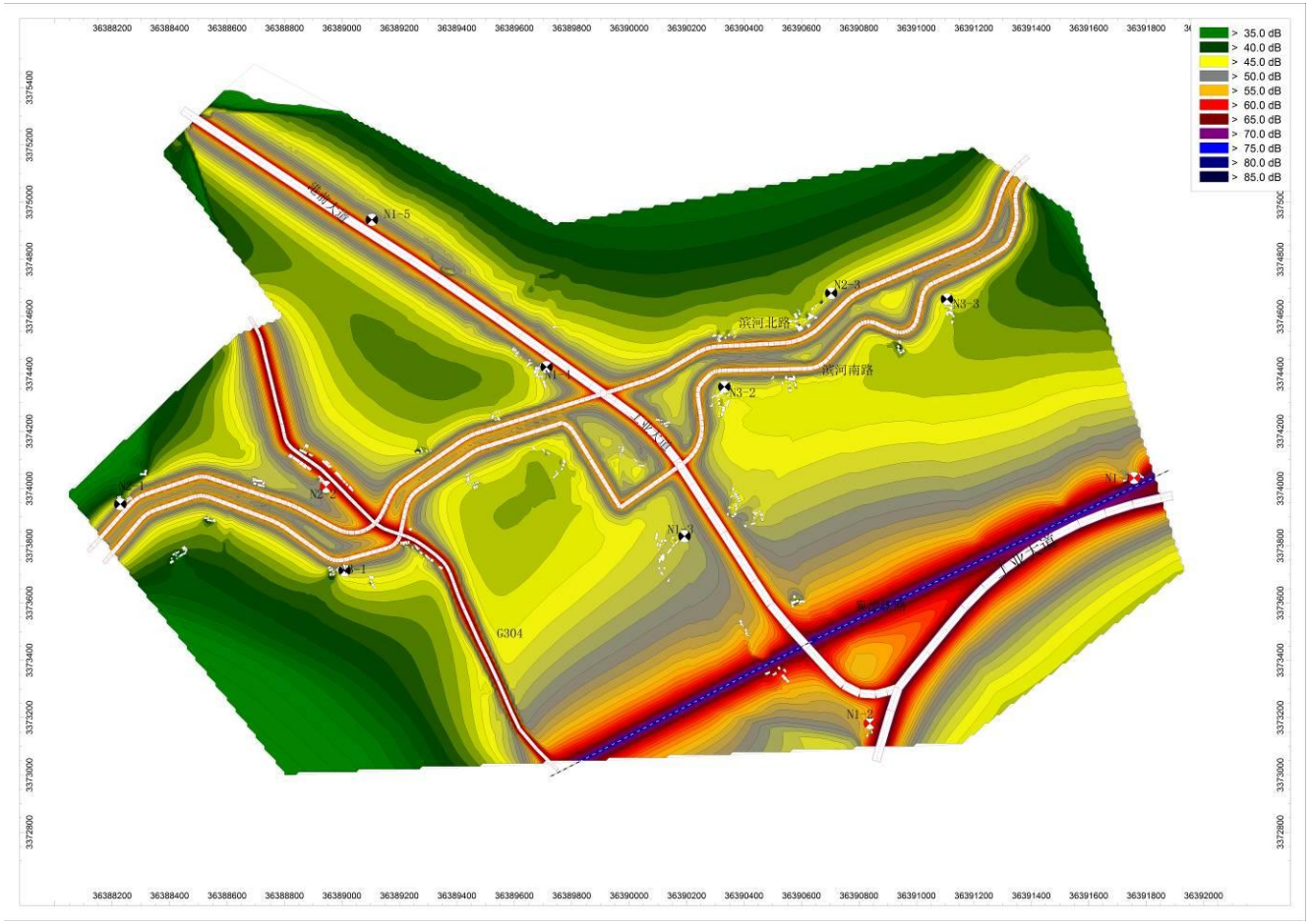


Figure 6.2.2-6 Noise Contours in Long Term (Night)

6.2.3 Air environment impact prediction and assessment during the operation period

1 Basic meteorological conditions of Qianfeng District

It is located in wet subtropical monsoon climate area, with mild climate and abundant heat and precipitation; the four seasons are district, with an average annual temperature of 16~18°C over years and maximum temperature of 41.2°C; the heatstroke prevention period is from July to September, the minimum temperature is -4.5°C,; the maximum air pressure is 979.2mPa, while the minimum air pressure is 976.9mPa; the average annual fog day is 31.5~78.5 days and the sunshine duration is 1356.9 hours; the wild is slight and in low speed and the magnitude of maximum wind force is VII, the average annual relative humidity is 80~85% over years, while the average annual precipitation is 1075~1260mm over years, with the maximum annual precipitation of 2732.3mm (1983) and the minimum annual precipitation of 594.5mm (1969); the annual precipitation is mainly concentrated in May to October, covering 80% of the annual precipitation; the average monthly precipitation is 220~260mm and may up to 577~773mm; the season with heavy precipitation intensity is as same as that with integrated precipitation, which is mainly in June to September, during which the annual evaporation is near to the annual precipitation; the annual evaporation intensity is 1052~1351.6mm, of which the monthly evaporation intensity of June to September makes up 42.8~46.9% of the annual evaporation; the precipitation intensity is heavy (reached 188.20mm on September 5, 2004).

2. Meteorological statistics of pollutants

In order to understand the pollution meteorological conditions in project area and predict the impact of construction and operation of roads, pipelines on the ambient air quality of the place where road residents are concerned, meteorological data of Qianfeng District is collected to obtain the wind direction, wind speed and wind-rose diagram of the project area, as shown below.

(1) Wind speed characteristics

The meteorological data shows that the average wind speed in 2013 is 1.584m/s. See the table below for statistics of average wind speed at each wind direction of the project area in each month, quarter and the whole year.

Table 6.2.3 -1 Statistics of Wind Speed at Each Wind Direction of the Project Area Unit: m/s

Month	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Average
January	1.98	1.92	2.4	1.26	1.7	0.55	1.6	1.5	1.1	1.68	1.6	1.6	1.96	1.57	1	1.3	1.67
February	2.35	3.37	1.76	1.33	1.35	1.31	0	2.3	1.27	1.86	1.7	2.55	2.03	1.67	1.3	1.38	1.95
March	2.4	3.48	2.73	2.52	1.98	2.13	2.45	1.76	2.33	1.98	1.67	1.34	1.64	1.83	1.75	1.92	2.33
April	2.63	2.58	2.38	2.5	2.98	1.45	2.3	1.55	0	2.01	1.7	1.98	1.15	2.5	1.62	2.34	2.23
May	1.95	2.47	1.74	2.26	1.78	2.67	1.1	2	1.75	1.62	1.72	1.7	1.67	1.3	1.68	0.87	1.8
June	2.32	2.95	2.77	1.88	2.12	1.08	1.84	1.4	1.6	2.08	1.58	1.05	1.46	1.3	2.8	3.22	2.04
July	2.26	2.35	2.24	1.98	1.68	1.8	1.1	1.59	0	1.99	1.95	2.7	2.6	0.92	1.35	1.98	1.99
August	2.01	2.33	2.1	2.58	1.63	1.7	2.2	2.48	2.17	2.28	2.1	3.3	1.4	1.43	2.01	1.79	2.09
September	2.09	2.39	3.12	0.8	1.6	1.68	2.35	1.3	0	1.76	1.8	1.25	1.95	1.15	1.57	2.3	1.98
October	1.26	1.5	1.35	1.74	0.78	1.8	1.5	1.27	1.67	1.2	1.82	0.8	1.7	1.43	1.4	1.54	1.36
November	2.76	2.21	1.54	1.2	1.35	1	1.72	1.4	0	1	1.95	1.64	1.39	1.12	0.8	2.09	1.67
December	1.96	1.97	1.45	1.35	1.8	1.52	1.7	1.73	1.6	2.2	1.17	1.7	1.43	1.14	1.23	1.27	1.58
Yearly	2.18	2.46	2.2	1.87	1.8	1.54	1.85	1.67	1.74	1.84	1.71	1.68	1.66	1.38	1.65	1.82	1.89
Spring	2.27	2.97	2.39	2.41	2.26	2.16	2.13	1.74	1.94	1.89	1.7	1.69	1.61	1.95	1.67	1.83	2.12
Summer	2.2	2.56	2.3	2.07	1.82	1.5	1.91	1.81	2.06	2.1	1.84	2.08	1.79	1.16	1.99	2.2	2.04
Autumn	2.14	2.13	2.08	1.32	1.12	1.48	1.75	1.32	1.67	1.48	1.84	1.26	1.56	1.27	1.4	1.9	1.67
Winter	2.11	2.35	1.96	1.3	1.67	1.27	1.64	1.71	1.31	1.8	1.37	1.82	1.73	1.34	1.23	1.32	1.73

According to the statistical processing result of meteorological observation data in 2013, NNE wind speed, 2.46m/s, is the largest while WNW wind speed, 1.38m / s, is the smallest. See the table below for annual average wind speed curve at each wind direction of the project area in 2013.

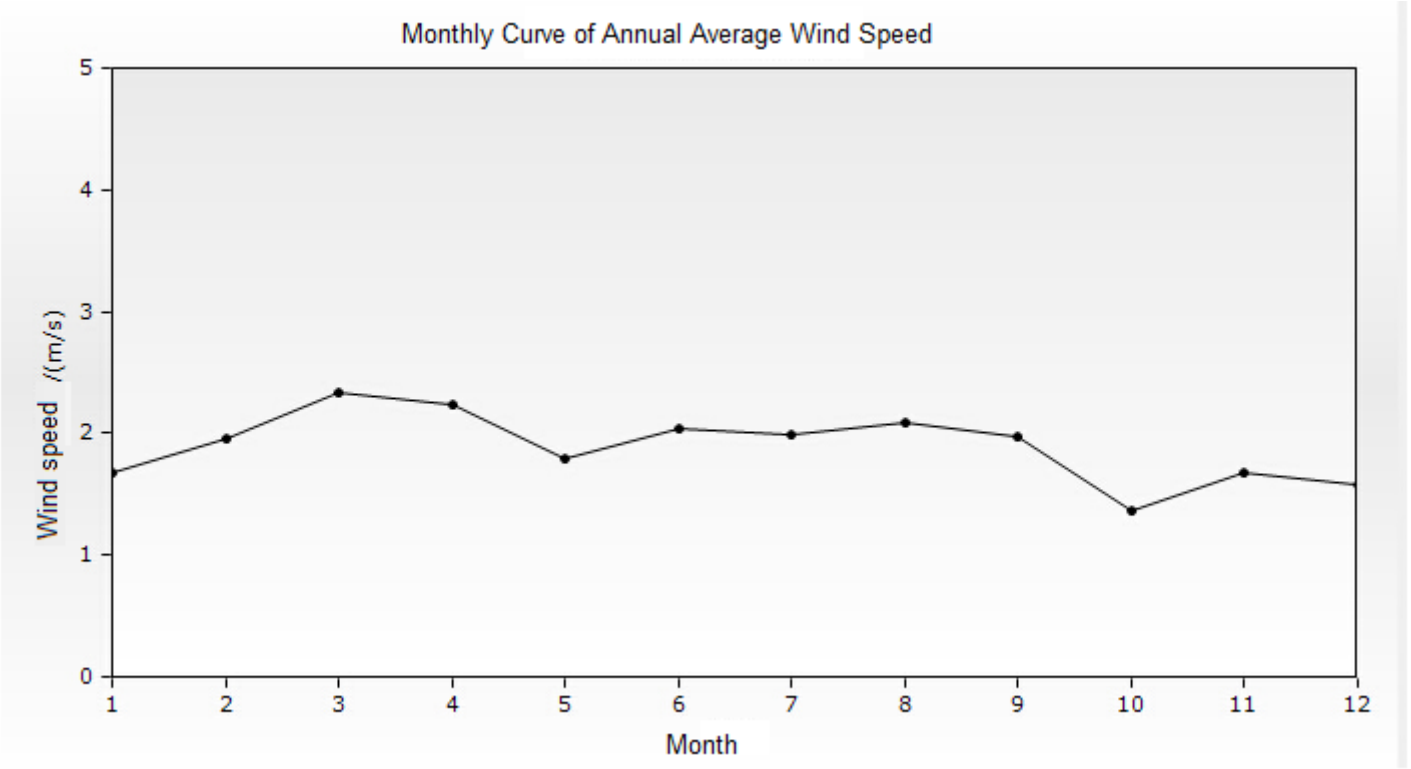


Figure 6.2.3-1 Annual Average Wind Speed Curve at Each Wind Direction in 2013

(2) Wind direction characteristics

See Table 6.2.3-2 for frequency of four-season and annual average wind direction of the project area in 2013 and Table 6.2.3-2 for rose diagram of wind frequency of the year in the project area.

Table 6.2.3-2 Statistics for Frequency of Year-round and Four-season Wind Direction of the Project Area Unit: %

Month	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Calm Wind
January	12.9	20.43	9.68	8.6	4.3	2.15	6.45	3.23	2.15	6.45	1.08	4.3	5.38	3.23	1.08	4.3	4.3
February	14.29	17.86	11.9	3.57	2.38	10.71	0	1.19	3.57	5.95	3.57	2.38	3.57	3.57	3.57	7.14	4.76
March	7.53	17.2	15.05	4.3	4.3	3.23	6.45	5.38	3.23	5.38	3.23	5.38	8.6	3.23	2.15	4.3	1.08
April	12.22	10	15.56	10	5.56	2.22	1.11	2.22	0	7.78	10	6.67	2.22	3.33	4.44	5.56	1.11
May	16.13	9.68	7.53	8.6	5.38	3.23	2.15	1.08	6.45	5.38	5.38	3.23	11.83	2.15	5.38	3.23	3.23
June	10	13.33	6.67	8.89	6.67	4.44	5.56	2.22	1.11	5.56	8.89	6.67	5.56	3.33	3.33	5.56	2.22
July	8.6	15.05	17.2	5.38	8.6	3.23	1.08	8.6	0	7.53	2.15	2.15	4.3	5.38	4.3	6.45	0
August	9.68	8.6	9.68	4.3	3.23	4.3	4.3	4.3	4.3	5.38	7.53	4.3	4.3	3.23	12.9	9.68	0
September	13.33	18.89	13.33	3.33	2.22	4.44	2.22	2.22	0	8.89	4.44	6.67	2.22	2.22	7.78	4.44	3.33
October	5.38	9.68	10.75	5.38	4.3	2.15	4.3	3.23	6.45	3.23	5.38	4.3	6.45	7.53	7.53	8.6	5.38
November	8.89	18.89	11.11	4.44	2.22	3.33	6.67	3.33	0	3.33	2.22	5.56	10	6.67	2.22	7.78	3.33
December	10.75	20.43	4.3	4.3	4.3	4.3	4.3	3.23	2.15	1.08	6.45	5.38	7.53	8.6	3.23	8.6	1.08
Yearly	10.78	14.98	11.05	5.94	4.47	3.93	3.74	3.38	2.47	5.48	5.02	4.75	6.03	4.38	4.84	6.3	2.47
Spring	11.96	12.32	12.68	7.61	5.07	2.9	3.26	2.9	3.26	6.16	6.16	5.07	7.61	2.9	3.99	4.35	1.81
Summer	9.42	12.32	11.23	6.16	6.16	3.99	3.62	5.07	1.81	6.16	6.16	4.35	4.71	3.99	6.88	7.25	0.72
Autumn	9.16	15.75	11.72	4.4	2.93	3.3	4.4	2.93	2.2	5.13	4.03	5.49	6.23	5.49	5.86	6.96	4.03
Winter	12.59	19.63	8.52	5.56	3.7	5.56	3.7	2.59	2.59	4.44	3.7	4.07	5.56	5.19	2.59	6.67	3.33

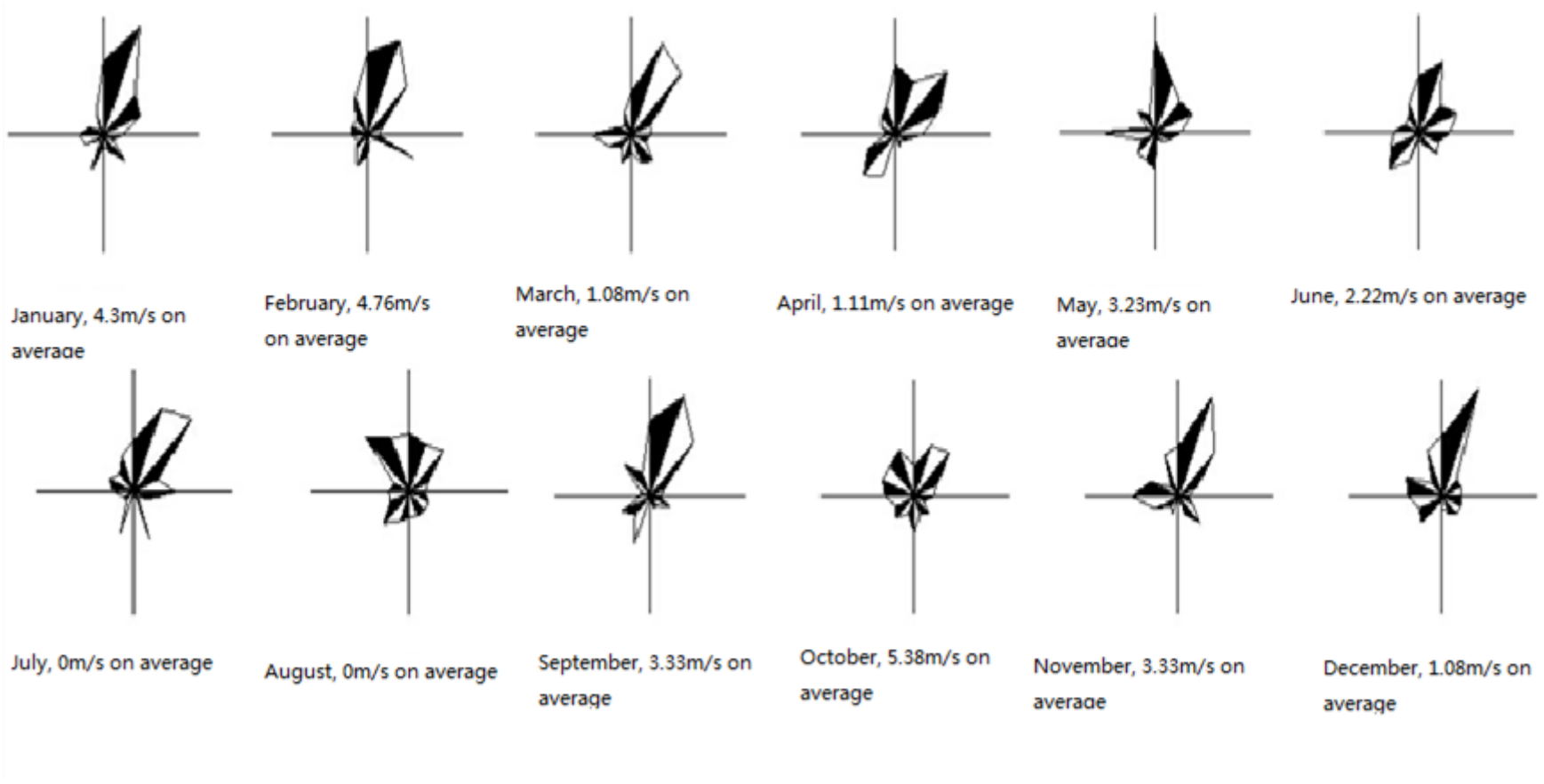


Figure 6.2.3-2 Whole-year Wind Direction and Wind Speed Rose Diagram of the Project Area

From the above table and figure, we can know that the dominant wind direction in the project area in four seasons or the whole year is NNE and calm wind frequency in autumn is higher than that in other seasons.

(3) Temperature characteristics

See Table 6.2.3-3 for temperature changes of the project area in each month of 2013 and Table 6.2.3-3 for temperature curve of the year.

Table 6.2.3 -3 Temperature Change of the Project Area in the Whole year Unit: (°C)

Month	January	February	March	April	May	June	July	August	September	October	November	December	Yearly
Temperature (°C)	7.21	10.46	17.16	19.99	21.95	27.26	29.95	29.43	22.54	19.02	13.08	7.12	18.81

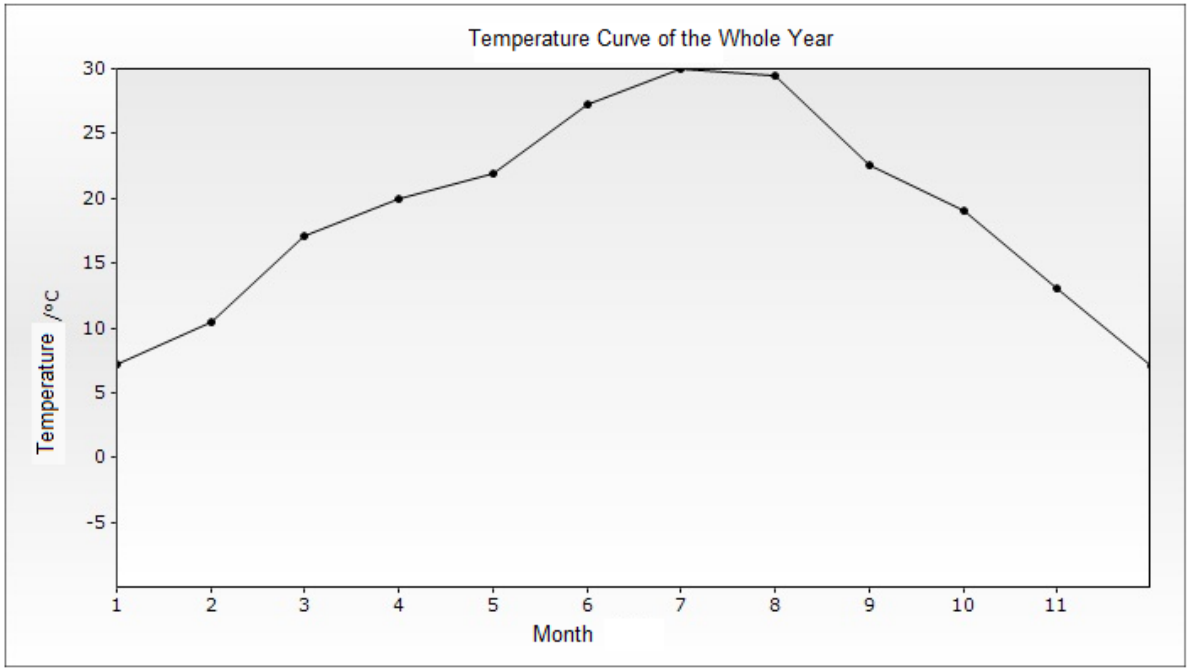


Figure 6.2.3-3 Temperature Curve of 2013

2. Prediction and assessment of impacts on ambient air of Road

(1) Predicators

According to the characteristics of exhaust emission of the proposed project, NO_2 and CO are predictors of the ambient air.

(2) Prediction range

For line source-based road works, 200m from each side of the center line of the line source belongs to the assessment range.

(3) Prediction mode

1) Prediction mode

According to the requirements in *Technical Guidelines for Environmental Impact Assessment - Atmospheric Environment*, line source mode is applied for air impact prediction of the Project and the air environment assessment system software developed by Shijiazhuang Huanan Technology Co., Ltd. for calculation and drawing. The calculation is for ground concentration of the ambient air at each grid point and specific calculation for each ambient air sensitive point.

2) Source intensity prediction

Pollution emission source intensity of vehicle exhaust is calculated by continuous line source, which is calculated as follows:

$$Q_j = \sum_{i=1}^{3} 3600^{-1} A_i E_{ij}$$

Where: *Qj*— emission source intensity of j-type gaseous pollutants, mg/s.m

Ai— hourly traffic volume of i-type vehicles in the predicted years, vehicle/h

Eij— single motor vehicle emission factor of i-type vehicles and j-type emissions under operation conditions in the predicted years, mg/(vehicle. m)

See the table below for source intensity of exhausts discharged during the construction period of trunk road of the Project.

Table 6.2.3-4 Pollutant Emission Coefficients of Single Motor Vehicles (National IV Standard) Unit: g/km per vehicle

Vehicle Model and Pollutant Type		Discharge Coefficient
Small vehicle	CO	1
	NO_2	0.1
Medium-sized vehicle	CO	1

	NO_2	0.2
Large vehicle	CO	1.5
	NO_2	3.5

See the table below for source intensity of automobile exhaust of the Project calculated based on the traffic volume of the Project.

Table 6.2.3-5 Source Intensity of Automobile Exhaust Discharge Unit: mg/s.m

Vehicle Model and Pollutant Type		Year 2020 (Short Term)	Year 2026 (Medium Term)	Year 2034 (Long Term)
All kinds of vehicles	CO	0.09	0.09	0.10
	NO_2	0.0806	0.0859	0.0936

(4) Prediction results

1) Maximum concentration prediction results for the short term

Based on the meteorological data in 2013, predictions for the concentration of CO and NO_2 at ambient air sensitive points which are caused by the operation of the proposed project in the short term are as shown below.

Table 6.2.3-6 Predictions for NO_2 Concentration in the Short Term

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Hourly value	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.05618	0.05618	0.2	28.09075
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.04215	0.04215	0.2	21.07282
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.0605	0.0605	0.2	30.25074
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.06304	0.06304	0.2	31.51991
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.04165	0.04165	0.2	20.82282
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.04091	0.04091	0.2	20.45406
	7	NO_2	N1-7 Group 2, Jijian Village	0.0584	0.0584	0.2	29.20114
	8	NO_2	Maximum value in the area	0.09706	0.09706	0.2	48.52833
Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Daily average	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.00373	0.00373	0.08	4.66033
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.00253	0.00253	0.08	3.16313
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.00434	0.00434	0.08	5.41959
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.00446	0.00446	0.08	5.57981
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.00251	0.00251	0.08	3.13306
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.00267	0.00267	0.08	3.3431
	7	NO_2	N1-7 Group 2, Jijian Village	0.00442	0.00442	0.08	5.5236
	8	NO_2	Maximum value in the area	0.00897	0.00897	0.08	11.21816
Perio	S	Pollut	Caring Points	Concentr	Predictive	Stand	Ratio to the

d	N	ants Name		ation [mg/m^3]	Value [mg/m^3]	ard Value	Standard Value [%]
Annual average	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.00614	0.00614	0.04	15.34788
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.00306	0.00306	0.04	7.65593
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.00684	0.00684	0.04	17.09383
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.00725	0.00725	0.04	18.12438
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.00315	0.00315	0.04	7.87823
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.00317	0.00317	0.04	7.93345
	7	NO_2	N1-7 Group 2, Jijian Village	0.00432	0.00432	0.04	10.79833
	8	NO_2	Maximum value in the area	0.01342	0.01342	0.04	33.552

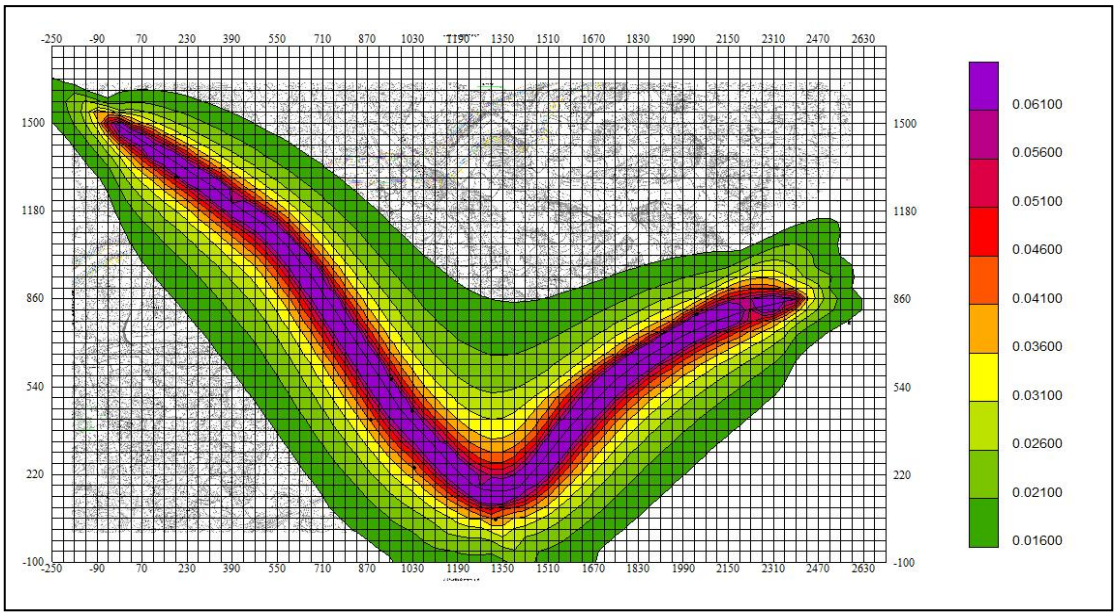


Figure 6.2.3-4 Predictions for Hourly Average Value of NO_2 in the Short Term

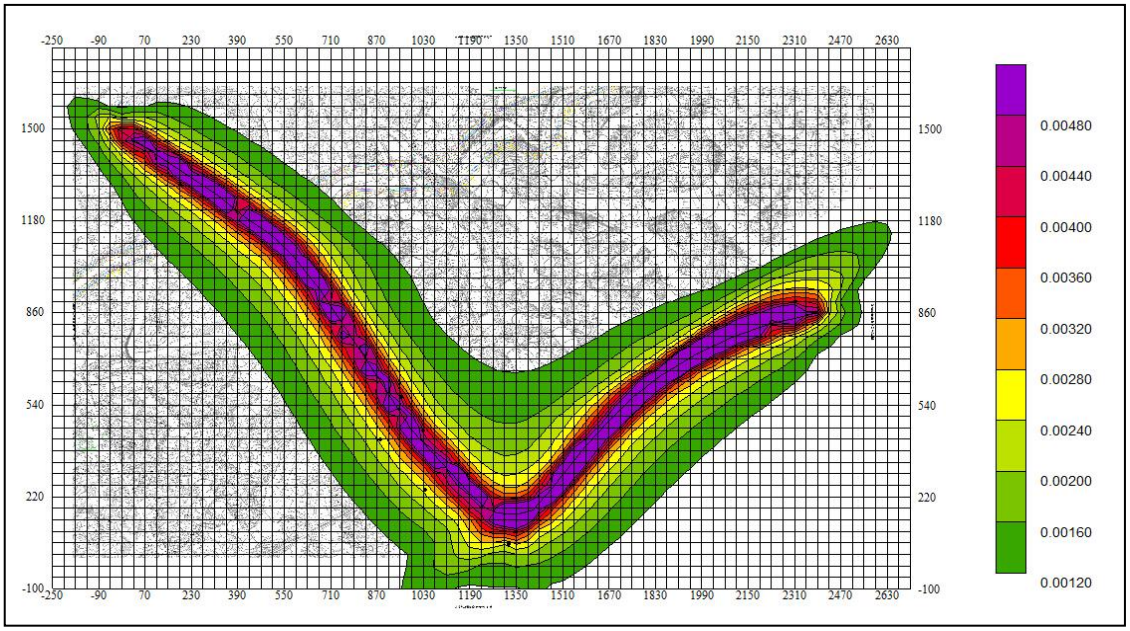


Figure 6.2.3-5 Predictions for Daily Average Value of NO_2 in the Short Term

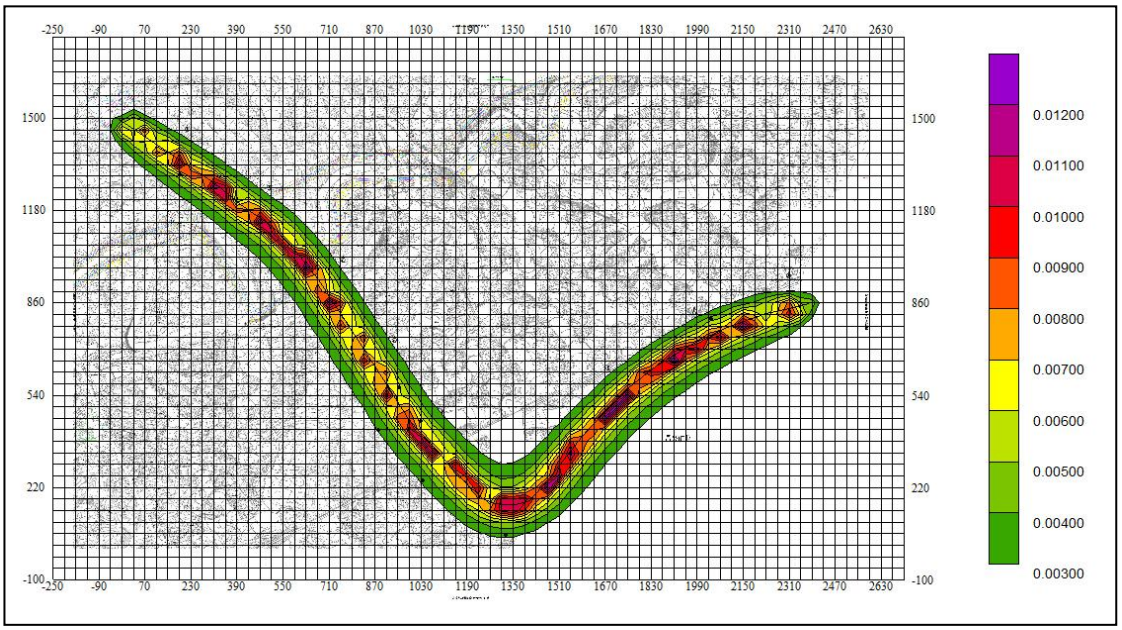


Figure 6.2.3-6 Predictions for Annual Average Value of NO_2 in the Short Term

Table 6.2.3-7 Predictions for CO Concentration in the Short Term

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Hourly value	1	CO	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.06064	0.06064	10	0.60643
	2	CO	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.04549	0.04549	10	0.45492
	3	CO	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.06531	0.06531	10	0.65306
	4	CO	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.06805	0.06805	10	0.68045
	5	CO	N1-5 Daijiayuanzi, Group 5, Eli Village	0.04495	0.04495	10	0.44952
	6	CO	N1-6 Pujiayuanzi, Group 3, Eli Village	0.04416	0.04416	10	0.44156
	7	CO	N1-7 Group 2, Jijian Village	0.06304	0.06304	10	0.6304
	8	CO	Maximum value in the area	0.10476	0.10476	10	1.04763

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Daily average	1	CO	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.00402	0.00402	4	0.10061
	2	CO	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.00273	0.00273	4	0.06829
	3	CO	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.00468	0.00468	4	0.117
	4	CO	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.00482	0.00482	4	0.12046
	5	CO	N1-5 Daijiayuanzi, Group 5, Eli Village	0.00271	0.00271	4	0.06764
	6	CO	N1-6 Pujiayuanzi, Group 3, Eli Village	0.00289	0.00289	4	0.07217
	7	CO	N1-7 Group 2, Jijian Village	0.00477	0.00477	4	0.11924
	8	CO	Maximum value in the area	0.00969	0.00969	4	0.24218

The prediction results show that the ratio of hourly concentration, daily concentration and annual average value of NO_2 and CO at each sensitive point to the standard value is less than 100% during the short term of project operation, which may meet Class II standard requirements specified in the *Ambient Air Quality Standard* (GB3095-2012) and has little impact on the surrounding air environment.

2) Maximum concentration prediction results in the medium term

Based on the meteorological data in 2013, predictions for the concentration of CO and NO_2 at ambient air sensitive points which are caused by the operation of the proposed project in the medium term are as shown below.

Table 6.2.3-8 Predictions for NO_2 Concentration in the Medium Term

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Hourly value	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.05988	0.05988	0.2	29.94
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5,	0.04492	0.04492	0.2	22.46

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
			Xinqiao Village				
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.06448	0.06448	0.2	32.24
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.06719	0.06719	0.2	33.59
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.04438	0.04438	0.2	22.19
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.0436	0.0436	0.2	21.80
	7	NO_2	N1-7 Group 2, Jijian Village	0.06224	0.06224	0.2	31.12
	8	NO_2	Maximum value in the area	0.10344	0.10344	0.2	51.72
Daily average	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.00397	0.00397	0.08	4.97
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.0027	0.0027	0.08	3.37
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.00462	0.00462	0.08	5.78
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.00476	0.00476	0.08	5.95
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.00267	0.00267	0.08	3.34
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.00285	0.00285	0.08	3.56
	7	NO_2	N1-7 Group 2, Jijian Village	0.00471	0.00471	0.08	5.89
	8	NO_2	Maximum value in the area	0.00956	0.00956	0.08	11.96
Annual average	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.00654	0.00654	0.04	16.3571
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.00326	0.00326	0.04	8.15935
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.00729	0.00729	0.04	18.21785
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.00773	0.00773	0.04	19.31618
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.00336	0.00336	0.04	8.39628
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.00338	0.00338	0.04	8.45513

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
	7	NO_2	N1-7 Group 2, Jijian Village	0.0046	0.0046	0.04	11.5084
	8	NO_2	Maximum value in the area	0.0143	0.0143	0.04	35.75828

Table 6.2.3-9 Predictions for CO Concentration in the Medium Term

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Hourly value	1	CO	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.64825	0.64825	10	6.48248
	2	CO	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.4863	0.4863	10	4.86296
	3	CO	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.69809	0.69809	10	6.98094
	4	CO	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.72738	0.72738	10	7.27382
	5	CO	N1-5 Daijiayuanzi, Group 5, Eli Village	0.48053	0.48053	10	4.80527
	6	CO	N1-6 Pujiayuanzi, Group 3, Eli Village	0.47202	0.47202	10	4.72017
	7	CO	N1-7 Group 2, Jijian Village	0.67387	0.67387	10	6.73872
	8	CO	Maximum value in the area	1.11988	1.11988	10	11.19884
Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Daily average	1	CO	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.04302	0.04302	4	1.07546
	2	CO	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.0292	0.0292	4	0.72995
	3	CO	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.05003	0.05003	4	1.25067
	4	CO	N1-4 Yujiayuanzi,	0.05151	0.05151	4	1.28765

			Group 5, Suzhai Village				
	5	CO	N1-5 Daijiayuanzi, Group 5, Eli Village	0.02892	0.02892	4	0.72302
	6	CO	N1-6 Pujiayuanzi, Group 3, Eli Village	0.03086	0.03086	4	0.77149
	7	CO	N1-7 Group 2, Jijian Village	0.05099	0.05099	4	1.27468
	8	CO	Maximum value in the area	0.10355	0.10355	4	2.58881

The prediction results show that the ratio of hourly concentration, daily concentration and annual average value of NO_2 and CO at each sensitive point to the standard value is less than 100% during the short term of project operation, which may meet Class II standard requirements specified in the *Ambient Air Quality Standard* (GB3095-2012) and has little impact on the surrounding air environment.

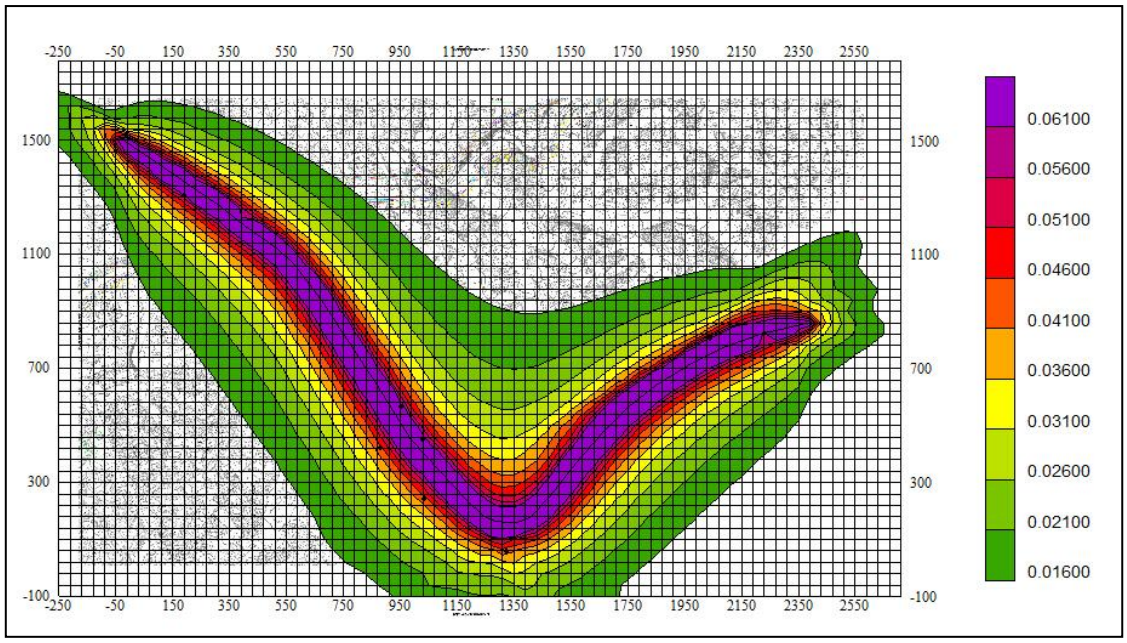


Figure 6.2.3-7 Predictions for Hourly Average Value of NO_2 in Medium Term

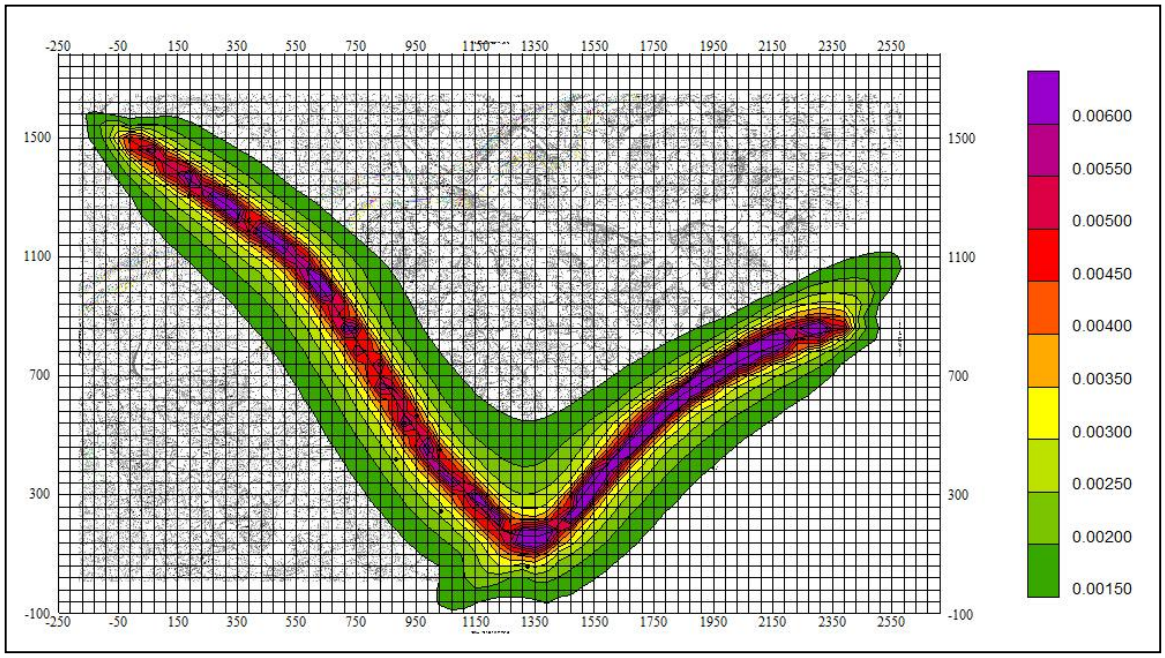


Figure 6.2.3-8 Predictions for Daily Average Value of NO_2 in Medium Term

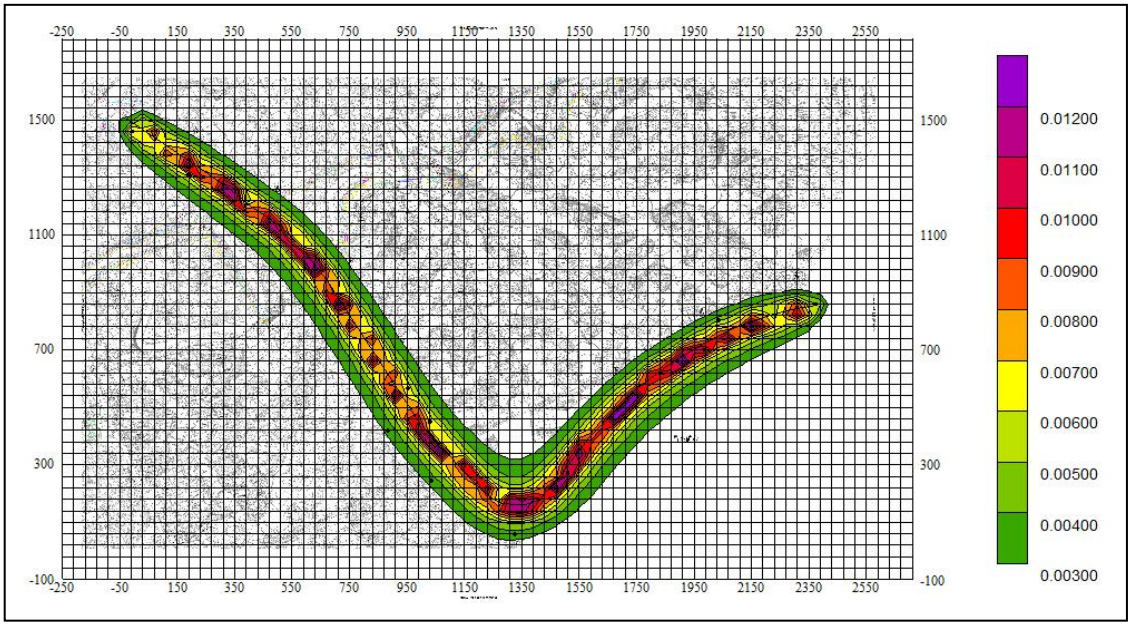


Figure 6.2.3-9 Predictions for Annual Average Value of NO_2 in Medium Term

2) Maximum concentration prediction results in the long term

Based on the meteorological data in 2013, predictions for the concentration of CO and NO_2 at ambient air sensitive points which are caused by the operation of the proposed project in the long term are as shown below.

Table 6.2.3-10 Predictions for NO_2 Concentration in the Long Term

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Hourly value	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.06524	0.06524	0.2	32.62152
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.04894	0.04894	0.2	24.47166
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.07026	0.07026	0.2	35.12989
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.07321	0.07321	0.2	36.60377
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.04836	0.04836	0.2	24.18134
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.04751	0.04751	0.2	23.75311
	7	NO_2	N1-7 Group 2, Jijian Village	0.06782	0.06782	0.2	33.911
	8	NO_2	Maximum value in the area	0.11271	0.11271	0.2	56.35548
Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Daily average	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.00433	0.00433	0.08	5.41199
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.00294	0.00294	0.08	3.67331
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.00503	0.00503	0.08	6.29371
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai	0.00518	0.00518	0.08	6.47978

			Village				
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.00291	0.00291	0.08	3.6384
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.00311	0.00311	0.08	3.88231
	7	NO_2	N1-7 Group 2, Jijian Village	0.00513	0.00513	0.08	6.41451
	8	NO_2	Maximum value in the area	0.01042	0.01042	0.08	13.02755
Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Annual average	1	NO_2	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.00713	0.00713	0.04	17.82333
	2	NO_2	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.00356	0.00356	0.04	8.89075
	3	NO_2	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.00794	0.00794	0.04	19.8509
	4	NO_2	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.00842	0.00842	0.04	21.04768
	5	NO_2	N1-5 Daijiayuanzi, Group 5, Eli Village	0.00366	0.00366	0.04	9.14893
	6	NO_2	N1-6 Pujiayuanzi, Group 3, Eli Village	0.00369	0.00369	0.04	9.21305
	7	NO_2	N1-7 Group 2, Jijian Village	0.00502	0.00502	0.04	12.54
	8	NO_2	Maximum value in the area	0.01559	0.01559	0.04	38.9636

Table 6.2.3-11 Predictions for CO Concentration in the Long Term

Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Hourly value	1	CO	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.0704	0.0704	10	0.70
	2	CO	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.05281	0.05281	10	0.53

	3	CO	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.07581	0.07581	10	0.76
	4	CO	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.079	0.079	10	0.79
	5	CO	N1-5 Daijiayuanzi, Group 5, Eli Village	0.05219	0.05219	10	0.52
	6	CO	N1-6 Pujiayuanzi, Group 3, Eli Village	0.05126	0.05126	10	0.51
	7	CO	N1-7 Group 2, Jijian Village	0.07318	0.07318	10	0.73
	8	CO	Maximum value in the area	0.12162	0.12162	10	1.22
Period	SN	Pollutants Name	Caring Points	Concentration [mg/m^3]	Predictive Value [mg/m^3]	Standard Value	Ratio to the Standard Value [%]
Daily average	1	CO	N1-1 Youjiayuanzi, Group 4, Chunlei Village	0.00467	0.00467	4	0.12
	2	CO	N1-2 Ancient Yejiayuanzi, Group 5, Xinqiao Village	0.00317	0.00317	4	0.08
	3	CO	N1-3 Luojiayuanzi, Group1, Yongxin Village	0.00543	0.00543	4	0.14
	4	CO	N1-4 Yujiayuanzi, Group 5, Suzhai Village	0.00559	0.00559	4	0.14
	5	CO	N1-5 Daijiayuanzi, Group 5, Eli Village	0.00314	0.00314	4	0.08
	6	CO	N1-6 Pujiayuanzi, Group 3, Eli Village	0.00335	0.00335	4	0.08
	7	CO	N1-7 Group 2, Jijian Village	0.00554	0.00554	4	0.14
	8	CO	Maximum value in the area	0.01125	0.01125	4	0.28

The prediction results show that the ratio of hourly concentration, daily concentration and annual average value of NO_2 and CO at each sensitive point to the standard value is less than 100% in the long term of project operation, which may meet Class II standard requirements specified in the *Ambient Air Quality Standard* (GB3095-2012) and has little impact on the surrounding air environment.

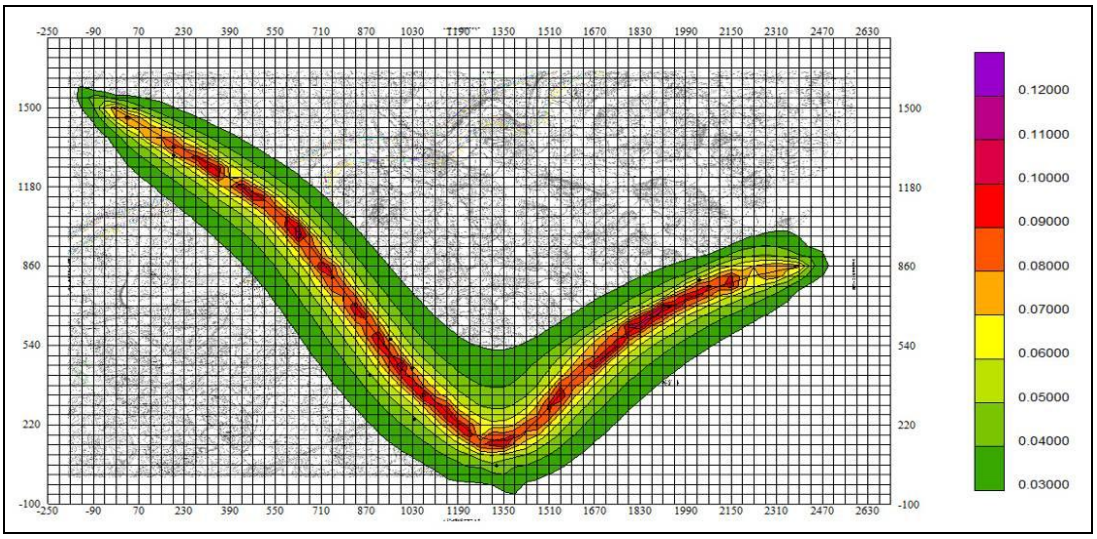


Figure 6.2.3-10 Predictions for Hourly Average Value of NO_2 in the Long Term

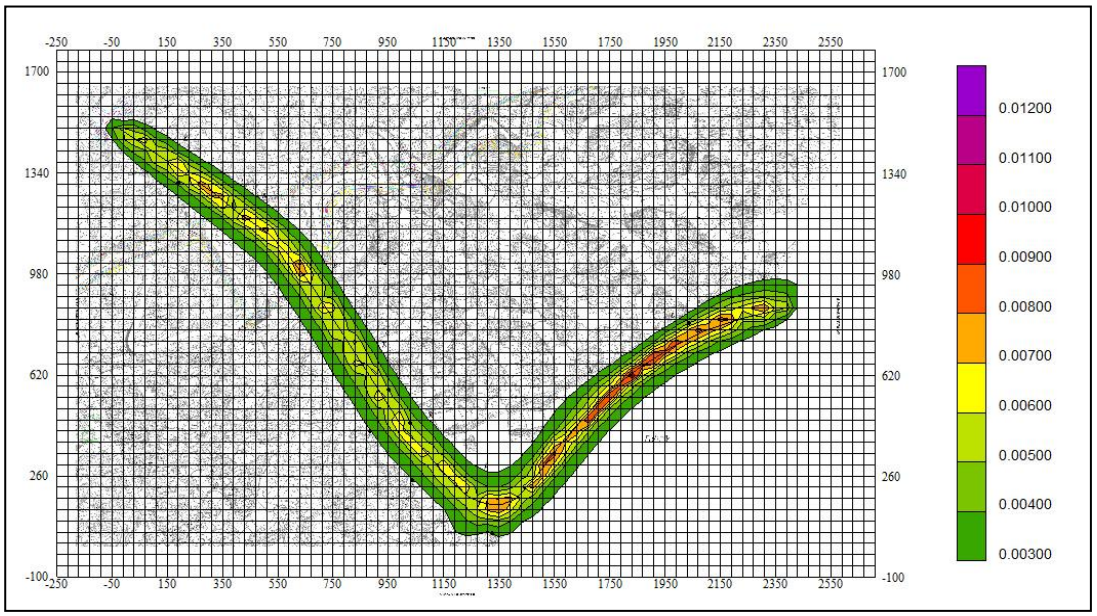


Figure 6.2.3-11 Predictions for Daily Average Value of NO_2 in the Long Term

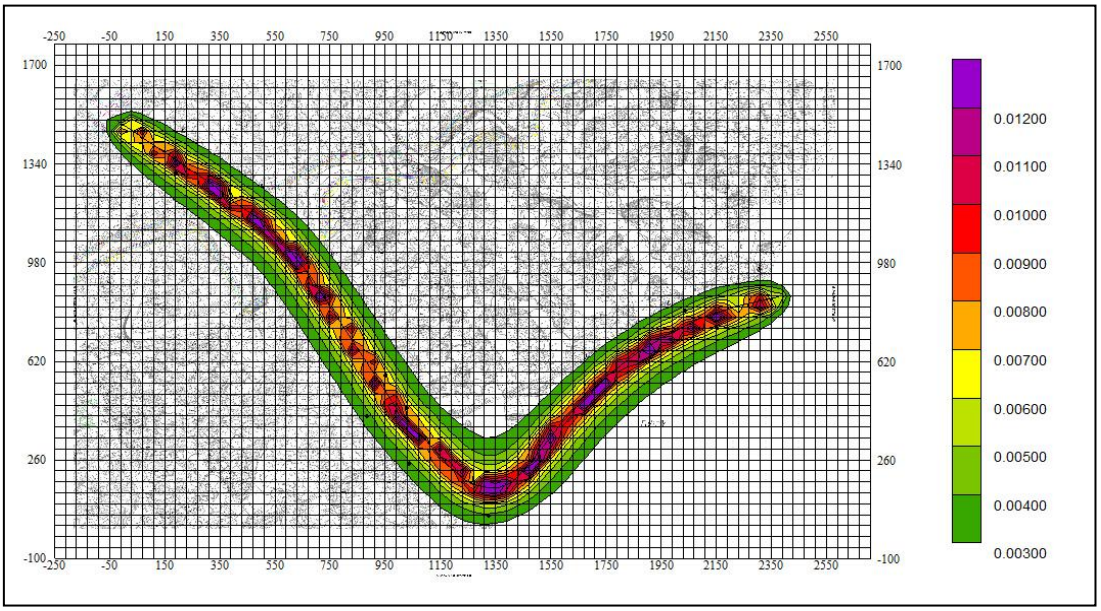


Figure 6.2.3-12 Predictions for Daily Average Value of NO_2 in the Long Term

3. Prediction and assessment of the impact on ambient air of other roads

(1) Predicators

According to the characteristics of exhaust emission of the proposed project, NO_2 and CO are predictors of the ambient air.

(2) Line source intensity and emissions of the pollutants emitted by vehicles

For line source-based road works, 200m from each side of the center line of the line source belongs to the assessment range.

Pollution emission source intensity of vehicle exhaust is calculated by continuous line source, which is calculated as follows:

$$Q_j = \sum_{i=1}^{3} 3600^{-1} A_i E_{ij}$$

Where: *Qj*— emission source intensity of j-type gaseous pollutants, mg/s.m

Ai— hourly traffic volume of i-type vehicles in the predicted years, vehicle/h

Eij— single motor vehicle emission factor of i-type vehicles and j-type emissions under operation conditions in the predicted years, mg/(vehicle.m)

Guang'an Port-Qianfeng Avenue is proposed to be constructed in Qianfeng District from 2014 to 2016 to connect the Industrial Avenue and the existing Keta Road. At present, Guang'an Port-Qianfeng Avenue is in the planning stage. It is the extension of Industrial Avenue, with traffic volume similar to that of the Industrial Avenue.

See the table below for annual total emissions of the Project in the

short term base on the pollutant emission coefficient of single motor vehicles (National IV standard).

Table 6.2.3-12 Quantity of Pollutants from the World Bank Loan Funded Road in the Assessed Area

Description	Vehicle Type	Pollutant	Traffic Volume (Vehicle/Hour)			Route Length (km)	Emission Coefficient (g/km per Vehicle)	Annual Emissions (t/a)		
			2020	2026	2034			2020	2026	2034
Volume of the largest section of North Binhe Road	Large vehicle	CO	8	9	10	3.83	1.5	0.4026	0.4529	0.5033
		NO_2	8	9	10	3.83	3.5	0.9394	1.0569	1.1743
	Medium-sized vehicle	CO	10	10	11	3.83	1	0.3355	0.3355	0.3691
		NO_2	10	10	11	3.83	0.2	0.0671	0.0671	0.0738
	Small vehicle	CO	12	13	14	3.83	1	0.4026	0.4362	0.4697
		NO_2	12	13	14	3.83	0.1	0.0403	0.0436	0.0470
Volume of the largest section of South Binhe Road	Large vehicle	CO	7	8	8	4.43	1.5	0.4075	0.4657	0.4657
		NO_2	7	8	8	4.43	3.5	0.9508	1.0866	1.0866
	Medium-sized vehicle	CO	9	9	10	4.43	1	0.3493	0.3493	0.3881
		NO_2	9	9	10	4.43	0.2	0.0699	0.0699	0.0776
	Small vehicle	CO	11	11	12	4.43	1	0.4269	0.4269	0.4657
		NO_2	11	11	12	4.43	0.1	0.0427	0.0427	0.0466

Table 6.3.3-13 Quantity of Pollutants from the Non-World Bank Loan Funded Road in the Assessed Area

Item	Vehicle Type	Pollutants Name	Analogy Traffic Flow (Vehicle/Hour)	Annual Emissions (t/a)
Guang'an Port-Qianfeng Avenue	Large vehicle	CO	112	2.35
		NO_2	112	5.49
	Medium-sized vehicle	CO	89	1.25
		NO_2	89	0.25
	Small vehicle	CO	75	1.05
		NO_2	75	0.11

(2) Impact analysis

This pollution source belongs to dispersed and mobile line source, with low pollution source height and small pollutant dispersion range. Due to traffic volume variation between day and night, the pollution in the daytime is generally more serious than that at night.

When construction of rebuild roads is completed, the road surface will be changed from cement pavement into asphalt pavement, thus improving the vehicle driving environment. In addition, good running condition of vehicle engines will reduce pollutant emissions. On the whole, the project implementation does not impact the air environment; while in contrast reduce the pollution load of automobile exhaust on regional air environment.

4 Prediction and assessment of impacts on air caused by WWTP works

Due to the ongoing preliminary work for project design of WWTP of Qianfeng District, Guang'an City and Western Jeans Industrial Zone, currently no detailed design document is available, and only analog prediction for WWTP is conducted.

When covering adding and deodorization are not performed for WWTP structures, the range with greatest odor impact is within 100cm from the odor source; while when performed, odor impact is obviously reduced and the impact scope is significantly narrowed.

The emission of H_2S and NH_3 pollutants of WWTP is below the standard of Grade II as specified in the *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002). Moreover, in accordance with relevant provisions in the *Technical Methods for Making Local Emission Standards of Air Pollutants* (GB/T13201-91), 100m health protection zone shall be arranged.

New facilities for living, education, health, and three production industries shall not be planned or built in the designated 100m health protection zone. The introduction of enterprises with strict demand on the air like food enterprises and pharmaceutical enterprises is inadvisable.

6.2.4 Prediction and assessment of impacts on surface water environment during the operation period

1. Road transport works

When the roads are put into operation, deposited pollutants carried by various types of vehicle exhausts on the road, tire wear particles, dirt of adhesive tape on carframe, scattered pollutants during vehicle braking and leaked oil under poor vehicle operating conditions will enter into the road drainage system and eventually into surface waters rainfall along with the road runoff produced by rainfall. The followings are brief analysis of impacts on road runoff.

Impacts on road runoff pollution are from many factors, including rainfall, rainfall duration, extent of road and air pollution related to traffic flow, interval between two rains, road width, dust settlement, early drought time and length of the road section accepting pollutants. Therefore, the factors impacting the concentration of road runoff pollutions are diversified.

Because of the large variability of impact factors, strong randomness of a variety of factors and big chance, yet no universally applicable unified means has been available.

South China Institute of Environmental Sciences, MEP tested the road runoff pollution situations in South China, with method as follows: form road runoff with artificial rainfall method, with time period of two artificial rainfall for 20 days, known traffic flow and rainfall, one-hour rain duration and rainfall intensity of 81.6mm, collect water samples at different times within one hour, and at last measure and analyze the changes of road pollutants, as shown in the table below.

Table 6.2.4-1 Measurements for Concentration of Pollutants in Road Runoff

Item	5~20 Minutes	20~40 Minutes	40~60 Minutes	Average Value
SS (mg/L)	231.42-158.52	185.52-90.36	90.36-18.71	100
BOD (mg/L)	7.34-7.30	7.30-4.15	4.15-1.26	5.08
Petroleum (mg/L)	22.30-19.74	19.74-3.12	3.12-0.21	11.25

It is thus clear that the concentration of suspended solids and oils in the rainfall is relatively high usually within 30 minutes from the early rains to runoff formation, after which the concentration decreases rapidly as rainfall duration extends. When the rain lasts for 40-60 minutes, the road surface is basically cleaned and the concentration of road runoff pollutants is relatively stable at a low level.

2 Wastewater interceptor works

When the project is completed and put into operation, no wastewater is generated and discharged, which almost has no impact on the quality of local surface water environment. Since domestic sewage and production wastewater from the old downtown, industrial park and the south area of new downtown of Qianfeng District are effectively collected during the construction, it plays a positive role to improve the waters quality and function of Luxi River, with positive environmental benefits.

According to the design, wastewater interceptors of the Project are laid along North and South Binhe Road. The wastewater interceptors will be constructed along the Guihua 1st Cross Road after integrating at this road and collect the wastewater along the road and finally connect to the WWTP of Qianfeng District and Western Jeans Industrial Zone.

Based on the plan, it is proposed to build WWTP of Qianfeng District and Western Jeans Industrial Zone. The short term capacity (2020) of WWTP is 60,000m^3/d, and long term (2030) capacity is 100,000m^3/d. WWTP of Qianfeng District, Guang'an and Western Jeans Industrial Zone is located in the south of Qianfeng Industrial Park. The works shall be constructed in two phases (Phase 1 and Phase 2), and phase 1 project shall be constructed in two stages. At present, the first stage of Phase 1 is in progress, with construction capacity of 20,000m^3/d, including municipal wastewater of 10,000m^3/d and industrial wastewater of 10,000m^3/d, which may meet the requirements for initial development of the Industrial Park. When the Industrial Park forms a certain scale and achieves the requirements for water quantity of WWTP, the second stage of Phase 1 will be implemented. This WWTP, mainly collecting and treating the municipal wastewater and industrial wastewater from the urban area of Qianfeng

District and Industrial Park, is constructed by the self-raised funds of United Envirotech Ltd. (Guang'an), which will be commenced by the end of 2014 and put into operation by the end of 2015.

The WWTP of Qianfeng District, Guang'an City and Western Jeans Industrial Zone, situated at Group 5, Jingwan Village, Qianfeng District, adopts "membrane bioreactor" process; and the quality of processed wastewater may meet Class 1A standard of *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002). The treatment capacity of this WWTP in the first stage of Phase 1 is 20,000m^3/d. The wastewater collected by wastewater interceptors may be effectively treatment after being introduced into the WWTP, which plays a positive role to improve the waters quality and function of Luxi River.

3 WWTP works

(1) WWTP site

Group 5, Jingwan Village, Qianfeng District is preliminarily selected as the site for the WWTP of Qianfeng District, Guang'an and Western Jeans Industrial Zone according to the design.

(2) Service scope of WWTP

WWTP of Qianfeng District, Guang'an and Western Jeans Industrial Zone receives wastewater collected by the wastewater interceptors along Luxi River, with scope of service consistent with that of the wastewater interceptors along Luxi River, i.e., old downtown and industrial park in Qianfeng District and the southern area of new downtown of Qianfeng.

(3) Wastewater treatment capacity

The short term capacity (2020) of WWTP is 60,000m^3/d, and long term (2030) capacity is 100,000m^3/d. WWTP of Qianfeng District, Guang'an and Western Jeans Industrial Zone is located in the south of Qianfeng Industrial Park. The works shall be constructed in two phases (Phase1 and Phase 2), and phase 1 project shall be constructed in two stages.At present, the first stage of Phase 1 is in progress, with construction capacity of 20,000m^3/d, including municipal wastewater of 10,000m^3/d and industrial wastewater of 10,000m^3/d, which may meet the requirements for initial development of the Industrial Park. When the Industrial Park forms a certain scale and achieves the requirements for water quantity of WWTP, the second stage of Phase 1 will be implemented.

(4) Inflow and effluent quality of WWTP

The wastewater disposed by WWTP of Qianfeng District, Guang'an and Western Jeans Industrial Zone mainly includes industrial wastewater and domestic sewage. The enterprises introduced in Qianfeng Industrial Park are mainly light textile enterprises and mechanical processing enterprises. Inflow and effluent wastewater quality index of WWTP is as follows:

Table 6.2.4-2 Predictions on Designed Inflow and Effluent Wastewater Quality

Category of	COD_{cr}	BOD_5	SS	NH_3-N	TN	TP	pH	Chromaticity

Wastewater								**(Times)**
Municipal wastewater	≤300	≤150	≤200	≤35	≤45	≤5	7~9	
Starch wastewater	≤12200	≤1550	≤8250	≤15	≤40	≤15	11	≤5000
washing wastewater	≤240	≤20	≤65	≤11	≤15	≤3	7	≤40
Effluent quality	≤50	≤10	≤10	≤5(8)	≤15	≤0.5	7~9	≤30

(5) WWTP inflow and drainage scheme

WWTP of Qianfeng District, Guang'an and Western Jeans Industrial Zone receives wastewater collected by the wastewater interceptors along North and South Binhe Road. The starting point section of the wastewater interceptors shall be laid along the proposed road or riverbank, connecting to the existing wastewater interceptors. The ending section of wastewater interceptors will be laid along the South and North Binhe River after being connected to the existing wastewater interceptors, then it will be constructed along the Guihua 1st Cross Road after integrating at this road and collect the wastewater along the road and finally connect to the WWTP of Qianfeng District and Western Jeans Industrial Zone.

(6) Process and scale

The WWTP of Qianfeng District, Guang'an City and Guang'an western Jean Industrial Zone adopts "Membrane Bio-Reactor (MBR)" process. MBR is a new type of wastewater treatment system combining membrane separation technology and biological treatment technology. It is a new water treatment technology with combination of membrane separation unit and biological treatment unit. The membrane component replaces the secondary sedimentation tank to maintain a high concentration of activated sludge and reduce the area occupied by wastewater treatment facilities, and the sludge quantity is reduced by keeping low sludge load. Membrane separation equipment immersed in the aerobic biological tank is mainly used to intercept the activated sludge and macromolecule solids in the groove. Therefore, the concentration of activated sludge (MLSS) in the system may be increased to 10,000mg/L and solids retention time (SRT) may extend more than 30 days. With such a high concentration system, the volume of biological reaction tank may be reduced and refractory materials may degrade by continuous reaction in the treatment tank. Thus, with the continuous improvement of membrane manufacturing technology, MBR treatment technology will be more mature and attract the eyes of environmental protection industry at home and abroad, and become the only choice for wastewater treatment and water recycling in the 21st century. The quality of processed wastewater may meet Class 1A standard of *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002).

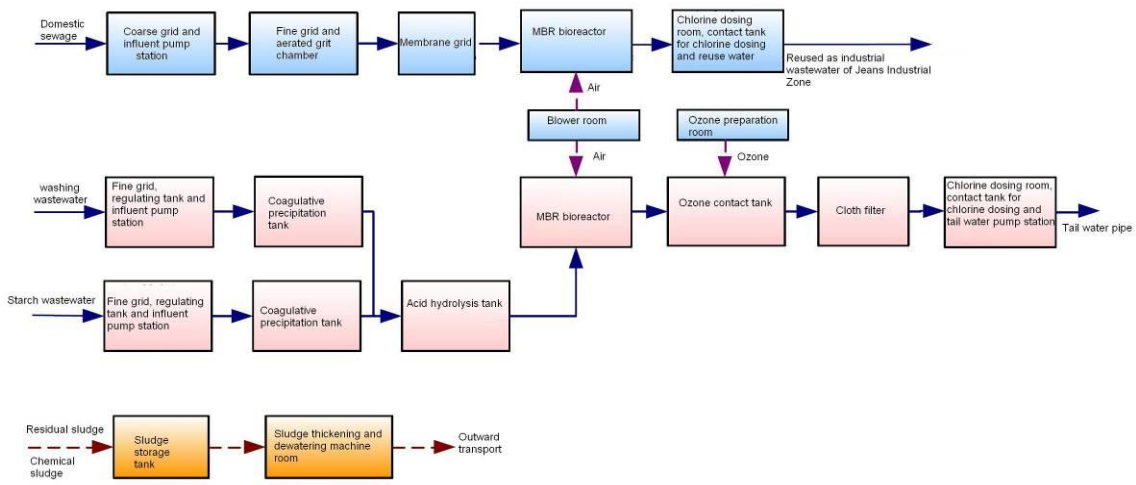


Figure 6.2.4-1 Treatment Process Flow of WWTP

4. Impacts of project construction on the drainage of natural rivers in Qianfeng District

Natural river near the project mainly includes Luxi River.

(1) No water course is occupied for land development, so the natural width, flow direction and width of the river will not be changed. Land leveling is required to be carried out prior to the land development. It will change the topography of the county to a certain extent and have some impact on the natural runoff in the county.

(2) Rain and wastewater separate system is applied for rain and wastewater pipe network planned to be built in the assessed area and rainfall runoff on the road surface in the Park may still be flow into the river course after being collected by rainwater pipe network for sedimentation. The wastewater is still discharged into the nature waters when meeting the standard upon treatment in WWTP. Therefore, the development of Qianfeng District has limited impact on the water quantity of natural waters.

6.2.5 Prediction and assessment of impacts on groundwater environment during the operation period

The impact on groundwater during the operation period of the Project is mainly from WWTP wastewater leakage or excessive discharge as well as leakage of wastewater interceptors and wastewater pipelines.

1. Wastewater interceptors and wastewater pipeline works

Wastewater interceptors and wastewater pipe network will not impact the environment under normal operating conditions. When the wastewater interceptors and wastewater pipe network are completed, the domestic sewage within the Industrial Park will be effectively collected to avoid or reduce the domestic sewage permeating into the groundwaters. As such, the operation of the Project has a positive impact on groundwater quality within the project affected area.

If leakage of wastewater interceptors and wastewater pipe network occurs, the wastewater may seep into the ground to pollute the groundwater. According to analogy investigation, if the pipeline breaks, the wastewater may seep into the ground and gradually spread to pollute the groundwater under normal circumstances. The rule is that the closer to the pipe damage location, the longer and more severe the leakage will be. Therefore, early discovery and early actions are the key to prevent environmental risks.

2. WWTP works

Groundwater level will not be changed during the operation period, and drainage and groundwater will not be directly connected. The groundwater quality may only be impacted due to wastewater infiltration.

6.2.6 Prediction and assessment of impacts on solid waste environment during the operation period

Solid waste during the construction period of the Project mainly includes transport materials being thrown to the ground during vehicle driving, sludge, grid residue and grit produced by WWTP and domestic waste produced by the staff.

1. Road works

The solid waste during road operation refers to a small quantity of transport materials being thrown to the ground during vehicle driving. Street cleaning shall be strengthened during road operation.

2. WWTP works

(1) WWTP of Qianfeng District and Western Jeans Industrial Zone

The process of “membrane bioreactor” is adopted for process design of WWTP. Solid waste of the WWTP mainly includes sludge, grid residue and grit. Since grid residue and grit belong to large particles and suspended substances, which has no toxic and harmful substances and almost cause no harm to the environment, the grid residue may be collected directly, together with municipal waste, for landfill or treatment and grit may be used as paving material.

Residue sludge of the Project features high moisture content, large volume, perishableness, small proportion, fine particle and easy odor generation. Sludge contains some toxic substances like bacteria, pathogenic microorganism and a small amount of heavy metal ions, and also nutrient elements such as nitrogen, phosphorus and potassium, so it must be properly handled and comprehensively utilized.

Grid residue has complex composition, mainly including foamed plastic, plastic bag, fiber, paper, peel, outer leaf, wood chips and plant and animal residues, in which waste plastic products generally take up a large proportion. Domestic waste like peel and outer leaf and plant and animal residues are easy perishable and decomposing to produce wastewater and odor. If not properly cleaned, it will seriously impact and pollute the stack yard, breed mosquitoes, impact the health environment, block wastewater pipe network and influence the normal operation of WWTP.

Inorganic residues like muddy sand are the main components of the

grit, which adsorbs some organic pollution bacteria and produces odor at the same time. If collection and transport are not promptly conducted for the stack yard, the pollutants will dissolve out after rain wash.

Grid residue and grit are proposed to be sent to the landfill, with piling, transport and other processes in strict accordance with relevant regulations. The production amount is small, but if ignored, they will cause harm to the environment. Packaging wastes like light plastic bags in the grid residue will be carried by the wind to the surrounding area of the WWTP, and grid residue and grit residue shall be promptly cleaned and carried away, or deterioration, mosquitoes and odor will be produced.

Grid residue is intercepted from the coarse grid and fine grid, with major components including foamed plastic, discarded plastic bag, film, fiber, peel, leaves, paper, wood chip and so on. The grid residue amount is $1m^3/d$ and unit weight is $190kg/m^3$, with an output of 190kg/d and an annual output of 69.35t/a.

Muddy sand is the main component of the grit. Its proportion is larger than that of inorganic residue of water, but meanwhile, it also adsorbs some organic dirt. The grit amount is $1.5m^3/d$ and unit weight is $1,500kg/m^3$, with an output of 2,250kg/d and an annual output of 821.25t/a.

According to the analogy, the domestic waste produced by WWTP staff amounts to 10kg/d, with an annual output of 3.65t/a.

Table 6.2.6-1 Solid Waste Production Amount and Disposal/Treatment Method

SN	Discharging Source	Category	Discharge Amount	Discharge Direction
1	Coarse and fine grid	Grid residue	190kg/d, with an annual output of 69.35t/a	Municipal unified collection to Guang'an Pu'an Landfill Plant for treatment
2	Grit chamber	Sand	2250kg/d, with an annual output of 821.25t/a。	
3	WWTP staff	Domestic waste	10kg/d, with an annual output of 3.65t/a	

6.2.7 Prediction and analysis of impacts on social environmental during the operation period

1. Impact on local economic development

(1) Impact of the project on promotion of the local economic development

When the Project is completed, traffic and wastewater treatment status of Qianfeng Economic And Technological Development Zone will be improved, a variety of transportation costs be reduced, commercial value of the district will be enhanced and living standards of urban residents will be raised, which are specifically reflected as follows:

* New roads and wastewater interceptor works will promote economic development, and simultaneously provide a large number of direct and indirect jobs and expand employment.
* When new roads are open to traffic, it may strengthen internal and

external economic ties, complement each other's advantages, reduce transportation costs of materials getting in and out of the Zone, improve product competitiveness, and provide transport corridor for products of the Zone to enter into domestic and international markets, which will bring business opportunities for the development of Qianfeng District and its surrounding markets.

* Economic development and social progress will be promoted, investment environment be improved, introduction of advanced technology, talents, capital and management experience be accelerated, and development and construction of the West be boosted.

* When wastewater interceptors are completed, water pollution is controlled, environmental health is safeguarded, roads are spacious and regular and land use function and layout are clear.

(2) Impact on traffic

When the project is completed, the regional traffic conditions will be greatly improved, which has a positive impact on improving road network layout in the district, travel conditions of urban residents and transport conditions.

(3) Impacts of construction on living standards and quality of local residents

With the completion of municipal infrastructures, the community environment will be beautified, traffic conditions be improved, people's living standards be gradually raised, and accordingly, communication, entertainment, education and health services be rapidly developed, which in return will improve people's cultural and living standards, thereby promoting the construction of material and spiritual civilization.

The residents involved in land acquisition, demolition and relocation of the Project will receive a total of about CNY 1871 million for land acquisition and resettlement. Farmers lost some land due to the implementation of the Project, but with subsidy and job opportunities offered during urbanization, their annual income level will be increased. The basis for the implementation of economic structural adjustment in the project area will be formed when the project is completed, thereby improving the living standards of residents. Moreover, the living quality of residents will be improved by improving the living environment in the project area.

(4) Job opportunities increase for local residents

Land occupation and house demolition are inevitably required for urban construction, which will lead to relocation of the population in the construction region, labor force resettlement and other issues alike. Some land is required to be occupied for infrastructure construction of the Industrial Park, and thus the lives of farmers will be impacted due to the loss of land and traffic block during the construction will also impact the lives of farmers. But with the development of urban construction, the land-use nature will be changed from agricultural land into urban land and farmers will be transformed from agricultural laborers to service providers, workers and businessmen, from which the social impact is acceptable. In the long term, commercial and tourism development in the project area will provide new job opportunities for local residents.

2. Analysis of impacts on the lives of residents

At present, due to outdated infrastructure in the project area, the construction of the project will improve the transport conditions and living environment for residents in the entire industrial park.

Road construction of the Project aims to improve local road transport network and facilitate residents travel. When the project is completed, it will not only shorten the travel time directly, but also reduce transport costs. Therefore we can say that road construction will reduce transport costs, and there is no need to consider the public willingness to pay and the ability to pay.

With the completion of municipal infrastructures like roads and WWTP, the wastewater in the district will be collected for centralized treatment, traffic conditions be improved, people's living standards be gradually raised, and accordingly, communication, entertainment, education and health services be rapidly developed, which in return will improve people's cultural and living standards, thereby promoting the construction of material and spiritual civilization.

3. Analysis of impacts on land use

Through the implementation of the Project, the function of the land in the district is improved for collective arrangement to replace the original part of the land. When the land meets the requirements for municipal supporting functions, the remaining land is listed for auction in accordance with relevant regulations and procedures, so as to improve land utilization rate and optimize land resource efficiency. As the step of urbanization speeds up, the surrounding geographical and human environment will be rapidly improved. Therefore, the land in the district has huge development potential and value, which will help improve land utilization rate and, optimize the efficiency of valuable land resources.

4. Analysis of impacts on urban traffic

When the project is completed, the regional traffic conditions will be greatly improved, which has a positive impact on improving road network layout in the district and transport conditions.

5. Analysis of impacts on the landscape

Plenty of flowers, shrubs, woods and graceful isolated trees are planted on the bank of Luxi River, thus, the landscape conditions of the river banks have been greatly improved. Upon the laying of wastewater interceptors of the Project, the wastewater produced in the project area is sent to WWTP for treatment in a unified manner, and then discharged when reaching the standards, which solves the original dispersed discharge issue, controls water pollution and guarantees the environmental health. When the project is completed, roads are spacious and regular and land use function and layout are clear. The Industrial Park will present a scene of prosperity.

6. Attraction for more migrant workers to return to their homes for work

When the project is completed, more migrant workers may be attracted to return to their homes for work, so that they may take better care of the family and play a role to solve the social issues like "left-behind children", "empty nesters" and "leave the land uncultivated".

Economic development within the Industrial Park and increase of settled

enterprises may attract more local labors to work in such enterprises, including returning migrant workers. Sichuan is a large migrant workers exporting province in China. Large numbers of labor forces here leave their homes, go to work in big cities, and leave parents or children in the rural home, which led to many social issues. But the implementation of the Project may play a role in solving such social issues. As regards the present issues like "left-behind children" and "empty nesters", the returning migrant workers may take better care of the family and give more care for the elderly and children. They not only may work in the Park, but also may go home for farming in busy farming seasons, thereby reducing idle lands in rural China.

7 Analysis on environmental cost-benefit

The project belongs to industrial park infrastructure construction, which has an impact on local ecological environment, acoustic environment, air environment and socio-economic environment during the construction period. But when the project is completed, it will produce positive environmental benefits. Therefore, the construction brings limited impact on the time and extent to the environment. The construction of the Project may accelerate infrastructure construction in the Park, facilitate travel, improve living conditions, beautify the environment and promote the rapid economic development of Qianfeng District. From the point of social, economic and environmental benefits, the beneficial impact of the project is much larger than negative impact.

7 Water and Soil Conservation Plan

7.1 Scope of Responsibility for Prevention and Control of Water and Soil Loss

According to the regulations in *Technical Code on Soil and Water Conservation of Development and Construction Projects,* the responsible area for water and soil loss prevention and control of the Project consists of project construction area and directly affected area.

The construction area involves acquired land and temporarily used land during construction, i.e., permanently and temporarily occupied land. The Project covers an area of 46.69hm^2 in total, including permanently occupied land of 40.71hm^2 and temporarily occupied land of 5.98hm^2.

Directly affected area mainly refers to the area outside the construction area but with water and soil loss due to construction, including lower scope of the filling section, bridge construction area, tunnel-affected area and the land temporarily occupied for construction. It covers 5.85 hm2 during the construction period.

The responsible area for water and soil loss prevention and control of the Project consists of project construction area and directly affected area, totaled 52.54hm^2.

Table 7.1-1 Estimated Responsible Area for Water and Soil Prevention and Control of the Proposed Project Unit: hm^2

Administrative District	Engineering Unit			Area	Type of Occupied Land
Qianfeng District, Guang´an City	Construction Area	Permanently occupied land	Main area of road works	36.21	Cultivated land, woodland, residential land, grassland and bare land
			Landscape renovation area	4.5	Cultivated land, woodland, residential land and bare land
			Subtotal	40.71	
		Temporarily occupied land	Construction site area	0.81	Cultivated land, woodland, grassland and bare land
			Road soil storage area	3.14	Cultivated land, woodland, grassland and bare land
			Wastewater interceptor construction area	0.65	Cultivated land, woodland, grassland and bare land
			Soil storage area for wastewater interceptor construction	0.93	Cultivated land, woodland, grassland and bare land

Administrative District	Engineering Unit			Area	Type of Occupied Land
			Construction access area	0.45	Cultivated land, woodland, grassland and bare land
			Subtotal	5.98	
		Total		46.69	
	Area directly affected	By subgrade construction		4.62	
		By wastewater interceptor construction site		0.65	
		Construction access		0.6	
		Landscape renovation works		0.28	
		Total		5.85	
	Total in Qianfeng District			52.54	

7.2 Prediction on Water and Soil Loss

The scope for the prediction on water and soil loss by the water and soil loss conservation plan includes the land permanently and temporarily occupied for construction of the whole project and that within the disturbed area. The prediction units are basically consistent with the water and soil loss prevention and control subarea, namely, main works area and temporary construction area of road works, pipeline operating area (interceptor excavation area and temporary soil storage yard) and construction access road of wastewater interceptor works, and square footpath area and landscaping area of landscape reconstruction works.

Prediction units and time division of the Project are shown in the table below.

Table 7.2-1 Prediction Unit and Time Division of Water and Soil Loss

Zonation	Construction Period		Natural Recovery Period	
	Predicted area (hm^2)	Predicted duration (a)	Predicted area (hm^2)	Predicted duration (a)
Main area of road works	36.21	2	17.65	1
Temporarily occupied area for road construction	3.95	2	3.95	1
Wastewater interceptor works area	1.58	1.25	1.58	1
Access construction area	0.45	1.25	0.45	1
Landscaping area	3.3	2	3.3	1
Square and footpath area	1.2	2	0.8	1

Zonation	Construction Period		Natural Recovery Period	
	Predicted area (hm^2)	Predicted duration (a)	Predicted area (hm^2)	Predicted duration (a)
Subtotal	46.69		27.73	

It is predicted that the Project may cause totally 21,844t of water and soil loss, resulting in an increase of 19,309t, of which, 20,940t of water and soil loss may be produced in construction period, with new loss of 189.99t; 904t of water and soil loss may be produced in natural recovery period, with new loss of 310t.

Table 7.2-2 Summary of Prediction Results of Water and Soil Loss

Zonation	Water and Soil Loss Amount (t)				
	Before disturbance	After disturbance			Increment
		Construction period	Natural recovery period	Total quantity	
Main area of road works	1877	17527	540	18067	16190
Temporary site area of road construction	226	1580	157	1737	1511
Pipeline operation area	27	191	63	254	227
Construction access area	15	40	18	58	43
Landscaping area	295	1175	101	1276	980
Square and footpath area	93	427	24	452	359

7.3 Prevention and Control Plan for Water and Soil Loss

7.3.1 Prevention and Control Standards of Water and Soil Loss

In accordance with the general rules of *Technical Code on Soil and Water Conservation of Development and Construction Projects* and the *Control Standards for Soil and Water Loss on Development and Construction Projects*, Qianfeng District of Guang'an City involved in the Project is defined as a key rehabilitation region of water and soil loss in Sichuan Province. Since the Project involves town and industrial park construction, Grade I standard for construction is applied.

Indicators of code standard are based on the rainfall of 400~600mm and moderate current soil erosion intensity; these are modified correspondingly based on the actual project conditions. Annual rainfall in the Project area is above 800mm, the current soil erosion intensity is mild and the geomorphic type is of shallow hill; of which the controlled percentage of erosion area, recovery percentage of forestry and grass and percentage of forestry and grass coverage

should be increased by 2~3 percent, soil loss control rate shall be greater than or equal to 1.0, and the percentage of dammed wastes shall not decreased. See the table below for project targets for prevention and control of water and soil loss upon modification.

Table 7.3.1-1 Control Standards for Soil and Water Loss Applied by the Project

Item	Standards and Specifications		Correction by the precipitation		Correction by Soil Erosion Intensity		Correction by landform		Criterion applied	
Period	Construction	Trial operation	Construction	Trial Operation	Construction	Trial operation	Construction	Construction	Construction	Trial operation
Treatment percentage of disturbed land (%)	*	95	*	0	*	*	*	*	*	95
Control rate of water and soil area (%)	*	85	*	+3	*	*	*	*	*	98
Controlled ratio of soil erosion modulus (%)	0.7	0.8	*	*	+0.1	+0.2	*	*	0.8	1.0
Percentage of dammed slag or ashes (%)	95	95	*	*	*	*	0	0	90	95
Recovery percentage of the forestry and grass (%)	*	97	*	+2	*	*	*	*	*	99
Percentage of the forestry and grass coverage (%)	*	25	*	+3	*	*	*	*	*	28

7.3.2 Prevention and Control Subareas for Water and Soil Loss and General Layout of Water and Soil Conservation Measures

Level-1 subarea of the Project is divided into road works control area, wastewater interceptor works control area and landscape reconstruction control area according to the nature of composition of the project, and Level-2 subarea is divided into six control subareas, namely, main works area and temporary construction area (including temporary soil storage yard,) of road works, pipeline operating area (interceptor excavation area, construction site and construction, etc.), construction area and construction access road control area of wastewater interceptor works, and landscaping area and square footpath area of landscape reconstruction works.

1 Precautions

Requirements and recommendations on water and soil conservation are put forward for the links that may impact water and soil loss during engineering design and construction based on the assessment on water and soil conservation of main works to optimize of the design of main works, and requirements for standard construction, especially for optimization of excavation and filling process, are proposed to reduce the amount of excavation and try to fill with excavated soil, in order to avoid random piling and stacking of spoils. In addition, effective water and soil loss prevention and control measures are taken to avoid or minimize the damage to the ecological environment as much as possible.

(1) Excavation and filling balance shall be achieved as far as possible during construction; excavation, backfill, rolling compaction and protective measures shall be conducted at the same time during

construction; and the construction period shall be shortened as much as possible to reduce the exposed time of loose surface, and construction time shall be reasonably arranged to avoid the rainy and flood seasons.

(2) Protection for temporary stacking of soil materials shall be paid attention during construction and retaining measures be taken for soil slope. The stacking height should not exceed 3m.

(3) Operation process of construction machinery and construction personnel shall be regulated and unlawful occupation of land is not allowed. Construction machinery, earth and stone and other building materials cannot be randomly placed, so as to prevent vegetation destruction and increase water and soil loss.

(4) The local water administrative department where the Project is located shall cooperate with the implementation of water and soil conservation plan and conduct coordination and supervision. The policy of “prevention first and conservation priority” shall be carried out, technical guidance to the implementation of water and soil conservation plan be strengthened and strict supervision and law enforcement be conducted to prevent the phenomenon of control while damaging.

2 Control measures

Water and soil loss control measures are zoned in the principle of combination of engineering measures and vegetation measures and combination of key control and general protection based on the assessment results for water and soil conversation of main works, in order to form a complete water and soil conservation measures system. The water and soil loss prevention and control measures include retaining and drainage, greening and temporary retaining, drainage and coverage, which meet the needs for water and soil conservation.

See the table below for water and soil conservation measures system of the Project.

Table 7.3-2 Protection System of Water and Soil Conservation Measures

Grade 1 Subarea	Grade 2 Subarea	Prevention and Control Measures	Type of Measures	Remarks
Road (and ancillary) works area	Main road works area	Engineering measures	Topsoil stripping	Increased for water and soil conservation
			Overburden	Increased for water and soil conservation
			Drainage pipeline	Already have in the main works

Grade 1 Subarea	Grade 2 Subarea	Prevention and Control Measures	Type of Measures		Remarks
			Skeleton slope protection		Already have in the main works
		Temporary measures	Earth bag retaining wall		Increased for water and soil conservation
			Tarpaulin cover		Increased for water and soil conservation
			Temporary drainage ditch		Increased for water and soil conservation
			Sand basin		Increased for water and soil conservation
		Vegetation measures	Garden-style landscaping	Lawn landscaping	Already have in the main works
				Shrub and grass flower landscaping	Already have in the main works
				Roadside trees	Already have in the main works
			Grass sowing by spraying seeds on side slope		Already have in the main works
			Grass seed sowing on side slope		Increased for water and soil conservation
	Temporary construction area	Engineering measures	Land reclamation		Increased for water and soil conservation
		Temporary	Earth bag retaining		Increased for water

Grade 1 Subarea	Grade 2 Subarea		Prevention and Control Measures	Type of Measures	Remarks
			measures		and soil conservation
				Tarpaulin cover	Increased for water and soil conservation
			Vegetation measures	Landscaping restoration by grassing	Increased for water and soil conservation
Wastewater interceptors area	Pipeline operation area	Excavation area	Engineering measures	Topsoil stripping	Increased for water and soil conservation
				Overburden reclamation	Increased for water and soil conservation
				Earth bag retaining wall	Increased for water and soil conservation
				Brick drainage ditch	Increased for water and soil conservation
			Temporary measures	Tarpaulin cover on side slope	Increased for water and soil conservation
				Temporary drainage ditch and grit chamber	Increased for water and soil conservation
			Vegetation measures	Landscaping restoration by grassing	Increased for water and soil conservation

Grade 1 Subarea	Grade 2 Subarea		Prevention and Control Measures	Type of Measures	Remarks
		Temporary soil storage yard	Engineering measures	Land reclamation	Increased for water and soil conservation
			Temporary measures	Earth bag retaining	Increased for water and soil conservation
				Tarpaulin cover	Increased for water and soil conservation
			Vegetation measures	Landscaping with shrub and grass	Increased for water and soil conservation
	Construction Access Road Area		Engineering measures	Topsoil stripping	Increased for water and soil conservation
				Overburden	Increased for water and soil conservation
				Land reclamation	Increased for water and soil conservation
			Temporary measures	Temporary drainage ditch	Increased for water and soil conservation
				Topsoil bag retaining	Increased for water and soil conservation
				Sand basin	Increased for water and soil

Grade 1 Subarea	Grade 2 Subarea	Prevention and Control Measures	Type of Measures		Remarks
					conservation
		Vegetation measures	Grassing on side slope		Increased for water and soil conservation
Landscaping works area	Greenery landscape	Engineering measures	Topsoil stripping		Increased for water and soil conservation
			Overburden		Increased for water and soil conservation
			Land reclamation		Increased for water and soil conservation
		Temporary measures	Construction baffle		Increased for water and soil conservation
			Earth bag retaining		Increased for water and soil conservation
			Tarpaulin cover		Increased for water and soil conservation
		Vegetation measures	Garden-style landscaping	Planting trees	Already have in the main works
				Planting ball shrub	Already have in the main works
				Green lawn	Already have in the main works
	Square and footpath area	Engineering	Grass brick		Already have in the

Grade 1 Subarea	Grade 2 Subarea	Prevention and Control Measures	Type of Measures	Remarks
		measures		main works
			Permeable concrete trial	Already have in the main works

7.3.3 Water and soil conservation measures

Water and soil conservation of the Project includes temporary protective measures, vegetation protective measures engineering protective measures and land rehabilitation. See Table 7.3-3 for summary of work quantities of various water and soil conservation measures.

Table 7.3.3-1 Work Quantities of Water and Soil Conservation Measures of the Project

No.	Item	Unit	Road Works Area		Wastewater Interceptor Works Area		Landscape Renovation Works Area		Subtotal
			Main area of road works	Temporary construction area	Pipeline operation area	Construction access area	Square and footpath area	Landscaping area	
I	Engineering measures								
1	Topsoil stripping	m3	57887		1609	450	3600		63546
2	Overburden	m3	48451		1609	450		13036	63546
3	Drainage pipeline	m	19275						19275
4	Skeleton slope protection	m<cf superscript="on">2</cf>	8551						8551
5	Permeable pavement	hm^2	2.73				0.8		3.53
6	Land reclamation	hm^2		3.95	0.93				4.88
7	Earth bag retaining wall	m3			240				240
8	Brick drainage ditch	m			270				270
8.1	Masonry quantity	m3			47				47
8.2	Excavation quantity	m3			90				90

No.	Item	Unit	Road Works Area		Wastewater Interceptor Works Area		Landscape Renovation Works Area		Subtotal
			Main area of road works	Temporary construction area	Pipeline operation area	Construction access area	Square and footpath area	Landscaping area	
II	Vegetation measures								
1	Garden-style greening								
1.1	Used for roadside trees and landscaping	Plant	4356						4356
1.2	Big arbors	Plant						563	563
1.3	small arbors	Plant						773	773
1.4	Globose shrubs	Plant						227	227
1.5	Landscaping with shrubs, grass and flowers	hm^2	0.92						0.92
1.6	lawn	hm^2	2.64					2.41	5.05
2	Slope afforestation								
2.1	Grass sowing by spraying seeds	hm^2	8.38						8.38
2.2	Grass seed sowing on the slope	hm^2	5.5						5.5
2.3	Quantity of grass seed	kg	550						550
3	Vegetation recovery								
3.1	Grass seed sowing	hm^2		3.95	1.55	0.45			5.95
3.2	Quantity of grass seed	kg		395	155	45			595
4	Grass brick						0.08		0.08
III	Temporary measures								
1	Earth bag retaining wall	m3	8693	2418	1609	450		720	13890

No.	Item	Unit	Road Works Area		Wastewater Interceptor Works Area		Landscape Renovation Works Area		Subtotal
			Main area of road works	Temporary construction area	Pipeline operation area	Construction access area	Square and footpath area	Landscaping area	
2	Tarpaulin cover	m<cf superscript="on">2</cf>		47400	15700			2340	65440
3	Temporary drainage ditch								
3.1	Length	m	23080		1700	1650			26430
3.2	Excavation	m3	4154		306	223			4683
4	Sand basin	Pieces	24		4	3			31
5	Construction baffle	m						2800	2800

7.3.4 Topsoil balance

Overburden of the Project is mainly for roads and landscaping. Given that the project area is flat with good hydrothermal conditions and based on the field survey, the plough layer thickness along the Project is mostly about 30cm~50cm, and therefore, overburden thickness of 30cm may basically meet landscaping needs and that of 50cm is applied for outer separator for road landscaping and greened sidewalks on both sides. Since the project site is planning land, the land temporarily occupied for the project may be used for other projects or later development, and simple grass scattering may be adopted for restoration, so 10cm may be considered as the backfill thickness of topsoil of the temporarily occupied land. The concrete plan for stripping and backfilling is as follows:

(1) Later landscaping for temporarily occupied land of the project may apply the topsoil stripped before construction and the stripping thickness is determined according to the principle of “stripping as required”. In general, it is about 10~30cm based on the thickness of the original landform. The stripping thickness for sections with relatively thick planting soil may be increased or decreased as appropriate.

(2) Overburden lower than 30cm is only considered in the restoration of temporarily occupied land designed with grass scattering, but not lower than 10cm as specified in the construction standards.;

(3) During overburden for road landscaping, the general overburden thickness of seeded slope for excavation is 20cm and average overburden of road greenbelt 50cm. Upon estimation, 48,500m^3 of soil is required for subgrade slope and road greenbelt.

(4) For the temporarily occupied construction site mainly for crushing while without excavation and damage (such as stack yard and production site), landscaping may be conducted by stripping the topsoil and scattering

grass after merely turning the soil.

Topsoil resources stripped by the Project topsoil are mainly from the topsoil within the occupied area of main works. See Table 7.3-4 for balance of topsoil usage of the Project.

Table 7.3.4-1 Topsoil Stripping and Use Planning

SN	Prevention and Control Zoning	Topsoil Stripping		Topsoil Deployment				Topsoil Backfilling			Source of Overburden
		Quantities (m^3)	Thickness (cm)	Import	Source	Export	Destination	Quantities (m^3)	Area (m^2)	Thickness (cm)	
①	North Binhe Road	15256	30			408	④	14848	55793	20～50	Local stripping
②	South Binhe Road A	8250	30			2379	③④	5871	20211	20～50	Local stripping
③	South Binhe Road B	1100	30	244	②			1344	4.44996	20～50	Stripping at local and ② sections
④	South Binhe Road C	4660	30	2543	①②			7203	25900	20～50	Stripping at local and ①② sections
⑤	Industrial Avenue	28621	30			9436	⑧	19185	67484	20～50	Local stripping
⑥	Trench Excavation	1609	30					1609	6500	30	Local stripping
⑦	Construction access	450	10					450	4500	10	Local stripping
⑧	Site reclamation for landscape renovation	3600	10	9436	⑤			13036	33000	30～50	Stripping at local and ⑤ sections
Total		63546		12223		12223		63546			

7.3.5 Earth and stone balance

The total amount of earth and stone of the Project follows the principle of using excavated soil for filling as much as possible.

The Project includes three parts, i.e., road and ancillary works, wastewater interceptor works and landscape reconstruction works, of which the construction time and contents have some similarities. South and North Binhe Road (and ancillary) construction includes some wastewater interceptor works. Road works and its underground pipe trench works are constructed over the same period and the amount of earth and stone is unified calculated in road works, so the amount of earth and stone listed in “wastewater interceptor works” in the earth and stone balance sheet only refers to the earth, stone and topsoil of 1,621m wastewater interceptor converged to Guihua 1st Cross Road.

Earthworks and stoneworks of road works include excavation, filling and transportation between piles, with composition calculated by the classification of earth and river stone.

All good planting soil (including soft soil requiring replacement) shall be stored well for reuse. It shall be stripped and properly kept prior to the construction. The stripped topsoil is firstly used for backfill of road landscaping works of this section, and the remaining soil is allocated for landscaping of the landscape reconstruction works.

Excavation or backfill is conducted for different sections of the same road of the Project, so earth and stone are firstly allocated and transported from adjacent piles, and then backfill from remote piles is considered based on the construction schedule to achieve balance between projects as much as possible.

According to the topography and the natural environment characteristics in the project area, and by comprehensively considering the excavation and filling characteristic along the main road works, the amount of earth and stone for all lines within the entire project area is estimated in accordance with the principle of “excavation + import + borrowing= backfill + export + abandoned”.

According to the project feasibility study report, total excavation amount of the Project is 614,400m³ and total backfill 60.05m³; in which topsoil of 63,500m³ is utilized and 13,9000m³ is remained. The Project is mainly constructed in Qianfeng District and the overall vertical layout in the Park is planned based on earth and stone balance, while the remaining earth and stone of the Project are comprehensively utilized in combination with the land leveling within the Park. See the table below for earth and stone balance conditions.

Table 7.3.5-1 Earth and Stone Balance

SN	Item	Excavation volume (bank volume)				Filling volume (bank volume)				Export			Import			Spoil volume (bank volume)			Destination of spoils
		Subtotal	Earth		Stone	Subtotal	Earth		Stone	Earth	Stone	Destination	Earth	Stone	Source	Subtotal	Earth	Stone	
			Total earth	Overburden			Total earth	Earthing											
I	Road Works																		
①	North Binhe Road	207001	82800	15256	124201	177536	67189	14848	110347	15611	13854	Overburden of ② and ④				0	0	0	
②	South Binhe Road A	31856	19282	8250	12574	92262	40712	5871	51550	2379		Overburden of ③ and ④	23808	38977	① ③ ④		0	0	
③	South Binhe Road B	31114	12006	1100	19108	9719	4112	1344	5607	8138	13501	②	244		Overburden of ①	0	0	0	
④	South Binhe Road C	96309	41320	4660	54989	86763	43396	7203	43367	467	11622	②	2543		Overburden of ① and ②	0			
⑤	Industrial Avenue	195921	100268	28621	95653	174019	82954	19185	91065	9436		Overburden of ⑧				12466	7878	4588	Backfilling the low-lying area on the side of Xinhong Avenue in Industrial Park
II	Wastewater interceptors																		
⑥	Trench Excavation	22695	9078	1609	13617	21294	8142	1609	13152							1401	936	465	
⑦	Construction access	2700	2700	450		2700	2700	450		0									

III	Site reclamation for landscape renovation	26764	16058	3600	10706	36200	25494	13036	10706				9436		Overburden of ⑤				
Total		614360	283512	63546	330848	600493	274699	63546	325794	36031	38977		36031	38977		138667	88144	5053	

7.4 Investment Estimate for Soil and Water Conservation Works

Total investment in water and soil conservation works of the Project is CNY 61.43 million, in which CNY 53.02 million is for water and soil conservation measures included in main works design and CNY 8.41 million as newly added investment for the water and soil conservation plan. Among the total investment in this regard, CNY 37.81 million is for engineering measures, CNY 16.51 million for vegetation measures, CNY 4.25 million for temporary construction, CNY 1.5 million for independent costs, CNY 420,000 for basic reserve funds and CNY 933,800 for compensation for water. See the table for details.

7.4-1 Total Investment Estimation for Water and Soil Conservation Measures Unit: CNY 10,000

SN	Description	Cost of Construction Works	Cost of Vegetation Measures	Independent Costs		Total Investment	Investment for Water and Soil Conservation of Main Works	Total
				Equipment Costs	Other Costs			
	Part I: Engineering measures	121.88				121.886	3659.08	3780.96
	Part II: Vegetation measures		8.38			8.38	1642.78	1651.16
	Part III: Temporary measures	425.29				425.29		425.29
	Part IV: Independent costs			4	145.69	149.69		149.69
(I)	Construction management fee				11.11	11.11		11.11
(II)	Water and soil conservation supervision fee				9.64	9.64		9.64
(III)	Scientific research, survey and design fee				32.94	32.94		32.94
(IV)	Water and soil conservation monitoring fee			4	42	46		46
(V)	Preparation fee for technical assessment report of water and soil conservation completion acceptance				50	50		50
	Total for 1 to 4	547.16	8.38	4	145.69	705.23	5301.86	6007.09
	Basic reserve funds					42.31		442.31
	Compensation fee for water and soil conservation facilities					93.38		93.38

SN	Description	Cost of Construction Works	Cost of Vegetation Measures	Independent Costs		Total Investment	Investment for Water and Soil Conservation of Main Works	Total
				Equipment Costs	Other Costs			
	Total investment for soil and water conservation works					840.92		6142.78
	Including: new investment in the plan							840.92
	Investment aready included in the investment for main works							5301.85

7.5 Benefit Analysis of Water and Soil Conservation

1 Ecological benefit

By taking comprehensive and necessary water and soil conservation measures like temporary retaining protection, drainage, greening restoration, land reclamation, and construction management in the project area during construction, it is possible not only to effectively reduce new water and soil loss in the construction area, but also increase the greening restoration and facilitate a virtuous circle of ecological system in the project area. By means of landscaping in the area, afforestation of permanently occupied land like the side slope and outer separator and vegetation restoration within the temporary occupied construction area, it is possible to realize 99.07% of vegetation restoration rate and 50.02% of forestry and grass coverage rate in the project construction area.

By implementing water and soil conservation measures of the Plan, it is possible to achieve over 99.59% of treatment percentage of disturbed land, over 99.03% of controlled percentage of erosion area, over 98.80% of percentage of dammed slag or ashes, which may effectively prevent and control additional water and soil loss, 99.07% of recovery percentage of forestry and grass and over 50.02% of percentage of forestry and grass coverage by the design level year.

2 Economic benefit

By implementing the water and soil conservation plan, it is possible to effectively prevent and control the possible water and soil loss, reduce and avoid the damage caused by water and soil loss in the project area due to construction, reduce the impact on river course and ensure the safety and smooth operation of construction project, and thus to ensure the best investment benefit of the Project.

3 Social benefit

The construction of the Project may improve the infrastructure in the project area and promote regional economic development while improving the regional landscape. By taking prevention measures, treatment measures and supervision and inspection measures for water and soil conservation according to circumstances, it is possible to minimize the

water and soil loss and hazard during the project construction period and the natural recovery period, and thus to ensure the smooth progress of construction of the Project.

The combination of construction of the Project and regional urbanization and industrial development, coordination of road greening and urban landscaping, and improvement of living conditions of urban residents may accelerate the sustainable and rapid development in the project area, beautify the urban landscape along the road and promote the sustainable and rapid development of transport, tourism and other industries. By implementing the water and soil conservation plan, it is possible to effectively control water and soil loss and avoid major water and soil loss hazard, and ensure unobstructed rivers, channels and pipes along in the project area; thus to facilitate the steadily development of national economy and social undertakings in the project area and realize the goal of promoting economy development in Qianfeng Town and its surrounding areas by infrastructure construction. Therefore, construction of the Project will produce huge social benefits.

7.6 Brief Summary of Assessment

The land occupied by the Project has been planned as construction site. In addition to meeting the requirements of project construction, existing facilities within the land acquisition area are utilized and temporary construction site is controlled to reduce new area. The floor area of the Project is reasonable. The Project is constructed in the urban area of Qianfeng District, following the principle of earth and stone excavation and filling balance as specified in the design. The earth and stone are tried to be allocated from other projects as much as possible, which is in line with soil and water conservation requirements. The construction process of each works of the Project is simple and mature, with scientific and rational construction methods, which helps to reduce the disturbance range due to disorder construction and earth and stone piling as well as additional water and soil loss caused by construction. However, it is required to optimize construction organization and time sequence, adjust and shorten the construction period, avoid excavation and filling of a large number of earth and stone in rainy seasons, coordinate with the land for surrounding projects that are constructed over the same period, and reduce temporarily occupied land in the next stage design.

Main works of the Projects itself includes landscaping design. Permeable pavement is given more consideration in the design to increase the infiltration rate of rainfall on the ground and reduce the pressure of the drainage system. These measures may increase the moisture content of the soil, improve water conservation capability of the land and conserve water and soil. In addition, drainage and protection works in the road works have significant benefits for water and soil conservation while maintaining the safety and stability of the works.

8 Environmental Risk Assessment

8.1 Risk Analysis on Wastewater Interceptor and Wastewater Pipeline Works

1. Environmental risk factors

   After being put into operation, pipelines of the Project have no harmful effect on the environment in normal condition, however, in case of abnormal conditions (namely, accidental state), they may produce harmful effect impact on the external environment, especially water and air environment. Abnormal state is mainly refers to possible pipeline fracture, breakage, etc. Causes for abnormal conditions include two aspects, one is natural factor, referring to earthquake and climate change, etc., and the other is human factor, referring to material, construction, corrosion protection, maintenance, operation, non-conformity to standard of trench backfill and pressing or occupation of pipelines.

   Accident caused by natural factors is unavoidable, what we can do is to find out and repair in time after the occurring of accident, while these caused by human factors is avoidable. Previous analysis indicates that the selections of Project pipelines are reasonable; therefore, what is needed is to enforce strict management during construction and operation period, to comply with the relevant provisions, to perform regular inspection, to execute standard operation, thus occurrence of accident caused by human factors may be drastically reduced.

2. Analysis of pipeline environmental risks

   Abnormal condition of sewage pipeline mainly refers to fracture and rupture of pipeline, sewage leaked from which may pollute the surface water and groundwater environment.

   In general, it is easy to find out when a pipeline is seriously damaged, resulting sewage spills and polluting the surface water environment, and the pollution degree and range may be reduced if only reporting to relevant departments in time. But if there is a leak in the pipeline which results sewage infiltration and pollution of groundwater, it is not easy to find out which may only be discovered by regular inspection. According analogous investigation, when a pipeline leaks and sewage seeps into the underground and gradually spreads to pollute the groundwater, the law is that the closer to the leakage and the longer time the leakage lasts, the more serious the pollution is; therefore, to find out the leakage as soon as possible and to take measures as soon as possible is the key to prevent environmental risks.

3. Precautions

   (1) Human factors are often the main cause of the accident, therefore, to enforce strict management and managing people well to eliminate accident-causing human factors is the key to prevent accident. These include: strengthen the virtue education on staff to improve the staff's sense of responsibility and initiative; provide systematic post training for operators to make them familiar with work procedures and rules and to strengthen the post responsibility system; for locations prone to accident, apart from in time inspection by worker of the post, safety inspector shall be appointed to perform routine inspection and

maintenance, in order to find out and repair problems in time.

(2) It is suggested that the employer shall perform careful review in Project design stage and check the facilities concerning safety, health and environment in accordance with the relevant specifications and standards, and enforce strict management and inspection on these during the construction period to ensure the construction quality.

(3) In the event of an accident, it shall be reported to the relevant authorities in time to take effective treatment measures to minimize the harm on the surrounding environment and people's lives and properties.

8.2 Risk Analysis on WWTP

1. Environmental risk factors

According to analysis on the WWTP technology and the WWTP facilities, the types of pollution accident risks of WWTP mainly include environmental problems like sewage discharge, sludge bulking, and foul-smelling substances emissions under abnormal condition of WWTP. Links involving accident risks include the following aspects:

(1) Due to pipe blockage, pipe fracture and damage in joints in the sewage pipe network system, large amount of sewage may spill over and pollute the surface water and groundwater. Rupture of pipeline section crossing river may pollute the river water quality.

(2) Long time power outage of sewage pumping station or damage of sewage pump results in poor drainage and subsequent sewage overflow.

(3) Due to power outage, equipment damage, abnormal operation of sewage treatment facilities, and service shutdown, etc. of WWTP, large amount of untreated sewage discharges into nearby waters, causing pollution accident.

(4) Abnormal condition of sewage treatment tank like sludge bulking or sludge disintegration results in sludge loss, reducing treatment efficiency.

(5) Damages of sewage pipe, processing structures and storage yard due to natural disasters such as earthquake result in sewage to spill over the plant and surrounding area and water area, causing serious local pollution.

2. Accident prevention measures and countermeasures

(1) Pipe network maintenance measures

Pipe network maintenance is important for the normal operation of WWTP. Special attention shall be paid to the maintenance and management of pipe network and pump station to prevent the discharge capacity of pipe from being reduced by sediment jam. Pipe connection shall be prevented from leakage in polluting groundwater and emptying the foundation. Silting up of pipe shall be cleaned in time to ensure unblocked flowing in the pipe, in order to collect domestic sewage and industrial wastewater in full capacity. Design of main sewer and branch sewer shall select a proper fullness and

minimum flow rate to prevent sludge deposit.

Special person shall be appoint to take charge of the incoming pump station of WWTP, who, at ordinary times, shall strengthen the maintenance of machinery and equipment and, in the event of accident, shall repair them in time to prevent sewage from flowing into the nearby rivers.

Strict maintenance system shall be enacted for the sewage pipe network. Users shall strictly execute relevant national and local emission standards, management on the inflow water quality of industrial wastewater collected shall be specially strengthened to ensure the inflow water quality of WWTP.

(2) Precautions for pollution accident

WWTP accident stems from equipment failure and maintenance, or from poor treatment effect due to changes of technology parameters. Precautions are:

1) Provide duplicate supply for WWTP. Provide standby for water pump, blower and so on. Use mechanical equipment with reliable quality and performance, imported product is preferred.

2) In case of a shutdown accident of WWTP, the big discharging client shall restrain production to reduce discharge, and the WWTP shall start accident emergency pool which shall allow for 4 hours of servicing time which is 667m^3 in volume in the Project

3) In order to make the WWTP recover normal operation rapidly in the event of accident, corresponding buffer capacity shall be reserved in the volume of main hydraulic structures and corresponding equipment (such as reflux pump, reflux pipe, valve and instrument, etc.) shall be provided.

4) Choose high quality equipment. For mechanical and electrical equipment, instrument, etc. of WWTP, products of good quality, low accident rate, and easy to maintenance shall be used. Key equipment shall have one in use and one for standby; spare parts shall be provided for damageable parts in order to replace in time in case of accident.

5) Technological parameters of treatment unit like Water volume, water quality, residence time, and load intensity, etc. shall be controlled strictly to ensure a stable treatment effect. Flowmeter and water quality automatic monitoring instruments and the like shall be provided for regular sampling monitoring. Operator shall make adjustment in time to make the equipment in the best working condition. In case of abnormity, precautionary measures shall be taken immediately.

6) Establish safety operation procedures which are to be strictly followed at ordinary times. Perform regularly theoretical knowledge and skills trainings and examinations for WWTP staff.

7) Strengthen operation management and monitoring on the inflow and effluent quality, sewage untreated and not up to standard is prohibited from being discharged.

8) Toxic gas monitor shall be provided in sewage pump plant and necessary ventilation device shall be provided.

9) Establish safety responsibility system. A set of complete system shall be in place for daily work management which shall specify the responsibility of each person and shall be inspected regularly.

10) Establish emergency measures for risk accident which shall specify the emergent and rescue operation system.

3. Accident measures and emergency plan

In the event of sudden accident of WWTP in the process of sewage collection, transportation and treatment, it shall be handled emergently as per plan draw up in advance. Emergency plan includes the following:

(1) Profile of risk source

Describe in detail the type, intensity and location of the risk source.

(2) Emergent protection zone

Including the water quality control area downstream the waters near the Project.

(3) Emergency organization

Accident emergency team shall take overall command of the accident site, and professional rescue team shall take charge of the urgent repair or rule out of the accident or malfunction.

(4) Emergency facilities, equipment and materials

Provide relevant standby equipment, tools and materials.

(5) Emergency communication, notifications, and transportation

Stipulate contact communication methods in emergency, notify relevant parties, control the accident site, and make sure rescue teams arrive in time.

(6) Emergency environmental monitoring and post-accident assessment

For major accident, monitor the water environment nearby and assess the nature, parameters and the consequences of the accident to provide basic data for decision making by relevant department.

(7) First-aid measures

Control the accident to prevent it from expanding and chain reaction; close relevant gate to reduce harm.

(8) Emergency situation termination and recovery measures

Stipulate emergency termination procedures, make care-taking arrangement, and recover the normal operation of WWTP rapidly.

(9) Staff training and drilling

After the development of emergency plan, arrange training and drilling for relevant staff in peacetime.

(10) Recording and report

Make special accident record, establish accident records and

reporting system, appoint full-time or part-time personnel to take charge of management.

9 Environmental Protection Measures and the Economic and Technical Demonstration

9.1 Environmental Protection Measures and Suggestions in Design Stage

(1) The route and location of new roads and wastewater interceptors shall be further optimized and adjusted to balance as possible the excavation and backfilling, reduce excavation and backfilling quantities, reduce damage to surface vegetation and reduce new water and soil loss.

(2) Road landscaping design shall be conducted at the same time with the main works design. Meeting the regional planning requirement, the route of roads shall maintain the natural landscape and harmonize with the surrounding environment as much as possible. To reduce damage to the existing ecological environment, landscaping and ecological construction works shall be carried out simultaneously in Project design.

(3) New WWTP shall strictly implement pollution prevention principles and take positively clearer production measures in order to reduce pollutants from the source and reduce risks to human and the environment;

(4) Raw materials shall be purchased locally;

(5) The Project design shall comprehensively consider the surrounding environment and shall further refine the permanent land occupation design to use land reasonably.

(6) Make a good water and soil conservation plan which shall not only take into account sufficiently the type, mode and intensity of water and soil loss caused by the Project construction, but integrate the general plan of the management area of Project operation period;

(7) Due to a pretty large noise produced in the construction of building works and road works, reasonable noise isolation and reduction measures shall be taken in Project design to mitigate the impact of construction noise on the field construction workers.

(8) The standard distance for the function area provided by the construction planning department shall be arranged rationally and no sensitive structure shall be built within the standard distance.

9.2 Environmental Protection Measures and Suggestions in Construction Period

9.2.1 Ecological environment protection measures and suggestions

Flowers, grass and trees in the median separator and outer separator shall be transplanted and protected, these shall not be completely destroyed and plant new vegetation, they shall rather be temporarily transplanted and replanted as per design. Be aware to protect trees and green belt in the adjacent areas during construction. Road construction shall be conducted within the right-of-way as possible; earth-pile and stock-pile shall not intrude into the farmland nearby; As for the ruins belt caused by demolition in construction, this shall be handled by carrying out orderly demolition zone by zone and to avoid messy landscape, and barrier or protective plate (wood, glass, and iron sheet, etc.) may be used as fence to reduce landscape pollution; reasonable allocation shall be made for excavation and backfilling construction; excavation

and backfilling construction shall not be done in rainy days to prevent water and soil loss by rainwater washing from polluting the waters and blocking the drainage pipe; meeting the construction demand, land occupation shall be minimized as possible and construction schedule shall be rationally arranged. After work finished, clear the construction site in time, withdraw from the occupied land, restore the original road and greening; reasonably arrange the construction period to avoid rainy season construction so as to minimize soil erosion.

Strengthen construction management and supervision and regulate construction activity to reduce construction land occupation and vegetation loss and reduce damage to wildlife habitat. Regulate construction activity and perform construction reasonably and orderly; optimize construction organization by gradually advancing construction in one direction in the same construction section, staggering the construction peak between two adjacent construction sections to avoid large scale concurrent construction in the same area and to reduce disturbance of terrestrial ecological environment by disordered construction. Strengthen environmental protection publicity and education and wildlife protection knowledge propaganda on the construction staff by multiple means like announcement, leaflets, blackboard newspaper and meetings to improve environmental awareness; forbid constructors from hunting frogs, snakes, wild animals, birds and other wildlife and engaging other activities hazardous to ecological environment protection.

9.2.2 Acoustic environment protection measures and suggestions

1. Reasonable construction site layout

   Reasonable and scientific construction site layout is a major way in reducing construction noise. Place the fixed noise sources on the construction site collectively to reduce the noise affected scope.

2. Reasonable arrangement of construction time

   Arrange construction time reasonably in accordance with the provisions of the *Emission Standard of Environment Noise for Boundary of Construction Site (GB 12523-2011)*. Forbid construction operation with high-noise machinery at night (22:00~6:00). Adjust construction time as appropriate or take temporary noise reduction measures like setting up temporary noise barrier or adopting semi-underground construction and so on when performing construction near residential area. For worksite requiring continuous construction operation, the Contractor shall contact in time the environmental protection department according to specific situation to apply for nighttime construction certificate as per regulations and strive for public support as much as possible by issuing announcement.

3. Reasonable arrangement of construction transport routes

   Transport routes and time for construction transportation vehicles, especially large transport vehicles shall be reasonably determined as per provisions of the relevant departments, the transport route shall be far

away from residences area. Vehicles for transporting and handling construction materials shall lower their speed to 20km/h at sensitive spot and blaring horns is prohibited.

4. Reasonable selection of construction machinery equipment

   Select construction machinery equipment with low noise as possible and perform regular maintenance for them; select the reasonable construction method, construction site; set up sound insulation board for high noise construction machinery on sides close to sensitive spot during construction to reduce the impact of noise on sensitive spot.

5. Strengthen environmental management and accept the supervision of environmental protection department

   In order to effectively control the impact of construction noise on the urban environment, in addition to the implementation of relevant control measures, environmental management must be strengthened; In accordance with relevant state and local laws, decrees and regulations, the constructor shall voluntarily accept the supervision and inspection of environmental protection department; in bid inviting of subsequent project, noise attenuating measure shall be explicitly included in the bidding documents; the contractor shall include the construction noise control into the contract content and special person shall be appointed to take charge in this respect during construction and engineering supervision to ensure the smooth implementation of construction noise control measures. Construction operation personnel and constructors on site shall control the working hours as per labor protecting standard and do well their own personal protection, wearing earplugs, helmet, etc., for example.

6. The contractor shall use construction site barrier in a standardized way to give full play to its noise reduction effect. At sensitive spots within 50m on both sides of the proposed road like centralized dwelling district of Group 3 and 8 of Chunlei Village and Jijian Village, the construction barrier height shall be increased.

   As long as the contractor strictly executing the control measures provided in the EIA, the construction noise will not have obvious impact on the surrounding environment.

9.2.3 Atmospheric environmental protection measures

1. The Project site management shall strictly refer to the construction site management principle of “six must” and “six mustn’t”, namely, wet construction operation is a must, barrier circling construction is a must on urban road, road hardening is a must, providing washing facilities is a must, clean-keeping staff is a must, cleaning the construction site regularly is a must; and the six mustn’t, vehicles with mud mustn’t be allowed to leave, slag car mustn’t be allowed to overload, throwing built slag in the air mustn’t be allowed, mixing concrete on site mustn’t be allowed, ground water mustn’t be allowed, burning waste on site mustn’t be allowed, thereby effectively control the construction site dust pollution.

2. Provide dust-proof measures like construction barrier at concrete mixing station, or mix concrete inside building to effectively control dust pollution.

3. Watering in due time the construction site on non-rainy days, including the road section in construction and major transportation road. Watering

frequency shall be determined by the site supervision personnel according to the actual situation.

4. Powder material like cement, lime shall be packed in tanks or bags, transportation of these in loose packing is prohibited, dust scattering in transportation is prohibited; while in storage, these shall be stored in warehouse or covered with tarpaulin.
5. Provide dust-proof mat at exits of construction site; clean the body and tires of transport vehicles out of the construction site. Forbid overload in soil, sand, stone transportation; the loading height shall not exceed the truck baffle and the loaded material shall be covered with tarpaulin to prevent sprinkling along the way.
6. In case of a wind velocity above level 4 which is prone to producing dust, it is suggested that the contractor shall temporarily stop excavation and take measures like covering, wetting the stockpile to effectively reduce dust pollution;
7. Collect and transport the construction waste in time, and cover those which cannot be cleared and transported temporarily; vehicles transporting sand, stone, cement, earth which is apt to produce dust must be covered tightly to prevent sprinkling and leak.
8. Provide dust mask for constructors to reduce health damage by dust.
9. Watering the temporary storage yard regularly to reduce the impact of dust on the surrounding environment; set up closed enclosure with height no less than the piled up material around; divide the boundaries between the material area and road and clean up the scattered materials in time to keep the road neat and clean the road in time.
10. For soil pile of road and pipeline construction over 48 hours, it shall be completely covered to prevent dust.
11. Slag car shall use enclosed car bucket, vehicle cleaning platform shall be provided on the inner side of the in and out door for transport vehicles and shall be equipped with perfect drainage facilities; before leaving the construction site, vehicles shall have their tires and the bodies washed to prevent soil sticking.

9.2.4 Groundwater environment protection measures and suggestions

1 Measures for reducing sediment into river during bridge construction

(1) Construction of bridge pile foundation shall strictly comply with steel casing bored piles construction technology to reduce construction suspended sediment.

(2) Make recycling use of pile drilling mud and prevent it from overflowing into Luxi River.The slag of drilled pile, after being filtered and collected, shall be transported onto the bank and used as roadbed filler.

(3) Strengthen management of bridge construction machinery to prevent oil escape, oil spill, oil drip and oil leak of machinery.

2. Construction wastewater in the Project is reused after treatment and is not directly discharged into local waters, and domestic sewage is discharged after treatment in septic tank or used as agricultural fertilizer, which in

general will not impact the groundwater quality.

3. The constructor of the Project shall make simple processing to muddy water like filtering and precipitation, direct discharge is prohibited; the constructor shall strengthen construction management to perform civilized construction.
4. For living garbage, construction waste, maintenance garbage, which would produce pollution if directly discharged into the waters, therefore, they shall be recycled, sorted, stored and disposed; of which, the usable materials like most paper, wood, metal and glass wastes shall be reused or sold to garbage buyer, and the unusable shall be committed to health department for harmless treatment, incineration, landfill, stockpiling, etc.
5. Residual and waste oils produced in construction shall be collected, recycled and disposed with different vessel; aggregate wash water and concrete batch plant wash water produced in subgrade construction shall be reused after precipitation processing for watering the construction site to reduce dust.
6. Leakage and pressure test shall be performed after the connection of pipe network works, and the water pollutants for pressure test is mainly SS, which may be collected as dust suppression water or landscaping water after sedimentation.
7. Well-up water produced in the excavation of WWTP structures shall be used in construction after sedimentation.

8 Water stage and small dam, belonging to wading works during landscape renovation works, may bring impact to the water quality and aquatic organisms of Lvxi River during construction. Since Qianfeng Water Affairs Bureau is conducting comprehensive river course management works for Lvxi River, which is dried up at present, the water stage and small dam will be constructed at the same time as the comprehensive river course management works, in order to avoid the impact to the water quality and aquatic organisms of Lvxi River.

9.2.5 Groundwater environmental protection measures and suggestions

1. Strengthen sewage and production wastewater treatment during construction; domestic sewage of constructors shall be used for agricultural irrigation or recycling after pre-treatment and production wastewater shall be used for dust suppression in the construction;
2. Loose piled stock ground shall be covered to prevent water and soil loss from polluting groundwater.
3. The contractor shall make scientific and reasonable construction schedule to shorten the construction period in order to reduce the impact of pumping and discharging of groundwater.
4. Organize construction by sections to prevent a superposition effect on the groundwater recession due to the excessive concentration of dewatering wells in part section.
5. Increase the number of drain wells as appropriate, choose reasonably the locations of drain wells to minimize the distance from the pipeline in construction so as to reduce the affected scope of groundwater recession.

6. Construction of the foundation of sewage wells shall be arranged in non-flood season to reduce the adverse impact of a lower groundwater depth on construction.

9.2.6 Environmental protection measures and suggestions for solid wastes

1. Domestic garbage produced in construction shall be collected by classification and shall be collected, transported and disposed uniformly by local health department.
2. Upon completion of works, dismantle the temporary facilities in the construction area, remove construction waste and all sorts of sundry, clear up and level up the domestic garbage, simple toilet, and sump and perform disinfection for these with carbolic acid and caustic lime, and restore the construction site.
3. The contractors shall arrange special person to take charge of the collection of production waste; scrap iron, scrap steel, waste wood pieces shall be stacked in the location specified, random piling and stacking is prohibited; Waste shall be uniformly reclaimed and committed to centralized treatment.
4. In the process of transportation, living garbage, and building materials shall be enclosed or covered to prevent garbage, sandstone, earth material from scattering along the way or into the river.

9.3 Environmental Protection Measures and Suggestions in Operation Period

Environmental protection measures for road works during the operation period mainly consist of landscape works' maintenance on both sides of road, regular renovation of greening trees in order to ensure the design effect of landscape works.

The rational allocation of landscape will increase the beauty of the city, beautify city appearance and give a comfortable feeling. Besides, project implementation will promote urban development and urge the regional rural ecological landscape to gradually develop towards urban ecological landscape. Through the improvement of landscaping works on both sides of the roads and rivers, the urban ecological structure will tend to be more reasonable.

Upon completion of the Project, the reasonable arrangement of landscaping works will increase the beauty of city and beautify the appearance of city, while make people feel comfortable.The implementation of the Project will boost the development of city and promote the regional rural ecological landscape to develop into an urban ecological landscape; by improving the landscaping works on road sides and river banks, urban ecological structure will be more reasonable.

(1) Landscape of Industrial Avenue

Landscaping of Industrial Avenue mainly uses evergreen trees, together with multilayers of dungarunga and shrub. Between big evergreen trees and dungarunga there are layers of shrubs. The outer separator use trees as backdrop, combined with flowering small trees and with the ground covered with grass flower in order to add color; thus urban trunk roads characterized by many varieties and multi-function landscaping, four

seasons evergreen, three seasons of flowering, bright and colorful, and thriving are presented. Meanwhile the landscape continuity within road sections and the landscape integrity are maintained.At the same time, LID technology is used in the landscaping of sidewalks.

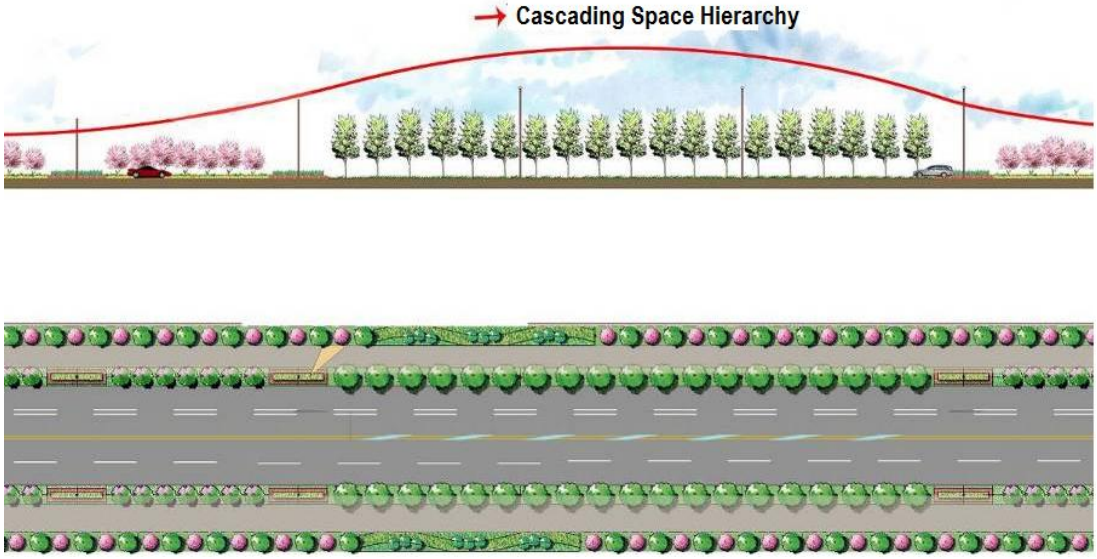


Figure 9.3.1-1 Standard Demonstration Section of Industrial Avenue Landscaping Works

(2) North and South Binhe Road

With total length of 8261.414m, the North and South Binhe Road is a sub-trunk road of Qianfeng District. Of which, the standard cross-section of Section A, Section C of South Binhe Road is similar to that of North Binhe Road for which the road width is 18m, and 20m for Section B of South Binhe Road.Despite, landscaping works for the North and South Binhe Road is the same which is the greening of sidewalks on both sides.As the North and South Binhe Road is built along the river, therefore, in order to ensure the clear vision of landscape and the good ventilation above the river, small arbors and short shrubs will be used in combination with lawn to create a wide visual space. Same with Industrial Avenue, urban road rainwater collection system is introduced to form LID technical system.

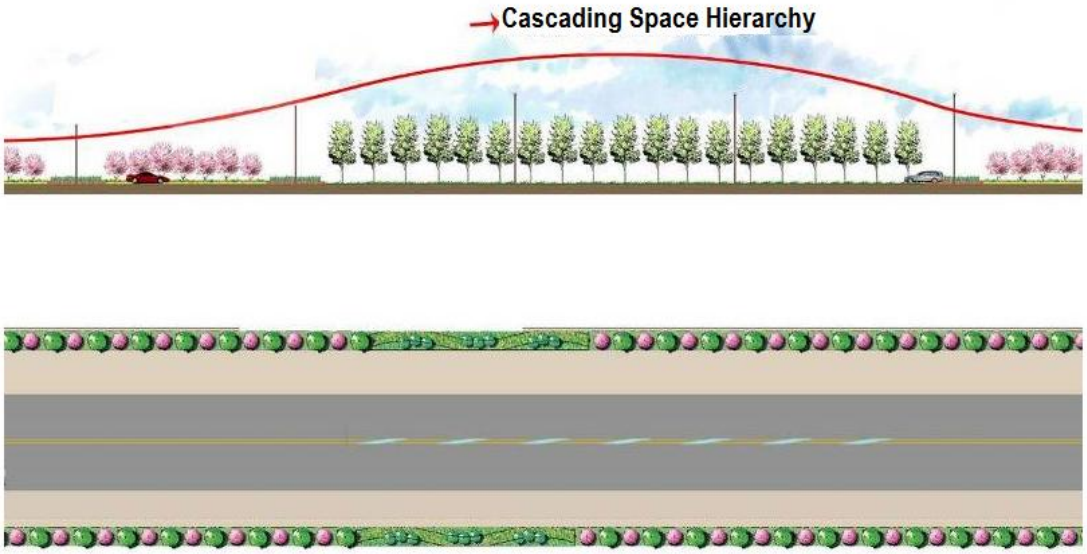


Figure 9.3.1-2 Standard Demonstration Section of North and South Binhe Road Landscaping Works

(3) Landscaping works of Luxi River

A design concept of livable, happiness, ecological, and humanistic is adopted, specifically ① Combination of natural ecology with artificial ecology - highlighting environmental harmony and integration; ② Combination of traditional ecology with modern landscape - highlighting the integration between eco-system and landscape system; ③ Combination of open and close- namely, combination of convenient traffic with the closeness of rest space; ④ Combination of recreational facilities with leisure sightseeing; Based on the demands of visitors, the Luxi River is divided into Happy Qianfeng, Cultural Qianfeng, and Ecological Qianfeng.

Figure 9.3.1-3 Effect of Landscaping Works of Luxi River

9.3.2 Acoustic environment protection measures and suggestions

(1) Make reasonable urban planning, architectural layout and control land use on both road sides.

Article 12, Chapter 2 of the *Law of the People's Republic of China on Prevention and Control of Pollution* from Environmental Noise provides that the urban planning department shall, in determining architectural layout, provide a reasonable noise-proof distance between the buildings and traffic artery in accordance with national acoustic environmental quality standard and civil building design code and propose corresponding planning and design requirements; Article 37, Chapter 5 provides that for new noise-sensitive buildings on both sides of urban traffic artery, certain distance shall be reserved from the road in accordance with national regulations and traffic noise mitigation measures shall be taken; Article 5(2) of Technical Policies for the Prevention and Control of Ground Traffic Pollution (HF[2010] No.7) provides that for noise-sensitive buildings besides roads and tracks, the functions of rooms in a building shall be reasonably arranged to reduce traffic noise impact, for instance, kitchen and restroom and the like in residential apartment shall be located on the side facing the road or tracks.

According to the said principles, land use on urban roadsides shall be properly planned and the function of land use along the road shall be strictly controlled; Based on the predicted noise value at varied distance and the predicted distance at which traffic noise meets the standard, it is suggested that acoustic-sensitive buildings like residential areas, schools and hospitals shall not be placed at the first row within 15m of the road centerline. In addition to reasonable planning of land function on roadsides, architectural layout and sound-proof design shall be strengthened to ensure the inside environment of noise-sensitive buildings meets requirements for use.

(2) Reduce the sound source noise radiation

Implement traffic control at night, restrict overspeed in sensitive sections at night; strengthen management on blaring horns by vehicles; strengthen the

maintenance and care of urban road and repair in time the damaged road; restrict the traffic of overspeed, overload vehicles and heavy-duty trucks.

(3) Suggestions on noise pollution control

Since South and North Binhe Road and Industrial Avenue in the Project are all located in Qianfeng Industrial Park, it is therefore suggested that housing demolition and residents´ relocation shall be carried out as soon as possible to reduce the noise impact of the Project.According to the planning of the Industrial Park, this area is proposed to be developed from 2014 to 2020. Currently development for some districts is being carried out and some houses have already been demolished, so it is suggested that housing demolition and resettlement should be carried out as soon as possible to reduce the noise impact of the Project.

9.3.3 Atmospheric environment protection measures and suggestions

1. Enforce strictly exhaust emission inspection system and restrict traffic of vehicles with excess emissions; organize transport route scientifically; restrict traffic of ultra-limit slag cars; strengthen road management and road maintenance and keep road in good operation condition and reduce traffic jam.

2 Enforce strictly national vehicle exhaust emission standards; strengthen law enforcement on vehicle management; restrict traffic of vehicles with excess emissions to reduce exhaust emissions.

3 Strengthen greening on road sides and plant trees capable of absorbing (or adsorbing) toxic gases like CO, NO_2, etc. to reduce road traffic air pollution.

4. Rational layout: place structure which is the main source of odor in the middle of the plant. Control odor radiation: reasonably arrange the WWTP with the structures of major odor sources in the center of plant. In addition, reinforce the plant management and enhance greening.

9.3.4 Surface water environmental protection measures and suggestions during Operation Period

1. Road works

The main impact during the operation period is the impact on the road works. When the rain falls in the project area, the pavement run-off wastewater is produced by rainfall scouring the pavement; this mainly occurs in the 30 minutes from the beginning of rainfall to forming run-off; after a half hour, the pavement is basically washed out and the pollutant concentration of pavement run-off is stabilized at a pretty low level.

A half-separated drainage system is adopted in design to collect the initial dirty rainwater which is discharged to the riverway after sedimentation.

The No.1 Middle Bridge of Industrial Avenue crosses the Luxi River, protective measures for the water environment under the bridge include: strengthen daily management and maintenance of bridge and clean the bridge surface regularly; strengthen traffic management on the bridge and control traffic speed to reduce water pollution of Luxi River due to traffic accident.

2 WWTP works

The short term capacity of WWTP is 10,000 m^3/d, the inflow is mainly from the old town of Qianfeng District, Industrial Park, the industrial wastewater and sanitary sewage of the new south city area of Qianfeng District; the types of enterprises in Qianfeng Industrial Park are basically decided, they are mainly of light textile and electromechanical machining.The WWTP of Qianfeng District, Guang'an City and Guang'an western Jean Industrial Zone adopts "membrane bioreactor" process; the quality of processed wastewater can meet Class 1A standard of *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002)*.

9.3.5 Groundwater environment protection measures and suggestions during Operation Period

1. Compressive strength, impermeability, frost resistance of the pool body concrete of WWTP must meet design requirement; and the concrete elevation and slope of the pool floor must meet design requirement; the pool walls shall be vertical and have smooth surface, and concrete of the adjacent wet joints shall be tight and the thickness of concrete cover shall meet the specification; before placing pool wall concrete, the concrete construction joints shall be scabbled and washed clean, and concrete joints shall be free from leak; embedded pipe fittings, water stop and caulk board shall be firmly mounted in right position; full water test shall be performed for each pool to ensure quality.
2. Enact partition anti-seepage plan, perform anti-seepage design and take reasonable anti-seepage measures based on different areas; anti-seepage treatment method of HDPE film + impermeable concrete (seepage coefficient≤1.0×10-10cm/s) shall be conducted for wastewater collection pool, treatment structures, sludge processing unit and dosing room to prevent pollution of groundwater environment.
3. Quality control shall be strictly enforced in Project design and construction to prevent groundwater pollution from the source; leakage of wastewater inceptor and sewage pipe and so on due to material, pipe fabrication, welding defects and operational errors shall be wiped out; strengthen anti-seepage treatment for pipe network, pool corners, bearings and joints. Strengthen monitoring in Project operation and make record for concealed works; perform regular inspection to effectively prevent wastewater leak.
4. Develop emergency response plan for groundwater risk accidents which shall provide emergent measures like close, shut-off, etc. in case of a risk accident.

The analysis concludes that by taking strict anti-seepage measures at wastewater discharge point and by performing regular inspection for drainage network, it is possible to rule out pollution potential, and impact on groundwater in the Project area is trivial. The groundwater environment protection measures are workable.

9.3.6 Environmental protection measures and suggestions for solid wastes during operation period

1 Solid waste in the Project during operation is mainly the scattered and leaked transportation material and a small amount of garbage produced on the roads; the Assessment suggests that these solid wastes shall be cleaned in time and after being collected shall be taken up by Qianfeng sanitation department for uniform disposal.

2. According to WWTP sludge treatment plan, in short term sludge will be disposed by sanitary landfill which will be delivered to Guang'an Pu'an Domestic Waste Landfill to be disposed together with the WWTP domestic garbage.

   The said various solid wastes shall be collected and transported in time with enclosed vehicles to prevent sprinkling and running off along the way in case secondary pollution.

   Special or part-time personnel shall be designated in WWTP to take charge of whole process management on the production, transportation, storage, treatment and disposal of sludge. Sludge transportation by individual and unit without relevant operational qualifications is prohibited; sealing, waterproof, anti-seepage and anti-littering measures shall be taken for sludge transport vehicles.

9.4 Environmental Protection Investment Estimate

The total investment for environmental protection of the Project hits CNY82.1659 million, of which total project investment is CNY503.5448 million. The environmental protection investment accounts for 16.3% of the total project investment. See the table below for environmental protection works and investment estimate of the Project:

Table 10.4-1 List of Environment Protection Works Investment

Item	Engineering Measures		Project Investment (CNY 10,000)		
			Already Included in the Main Works	Newly Added	Total
Ecological environment and water and soil conservation	Shrub planting, seed broadcasting, drainage ditch, desilting culvert, land reclamation, shrub planting, seed broadcasting and temporary soil drainage ditch		5302	841	6143
	Landscaping		1968.59	/	1968.59
Acoustic environment	Construction period	Temporary sound insulation enclosure, etc.	/	10	10
Air environment	Construction period	Dust-proof measures like watering	/	20	20
	Operation Period	Greening	Already listed in landscaping	/	/
Surface water environment	Construction period	5 sets of sedimentation tanks and privies established in the construction camp	/	50	50

Item	Engineering Measures		Project Investment (CNY 10,000)		
			Already Included in the Main Works	Newly Added	Total
Groundwater environment	Construction period	Combined with the measures for surface water during construction and collect construction wastewater and domestic sewage in a unified manner	/	/	/
Solid wastes	Construction period	Collect domestic waste and construction waste for centralized treatment	/	5	5
	Operation Period	Domestic waste and street refuse collection and treatment	/	20	20
Total	/	/	7270.59	946	8216.59

9.5 Mitigation measures and suggestions on social impact

1. Make sufficient preparation before construction; make detailed survey on roads and various ground and underground pipes and pipelines like communication, water supply and drainage, and gas, etc. affected by the Project, and coordinate in advance with relevant departments to determine demolition and relocation plans, and make various emergency works to ensure that construction would not affect the normal operation of necessary utilities like water, electricity, gas, and communication required by Qianfeng people and maintain a stable and normal social life.

2. The Contractor must strictly abide by *Law of the PRC on safe Production*, *Safe Production Regulations of Sichuan Province* and relevant laws and regulations. Prior to the commencement of Project, competent department of the company shall make safety technical disclosure to the engineering project department on key parts of the works and shall prepare official document; the head of Project department shall make construction organization technical disclosure to all construction management staff and shall prepare official document. Prior to the commencement of each work stage (component), the competent construction technical personnel of the Project department shall make safety technical disclosure to all construction workers and inform them about the hazards in workplace, about precautionary measures and accident emergency measures, and make records.

   Special measures and rules shall be enacted for the safety management on special work conditions like construction site, dangerous operations, working at heights, special weather operation, dig engineering construction, etc. and shall conduct special supervision. In this phase of monitoring the tenders visited on site all consistently comply with the safety management

regulations and no major safety accidents occurred.

3. During road works construction, “Road work ahead, no passing” signs shall be set up at the entrance and exit of the road section in construction, and guidance for normal traffic shall be provided in the nearest distance. In principle, road works construction shall be conducted in the premise of not affecting the normal traffic of existing roads. Pay attention to passers-by in construction to prevent accident.

   Billboard shall be installed on the construction site to explain the Project content, construction time, to ask public understanding and forgiveness for the inconvenience due to construction, and indicate on the billboard contact person and complaints hotline, etc.

4. Reduce the impact of the Project on social environment by following the corresponding environmental planning in *Environmental Management Plan*.

5. In Project planning stage while performing plan optimization and comparison, pay as much attention as possible to the impact on local social and economic environment by the Project, and make this a key factor for plan optimization and comparison.

   To reduce housing demolition and resettlement quantity, the optimal design shall design different width for different road sections while basically maintaining the original right of way width, thus to minimize the impact on the socio-economy and people's lives. At the same time, use waste land and state land as much as possible to reduce farmland occupation.

   Strengthen basic data collection, make in-depth analysis on the status-quo and future development of local social economy, and make practicable Resettlement Action Plan based on the actual local conditions to ensure that the living standard of the affected persons will not reduce because of the Project construction.

   Implement the compensation standard and compensation mode for land acquisition, demolition and resettlement proposed in Resettlement Action Plan to reduce the impact by Project construction.

6. Avoid construction in rainy season as possible, take good drainage measures, and make preparation for temporary works like construction road, and construction house.

7. Educate the constructors on safety and health, increase precaution consciousness, and make early warning and early prevention of dangers to prevent unnecessary loss.

8. In Project design, implementation, follow-up management and operation, enforce strictly public supervision mechanisms and information disclosure mechanism to ensure the Project to achieve targets and social benefits.

   During Project preparation and Project design, perform social investigations and organize community public participation to solicit extensively public opinions on the Project; upon determination of red line for Project land acquisition, demolition and resettlement, publicize the physical quantity affected; the Project office shall set up special information dissemination channels and methods and shall publish regularly the advancement of Project implementation; in the process of Project

implementation, it is required to publicize on government information public platform the Project design plan, resettlement action plan, Environmental Assessment Report, and social assessment report, etc. in order to accept public supervision and ensure feedback channels unblocked.

10 Environmental Management and Monitoring

The implementation of the Project causes a certain impact on socio-economic and physical environment in the local area. Therefore, environmental management is strengthened during the construction and operation period, and series of pollution control measures are implemented effectively, thus receiving the combined benefits in the fields of economy, society and environment.

10.1 Objectives

The Project causes a certain impact on social ecological environment, physical environment, socio-economic environment and people's living quality. Necessary environmental management and monitoring plans need to be prepared during the construction and operation period so that effective environmental protection measures are taken in time to reduce or eliminate the adverse impacts.

The main objectives: to define environmental management roles and responsibilities; to prepare proper mitigation measures; to establish monitoring procedures; and to provide the adequate budget to ensure the effective implementation of environmental management plan.

10.2 Environmental Management Suggestions

Avoid the adverse impacts on the environment due to the project construction, improve environmental management during the construction period, ensure the implementation of “Three Simultaneousnesses" principle and environmental protection measures of the Project, and establish and improve relevant environmental management system.

10.3 Environmental Management Targets

Systematic and scientific environmental management plan is prepared so that the construction and operation of the infrastructure project for Qianfeng Industrial Park in World Bank loan funded Sichuan-Chongqing cooperation (Guang'an) demonstration area conforms to the basic guidelines of "three simultaneousnesses" principle, i.e. “simultaneous design, simultaneous construction and simultaneous hand-over acceptance”. The plan provides a basis for the systematic implementation of environmental protection measures and the relevant supervision of the local environmental protection department.

Environmental management plan is prepared to minimize the adverse environmental impacts caused by the proposed works, thus realizing the coordinating, sustainable and stable development of social, economic and environmental benefits of the project construction.

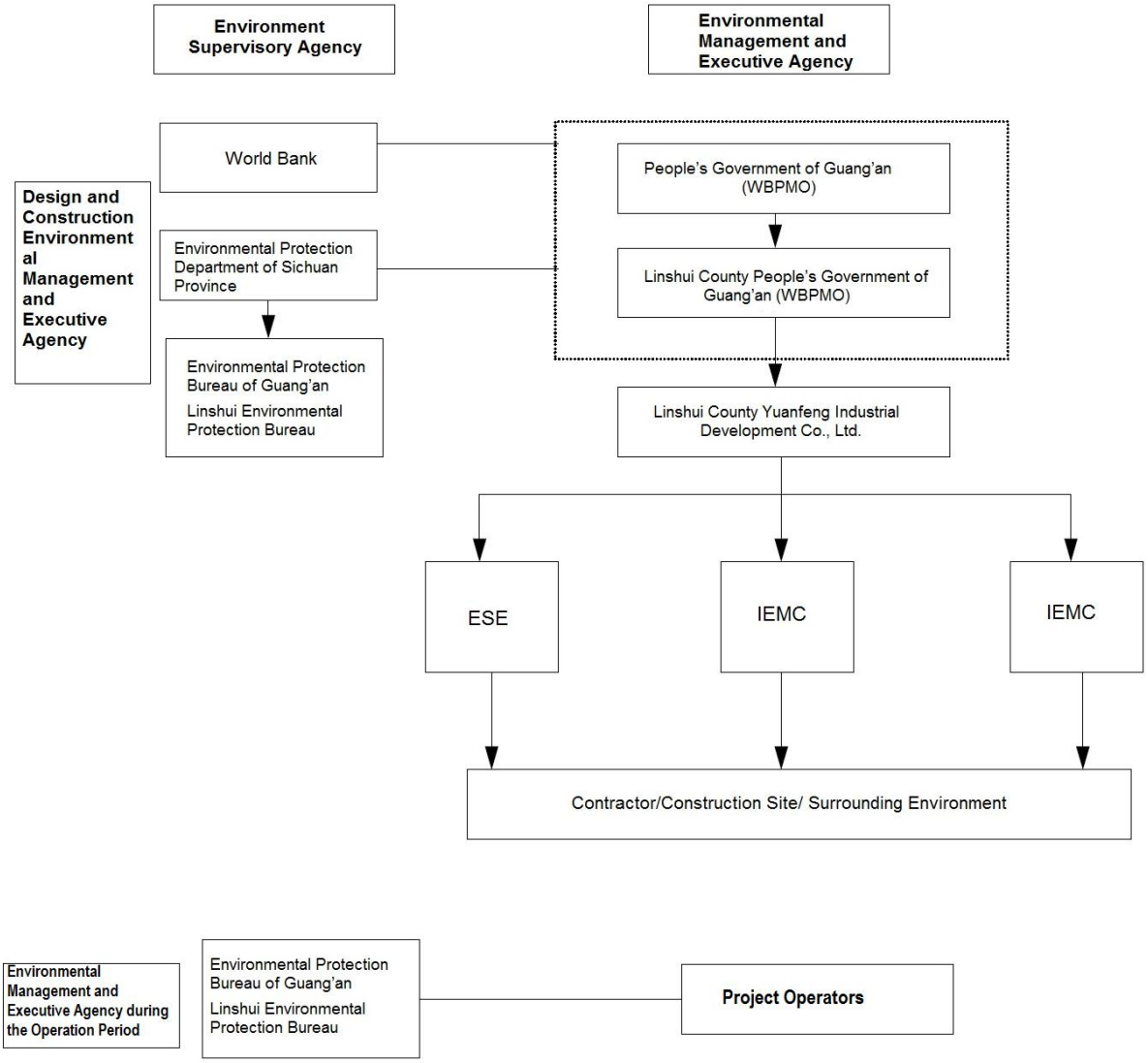
10.4 Environmental Management

10.4.1 Management organization and responsibilities

The implementation of this EMP requires the involvement of several agencies and institutions, each playing a different but vital role to ensure effective environmental management of the Project.

There are two groups of institutions involved in the process of environmental management: those responsible for organizing or implementing the EMP, and those that enforce the standards, laws and regulations relevant to the project, supervise the EMP and the overall environmental performance during the construction and operation period of the Project. Diagram of environmental

management and supervisory agency structure of the Project as shown in the following
figure.



10.4.2 Responsibilities of environmental management institutions

The main environmental management responsibilities of the respective environmental management institutions are shown in the table below:

Table 10.4.2-1 List of Environmental Management and Supervisory Responsibilities

SN	Agency/Unit	Responsibilities
1	Qianfeng District People's Government (WBPMO)	Take the overall responsibility for environmental management of the Project, involving the effective implementation, monitoring and supervision of mitigation measures; report the budget to World Bank and local environmental protection bureau. Ensure that the measures involved in EMP are included in the bid documents and construction contract; Carry out the supervision on the construction unit for

SN	Agency/Unit	Responsibilities
		the implementation of pollution prevention measures, and report any infringement to the construction unit; Make sure that the supervision performed by Environmental Protection Bureau is included in the bid documents and contracts signed by the supervision engineer; monitor and engage in the supervision of the Project; Entrust environmental monitoring institution to monitor the environment during the construction period; provide supports for environmental monitoring during the construction period; Organize trainings related to environment for Contractors and ESE
2	Guang'an Environmental Protection Bureau	Guang'an Environmental Protection Bureau is responsible for environmental management and monitoring within the scope of QETDZ. On behalf of Sichuan Environmental Protection Bureau, carry out monitoring and supervision on environmental protection during the construction and operation period. Investigate and deal with public complaints during the construction and operation period. Ensure "Three Simultaneous" and normal operation of environmental protection facilities.
3	Qianfeng District Xinhong Industrial Investment Co., Ltd.	Qianfeng District Xinhong Industrial Investment Co., Ltd. is responsible for the implementation of infrastructure project funded by World Bank, including procurement, construction management, the implementation and compliance of safeguard policy, monitoring and reporting, etc.
4	Project operators	Operation of the environmental facilities and environmental management, etc. during the operation period.
5	Environmental supervision engineer (ESE)	Verify and assess whether the construction design meets the requirements for EIA and EMP, in particular, environmental management on the construction site and required mitigation measures; Monitor contractors' environmental management on the construction site, and provide proper guidance; Examine the implementation of contractors' EMP, verify and confirm environmental monitoring procedures, parameters, monitoring sites, equipment and results; Report the implementation condition of EMP; Based on the implementation of EMP, verify invoices or expenses.
6	Contractors	Prepare detailed contractors' environmental protection plan, as a part of the contract (including construction land plan related to access roads to communities or commercial stores). Report new environmental issues or cultural relics discovered during the construction period to the supervision engineer. Perform the continuous public consultations during construction.
7	Project operators	Operation of the environmental facilities and environmental management, etc. during the operation period.
8	Independent	The IEMC, who is employed by the project owner, is

SN	Agency/Unit	Responsibilities
	environmental management consultant (IEMC)	independent of ESE and contractors. The IEMC is to assess the implementation of EMP during the construction period, to provide management suggestions and finally ensure that the Project satisfies the requirements for EMP.
9	Environmental quality monitoring consultant (EQMC)	The EQMC monitors the environment quality according to environment monitoring plan involved in EIA report. The project owner will engage an EQMC to implement the monitoring plan.

10.5 Environmental Supervision

10.5.1 Objectives, scope and stages

Environmental supervision is an important means to guarantee the effective implementation of EMP. The objective of environmental supervision is to perform the relevant obligations and to provide independent, fair, scientific and efficient services for the Project; to implement the environmental monitoring, to ensure that the Project conforms to national laws, regulations and policies, WB technical standards and specifications, approved design documents, bid documents and supervision and construction contract, the requirements for environmental protection and management in terms of design, construction and operation.

Based on the contract, each engineering supervision company shall entrust a professional ESE, who is responsible for the supervision on environmental protection performed by contractors by stages.

The scope of environmental supervision includes the construction area and densely populated areas of the Project. Environmental supervision is performed during the whole process, including: Construction preparation, construction and completion stages.

10.5.2 Environmental management contents

1. Environmental supervision before construction

ESE shall ensure the following tasks to be done before construction:

To assess pollution prevention control mechanism: Review treatment and disposal measures on discharged wastewater, wastes and solid wastes during construction, including the selection and feasibility of technology.

To review the contractor’s construction land plan and ensure that the following measures are included:

a) To ensure smooth traffic;

b) To minimize interference and other damages.

To review environmental protection clauses involved in the construction contract: The contractor shall meet all requirements for environmental protection as specified in the contract. During the construction period, the contractor is responsible for supervision, inspection and test work to minimize pollution.

2. Environmental supervision during the construction period

ESE shall perform the onsite inspection at different stages, for instance,

check whether the construction conforms to environmental protection clauses, or the clauses are changed without any permission. The monitoring is adopted to make sure whether the operation meets the requirements for environmental protection during the construction period and the works meets the environmental protection standards. In addition, effective implementation of these measures is ensured. Main contents include:

Monitoring transportation of surplus materials, transportation management, the construction plan on the access roads to communities or commercial stores, pedestrian safety measures, etc.

Performing the supervision on soil conservation measures; in addition, minimize water pollution during the construction period. The measures include:

a) Soil conservation;

b) Spoil disposal;

c) Implementation of temporary and long term erosion control measures;

d) Implementation of sediment reduction measures (sedimentation tank and sediment fence);

e) Ensuring that the designed runoff control measures are taken properly;

f) Normal operation of all wastewater treatment facilities.

Supervising production and domestic sewage: to check treatment and disposal schedule for production and domestic sewage source and wastewater, treatment procedures and final treatment plant; to examine and supervise whether treatment measures meet the allowable discharge standards.

Environmental supervision on air pollution: air pollution in the project area is mainly the waste gas from all vehicles and fugitive dust produced during the construction period. The strict implementation of fugitive dust control measures by the contractor is ensured.

Environmental supervision on noise: noise attenuating measures shall be taken in accordance with design parameters and allowable noise level.

Environmental supervision on solid waste treatment: Solid waste treatment shall satisfy local requirements; effective cleaning measures are taken to maintain a clean and tide construction site. ESE will monitor the spoil transportation, which is responsible by building garbage transportation authorities.

Environmental supervision on greening plan: vegetation protection measures, in particular, the implementation of measures on tree protection and transplantation and the greening plan.

Environmental supervision on safety and health: to ensure that adequate safety and health measures shall meet relevant rules and regulations.

3. Supervision at the completion stage

ESE shall perform monitoring and management on environmental restoration and all pollution prevention control equipment, including:

Perform the supervision on prepared completion documents;

Organize initial inspection;

Assist World Bank (Guang'an) PMO in organizing the completion acceptance of the works;

Prepare final report of environmental supervision of the project.

4. Environmental Management during Operation

Organization and implementation of environmental monitoring during operation

10.6 Environment Monitoring Plan

10.6.1 Objectives

The objectives of environmental monitoring plan include: To monitor surrounding environmental quality and pollution emission amount, and implementation of inspection measures, and to provide a basis for mitigation and corrective measures on environment.

10.6.2 Responsibilities of implementation

The project owner shall entrust the qualified environmental monitoring institution (for example, local environmental monitoring station) to perform environmental monitoring during the construction and operation period.

10.6.3 Environment monitoring plan

Based on characteristics of works and construction operation at each stage, the monitoring plan during the construction and operation period is listed in Table 10.6-1.

Table 10.6-1Construction Period and Implementation of Environmental Monitoring Schedule

Category	Items	Monitoring Plan in Each Stage	
		Construction Period	Operation Period
Acoustic environment	Monitoring location	The operation site with a large amount of operating equipment, sensitive area or unpaved road or empty ground near the sensitive area or environment	Youjianyuanzi, Group 4, Chuanlei Village; Yejiayuanzi, Group 5, Xinqiao Village; Luojiayuanzi, Group 1, Yongxin Village; Yujiaoyuanzi, Group 5, Suzhai Village; Daijiayuanzi, Group 5, Eli Village; Pujiayuanzi, Group 3, Eli Village; and Group 1 and 2, Jijian Village, etc.
	Factors to be monitored	Equivalent continuous sound level (L_{Aeq})	Equivalent continuous sound level (L_{Aeq})
	Monitoring frequency	Once/month	Once/quarter
Water environment	Monitoring location	Construction camp and construction site	The outlet of WWTP and its downstream
	Factors to be monitored	COD_{Cr}, BOD_5, SS and petroleum	pH,COD_{Cr},BOD_5,NH_3-N,TP

Category	Items	Monitoring Plan in Each Stage	
		Construction Period	Operation Period
	Monitoring frequency	Once/quarter	To conduct real-time monitoring at the outlet, and conduct a monitoring once a month at the downstream
Air quality	Monitoring location	The operation site with a large amount of operating equipment, the sensitive area or on unpaved roads or empty grounds near the sensitive environment	WWTP boundary and three monitoring locations in the downwind direction at the boundary
	Factors to be monitored	TSP, PM_{10}	H_2S,NH_3 and odor intensity
	Monitoring frequency	To perform random sampling during the peak construction period	One day/quarter
Water and soil conservation	Monitoring location	Subgrade excavation section, temporary soil storage yard of , of wastewater interceptor works, and landscape renovation area	road and auxiliary works area, wastewater interceptor works area, and landscape renovation area
	Monitoring Content	Disturbed surface area and the types and amount of water and soil loss; damaged vegetation area and degree; side slope condition; impact of water and soil loss on main works and the surrounding area; heap slope, heap stability and protective measures for temporary soil pile	Quality, integrity, and stability of subgrade protection works; survival rate of road greening vegetation and water and soil conservation effect; site clearing and leveling effect; clearing and leveling effect and protective condition of construction road surface; effect, survival rate and preserving rate of vegetation landscape
	Monitoring frequency	To monitor disturbed surface area once a month; once every three months for impact factor of water and soil loss; to perform the timely monitoring in case of rainstorm and strong wind, etc.	To take Vegetation measures for water and soil conservation; to conduct the monitoring on the growth once every three months during the recovery period of forest and grass; to perform the timely monitoring in case of rainstorm and strong wind.

10.6.4 Environmental monitoring report

1. Environment monitoring report during the construction period

The construction lasts about 48 months as performed according to the works contents at different stages. According to environmental management regulations of PRC and requirements of World Bank for business policy, the Owner shall prepare *Environmental Monitoring Report* and submit it to World Bank and Environmental Protection Bureau of Guang'an. The objective of the report is to assure environmental protection authorities that all environmental protection measures are implemented as required by the approved environmental monitoring plan in order to

eliminate the adverse environmental impacts of the project plan.

Environmental monitoring report includes:

a) Brief introductions to works progress;

b) The establishment and responsibilities of environmental management institutions;

c) Main construction contents and methods, environmental impacts caused and mitigation measures and the relevant implementation;

d) Environmental monitoring report;

e) Public complaints and resettling

According to construction management provisions, the contractor and ESE shall submit the periodic environmental report to the Owner during the construction period.

2. Environmental monitoring report during the operation period

After the proposed project is put into operation, World Bank Loan (Guang'an) PMO entrusts the qualified environmental monitoring station to undertake the environmental monitoring in accordance with the monitoring plan. In addition, annual environmental monitoring report is prepared, and its contents include: The establishment of the environmental management institution, operation status of the works, the implementation of environmental prevention measures as required by the environmental protection bureau, environmental monitoring (date, frequency, locations, methods, applicable standards, etc.), statistical analysis results of monitoring data and necessary follow-ups. The prepared environmental monitoring report shall be submitted to Environmental Protection Bureau of Guang'an and World Bank

10.7 Environmental protection training

1. Environmental protection technology and skill training

(1) In-service training for environmental management personnel

The objective of organizing in-service training for environmental management personnel is to strength environmental management during the construction and operation period, and to ensure the quality of environmental monitoring and effective environmental management, thus improving the quality of the whole works. After participating in position training, environmental management personnel can tell apart main environmental issues during the construction period, and have a better understanding of existing problems and deficiencies on environmental management, and report to the engineering environmental protection office (department) in time in order to facilitate to take necessary prevention and control measures as soon as possible. During the construction period, project management institution shall invite environmental protection experts or environmental management personnel with similar management experience to make the onsite explanation on environmental problems and relevant solutions.

(2) Construction responsible personnel and training for construction workers

Before the construction, for the bid winner, the systematic environmental professional knowledge training shall be organized for the responsible personnel and construction workers responsible for construction in order to avoid environmental damages due to misoperation during construction. For contract responsible personnel, the objective of training is to define the environmental protection responsibilities of the contractor; for construction workers, the objective is to ensure the proper construction operation during the construction period in order to avoid some construction behaviors, which have adverse impacts on the environment. The training is helpful for the project responsible personnel to understand their obligations in environmental protection needed to be assumed and possible consequences of the environmental damage; construction workers have a better understanding of the protection level and methods for environmental sensitive areas. Based on the actual situation of the Project, the training for construction workers only lasts one week.

(3) During the operation period, project management institution shall provide the personnel with the periodic trainings on environmental protection knowledge so as to identify possible environmental issues at respective posts and take necessary measures. Each personnel shall hold the idea of environmental protection.

2. Training methods and expenses

Table 10.7-1Environmental Protection Training Plan

SN	Training Objects	Training Contents	Organizer	Training number	Training Time	Location	Budget (CNY10,000)
1	Personnel from PMO and engineering environmental protection office (department)	Knowledge in environmental protection management	The Owner	2 persons	15 days	Guang'an	0.6
2	Personnel from PMO and engineering environmental protection office (department)	Visit similar domestic project site so as to learn the mature environmental management experience.	The Owner	2 persons	5 days	/	0.2
3	Personnel from PMO and engineering environmental protection office (department)	Acquire all-round knowledge in environmental protection and management and understand the contents of environmental impact report of the works.	The Owner	2 persons	15 days	Guang'an	0.3
4	Site responsible personnel from supervision unit and engineering	Knowledge in environmental supervision, the contents of environmental impact report of	The Owner and Supervision Unit	1 persons	15 days	Guang'an	0.3

SN	Training Objects	Training Contents	Organizer	Training number	Training Time	Location	Budget (CNY10,000)
	environmental supervisor	the works and environmental protection design documents related to the works					
6	Main technical leaders and construction responsible personnel of the Contractor	Knowledge in environmental protection and management	The Owner and the Contractor	3 persons	15 days	Guang'an	0.9
7	Construction workers	Knowledge in environmental protection of the works	The Owner and the Contractor	150 persons	5 days	Guang'an	7.5
Total				/	/	/	9.8

10.8 Completion and Acceptance Inspection

Environmental issues shall be fully considered in the project design. Appropriated works measures are taken to protect environment during the project operation period. According to the relevant regulations on the completion acceptance inspection of environmental protection facilities, the owner shall submit an application for the completion acceptance inspection of the works to Environmental Protection Bureau of Guang'an, prepare monitoring plan and perform the monitoring after approved by Environmental Protection Bureau.

Table 10.8-1 Execution Plan of Environmental Protection Measures

Content / Environment	Pollutants	Prevention and Control Measures	Execution Unit	Supervision Unit	Capital Source	Implementation Period
Ecology	Water and soil loss control	Apply dust cloth to cover temporary stacking site.	The Owner and the Contractor	Governmental departments	Included in the contractor's quotation	Construction Period
	Vegetation recovery	Land reclamation and replanting of trees and flowers in the temporary land.	The Owner and the Contractor	Governmental departments	Special investment for the works	Operation Period
Noise	Noise of construction machinery	Reasonably arrange construction time and strengthen management.	The Owner and the Contractor	Governmental departments	Included in the contractor's quotation	Construction Period
		Install temporary noise isolation screens.	Contractors	Governmental departments	Included in the contractor's quotation	
	Traffic noise	Reserve budgets for noise isolation measures taken.	The Owner and the Contractor	Governmental departments	Special investment for the works	Operation Period
Water pollutant	Construction muddy water and muddy wastewater from piers	Reuse the upper water upon preliminary sedimentation.	Contractors	Governmental departments	Included in the contractor's quotation	Construction Period

Content / Environment	Pollutants	Prevention and Control Measures	Execution Unit	Supervision Unit	Capital Source	Implementation Period
	drilling					
	Mechanical rinse water	Recycle the wastewater upon oil removal and sedimentation.	Contractors	Governmental departments	Included in the contractor's quotation	
	Domestic sewage	Use as farming fertilizer after preliminary treatment in the septic tank	Contractors	Governmental departments	Included in the contractor's quotation	
	Fecal sewage					
	Domestic sewage produced by working staff	Enter into the pipe network after the treatment in the septic tank.	Operators	Environmental protection authorities	Special investment for the works	Operation Period
Air pollutant	Demolition fugitive dust of buildings	Provide dust cloth and other sealing nets around the buildings.	The Owner and the Contractor	Governmental departments	Included in the contractor's quotation	Construction Period
	Fugitive dust	Provide dust cloth in the temporary storage yard in the prevention and control of dust, clear up the site.	The Owner and the Contractor	Governmental departments	Included in the contractor's quotation	
	Vehicle fugitive dust	Water for dust fall and provide the washing sites at in and out door for vehicles	The Owner and the Contractor	Governmental departments	Included in the contractor's quotation	
Solid waste	Spoils	Transport to Qianfeng Environmental Health Administration Office for timely treatment.	The Owner and the Contractor	Governmental departments	Included in the contractor's quotation	Construction Period
	Domestic waste	Deliver to environmental health departments for unified treatment.	Contractors	Governmental departments	/	
	Wastes scattered on the roads	Onsite recycling and timely collection	Operators	Environmental health departments	/	Operation Period
Environmental management and monitoring	/	Implement construction environmental supervision system, establish contract constraint mechanism, integrate relevant environmental protection measures into product quality management system and acceptance index system, strengthen the special supervision	Relevant qualified units entrusted by The Owner	Governmental departments	Special investment for the works	Construction Period

Content / Environment	Pollutants	Prevention and Control Measures	Execution Unit	Supervision Unit	Capital Source	Implementation Period
		on control measures for construction fugitive dust, noise and water and soil loss, etc., and publicize environmental protection laws and regulations.				
Environmental Monitoring	/	Environmental noise and air quality with the area	Relevant qualified units entrusted by The Owner	Environmental Protection Department of Guang'an	Special investment for the works	Construction Period Operation Period

11 Public Consultation and Information Disclosure

11.1 General

11.1.1 Objectives of Public Consultation

Public consultation is two-way communication between the project Owner, Environmental Assessment Working Group and the public. The objective is to provide the access for the public to fully understand project conditions via public consultation in order to gain public acceptance and improve environmental, economic and social benefits of the Project.

For development and construction of the Project, construction, completion and operation have positive or negative impacts on surrounding physical environment and social environment, thus directly or indirectly affecting living, working, studying, rest and entertainment of nearby residents. Local residents are direct or indirect beneficiaries or victims affected by the Project. Public consultation is helpful to avoid possible omission and negligence in EIA, thus providing comprehensive protection for physical and social environment. Their reasonable opinions and views are helpful to prepare complete and rational construction scheme of the Project and formulate feasible environmental protection measures, thus demonstrating better environmental, economic and social benefits of the Project.

Public consultation is helpful to let more people understand the significance of the proposed project and possible environmental issues in order to obtain understandings and supports from the public. It is also beneficial for the smooth implementation of the works. Furthermore, public consultation has a positive effect on improvement of environmental protection conscience and voluntary participation in environmental protection.

11.1.2 Principles of public consultation

Public consultation survey keeps to the principle of combining representativeness and randomness. Representativeness means that the respondents come from all walks of life in accordance with a certain proportion. Randomness means that the choice of respondents is characterized by statistically random sampling. The respondents are randomly selected from determined sampling population.

11.1.3 Survey scope and respondents

The survey scope of the public consultation mainly includes the areas along the Project. The respondents include personnel from local governments at all levels and relevant departments, entities or enterprises and government departments, staff from entities or enterprises, workers, teachers and students and self-employed workers directly affected by the construction. The selection of public representatives is characterized by favorable randomness and broad representativeness, taking gender, age, occupation and education background of the public into consideration.

11.1.4 Types and methods of public consultation

The construction will cause different levels of impacts on physical environment and social environment along the line. In order to obtain the attitude toward and

views of the public on the construction, the specific survey methods applicable to the public consultation are as follows:

1) Visit relevant departments and units along the Project in order to understand their opinions on environmental impacts of the Project and demands.

2) Convene the public consultation symposium; introduce the overview of the works, estimated environmental impact factors, strength and scope; consult the public for related comments and opinions on the construction project; and listen to their advice;

3) Give out public consultation questionnaires to the residents along the Project, and pay attention to representativeness and randomness.

4) Make announcements via the internet or newspaper and other media, and listen to public opinions as widely as possible.

5) Posting announcement is beneficial to make the public understand the works in time; in addition, it also facilitates to give opinions on the project construction and environmental protection for the public without any chance to fill the questionnaires.

11.2 The First Round of Public Consultation

The first round of public consultation involved website announcement, interview investigation and consulting local functional departments for opinions and suggestions on the Project. Through investigation, the assessment unit had a basic understanding of main concerns and attitudes of local residents and functional departments during the project construction and operation period.

1. Website announcement

After receiving the EIA task, the EIA institute publicized the EIA report on the portal website of Guang'an Development and Reform Commission (http://www.gasfgw.gov.cn/) for the first time on Apr. 22, 2014.

广安市发展和改革委员会

Guangan Municipal Development and Reform Commission

114年4月22日 星期二 网站首页 | 主要职能 | 领导介绍 | 政务服务 | 直属单位 | 资料交换 | 信息报送

利用世行贷款川渝合作（广安）示范区基础设施建设项目环境影响评价第一次公示

日期：2014年4月22日 作者：财贸外经科

一、项目名称及概要

项目名称：利用世行贷款川渝合作（广安）示范区基础设施建设项目

项目概要：本项目包括：

1、利用世行贷款川渝合作（广安）示范区邻水县工业园区基础设施建设项目，包含道路工程、截污干管工程、污水处理厂工程等子项目。

2、利用世行贷款川渝合作（广安）示范区前锋区工业园区基础设施建设项目，包含道路工程、芦溪河景观改造工程等子项目。

二、环境影响评价的工作程序和主要工作内容

1、工作程序

①建设单位委托有资质的环评机构；②第一次公示；③在环境质量现状调查以及项目工程分析的基础上，进行环境影响预测并编制初稿；④第二次公示；⑤公众意见调查；⑥编制环境影响报告书；⑦上报环境影响报告书及其他相关材料至环境保护主管部门审查、报批。

2、主要工作内容

①项目现场踏勘调查监测；②环境影响预测分析与评价；③提出环境保护对策措施及建议。

三、征求公众意见的主要事项

征求公众对环境保护方面的意见和建议，非环境保护方面的内容不在本次征求意见范围内。

四、公众参与主要方式

Figure 11.2-1 The First Round of Information Disclosure

B Interview investigation

During the site work, EIA workers visited local residents at random and provided them with basic information about the project construction and environmental impacts caused during the construction and operation period.Local residents had a certain understanding of the Project and supported the project construction. They expected that the earlier completion of the Project made it more convenient for the local residents in the future and improved the environmental quality in Qianfeng District. In addition, the public to be interviewed expected that land acquisition and house demolition shall conform to the relevant regulations; measures shall also be taken to prevent noise, water and soil loss and other environmental impacts produced by the roads.

Figure 11.2-2 Visit Local Residents

C Consult local functional departments for opinions

The EIA workers visited many administrative authorities in respect of planning, cultural relics and land resources etc., reported the relevant situation of the Project and listened to their opinions on environmental protection, water and soil conservation, soil resource protection, urban planning, cultural relic protection and animal and plant resources protection possibly involved in the project construction.

Local administrative departments at all levels would provide enormous supports for the project construction and expected that the railway construction was started as quickly as possible. As for their respective issues of concern, local administrative departments at all levels proposed specific opinions and suggestions in combination with local conditions:

Opinions from Planning Department: the construction is coordinated with urban planning, and the road construction keeps to the principle of convenient traffic and significant economic radiation driving effects. Wastewater interceptor construction shall comply with the terrain. During construction, the road to be occupied is minimized in order to avoid the long-term impacts on the traffic. The location of WWTP shall be consistent with the urban planning, and better services are provided for Qianfeng District.

Opinions from Department of Land and Resources: during the route selection, reduce the occupation of farmland, particularly basic farmland, establish compensation standard for the basic farmland occupied by the works, and realize “requisition-compensation balance” of basic farmland; reasonably construct the spoil area, occupy less farmland, combine the spoil area with land change and reclamation, eliminate the impact on the agricultural production caused by the project land occupation to the utmost extent; for the basic farmland to be occupied permanently, go through the approval formalities following relevant procedures by the Owner according to provisions under *Regulations on the Protection of Basic Farmland.*

Opinions from Cultural Relics Administrative Department: During the construction of the Project, in case of any buried cultural relics discovered by the Owner and Contractor, cultural relic protection shall be performed in accordance with the relevant provisions under *Law of the People's Republic of China on Protection of Cultural Relics.*

11.3 The Second Round of Public Participation

11.3.1 Survey method

A Website announcement

Upon completion of the EIA report, the environmental assessment unit publicized it on the portal website of Guang’an Development and Reform Commission (http://www.gasfgw.gov.cn/) for the second time on July 2, 2014.In addition, *Environmental Impact Assessment (EIA) Report of the Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang’an) Demonstration Area* is linked to the website to provide public relevant information about project overview, environmental impact, environmental protection measures and preliminary assessment conclusions etc.


广安市发展和改革委员会
Guangan Municipal Development and Reform Commission
114年4月22日 星期二 网站首页 | 主要职能 | 领导介绍 | 政务服务 | 直属单位 | 资料交换 | 信息报送

川渝合作（广安）示范区前锋区工业园区基础设施建设项目环境影响评价公众参与第二次公示

日期：2014年7月2日 作者：财贸外经科

一、建设项目情况简述
本项目位于广安市前锋区，为广安市前锋区工业园区基础设施建设项目，本工程包含3个子项目，分别为道路工程（新建广安前锋区工业园区内3条道路，分别为工业大道、滨河北路、滨河南路），截污干管工程、芦溪河景观改造工程。
表1 主要工程内容
序号 工程内容 工程规模
1道路工程 新建广安前锋区工业园区3条道路，道路总长约12km
2截污干管工程 沿滨河南北路新建2条截污干管，管长约1km，管径d400~d1500。
3芦溪河景观改造工程 对前锋区芦溪河上游段两岸的景观进行改造，改造长度约为1400m，宽度约为20~80m。
二、建设项目对环境可能造成的影响及主要防护措施
1、施工期
施工期的不利影响主要有：施工扬尘对环境空气质量的影响；施工车辆噪声和施工机械噪声对周围环境的影响；施工生产废水和生活污水对地表水的影响；施工占地对地表植被的破坏，施工弃渣产生的水土流失等。
主要防治措施：针对施工扬尘，合理安排施工时间，临近敏感点需设置施工围挡，施工期间采取洒水抑尘等措施；施工期噪声分为交通噪声和施工机械噪声，应加强管理，根据周围居民的作息时间，合理安排施工，尽量不在夜间进行高噪声设备的施工作业；施工生产废水经过隔油沉淀处理后排放、生活污水经化粪池预处理后交由当地农民用作农家肥或排入农灌沟渠，基本上对地表水的影响较小。施工结束后及时对取弃土场进行生态修复，恢复原有使用功能。

Figure 11.3-1 The Second Round of Information Disclosure


广安市发展和改革委员会
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114年4月22日 星期二 网站首页 | 主要职能 | 领导介绍 | 政务服务 | 直属单位 | 资料交换 | 信息报送

川渝合作（广安）示范区前锋区工业园区基础设施建设项目环境影响评价公众参与第二次公示

日期：2014年7月2日 作者：财贸外经科

一、建设项目情况简述
本项目位于广安市前锋区，为广安市前锋区工业园区基础设施建设项目，本工程包含3个子项目，分别为道路工程（新建广安前锋区工业园区内3条道路，分别为工业大道、滨河北路、滨河南路），截污干管工程、芦溪河景观改造工程。
表1 主要工程内容
五、建设单位、环评机构联系方式
建设单位：世行贷款广安项目办 联系人：倪女士 电话：0826-2332800 传真：0826-2332800 电子邮箱：6765161@qq.Com 通讯地址：广安市广安区兴安中街227号 邮编：638500
环评机构：中铁二院工程集团有限责任公司 联系人：魏女士 电话：028-87702825 传真：028-87672263 电子邮箱：teyghc@263.net.cn 通讯地址：四川省成都市通锦路3号环境工程研究院 邮编：610031
利用世行贷款川渝合作（广安）示范区前锋区工业园区基础设施建设项目
来源：市发展改革委

Figure 13.2-2 EIA Disclosure Link

The EIA Report is further modified upon this round of notification and consultation. The revised EIA Report was made public on the website of Development and Reform Commission of Guang'an City on August 22, 2014, and a public announcement was published on Guang'an Daily on August 23, as shown below.

Fig. 11.3-3 Newspaper Announcement of Full EA disclosure

广安日报

2014年8月 23 星期六

邓小平故里展现出焕然

王宁参观"两馆"缅怀

我市举行纪念邓小平同志诞辰110周年献花

侯晓春作重要讲话 全市机关单位干部职工组成30个方阵向邓小平铜像敬献花

广门乡妇联
积极维护妇女儿童合法权益

双鄢乡加强农村群体性聚餐活动监管

合作(广安)示范区邻水县工业园区基础设施建设项目
响评价公众参与第二次公示

利用世行贷款川渝合作(广安)示范区前锋区工业园区基础设施建设项目
环境影响评价公众参与第二次公示

监督管理委员会广安监管分局
人民共和国金额许可证》的公告

商务车转让

江淮瑞风七座商务汽车一辆欲转让，该车购于2013年7月，九成新，现行驶里程3万余公里，内置装配豪华。有意者，价格面议！

联系人：杨先生 13509492267

遗失启事

广安市发展和改革委员会

Guangan Municipal Development and Reform Commission

2014年8月28日 星期四 网站首页 | 主要职能 | 领导介绍 | 政务服务 | 直属单位 | 资料交换 | 信息报送

利用世行贷款川渝合作（广安）示范区前锋区工业园区基础设施建设项目环境影响评价公众参与第二次公示

日期：2014年8月22日 作者：财贸外经科

受世行贷款广安项目领导小组办公室委托，中铁二院工程集团有限责任公司正开展“利用世行贷款川渝合作（广安）示范区前锋区工业园区基础设施建设项目环境影响评价”工作，现依据《环境影响评价公众参与暂行办法》对本项目进行公示，并征求公众意见。

1、查阅公示方式与期限：公众可登陆广安市发展改革委员会门户网站（http://www.gasfgw.gov.cn/）查询本项目相关信息；或于广安市前锋区发改局查询报告书文本。

同时，自本公示公布之日起11个工作日，公众可通过电话、电子邮件、信函、传真等方式向建设单位或环评机构提出对项目环境保护方面意见和建议。

2、征求意见的范围及主要事项：本公示主要征求公众对项目环境保护方面意见，非环境保护方面的内容不属本次征求意见范围内。

3、联系方式：

建设单位：世行贷款广安项目办 联系人：倪女士 电话：0826-2332800 传真：0826-2332800 电子邮箱：6765161@qq.Com 通讯地址：广安市广安区兴安中街227号 邮编：638500

环评机构：中铁二院工程集团有限责任公司 联系人：魏女士 电话：028-87702825 传真：028-87672263 电子邮箱：teyghc@263.net.cn 通讯地址：四川省成都市通锦路3号环境工程研究院 邮编：610031

查看报告书请点击以下链接：

环境影响报告书

环境影响报告书

来源：市发展改革委

Fig. 11.3-4 Full EA Available at website of Guang’an DRC

B Posting announcements

During EIA, *Public Consultation Announcement for Environmental Impact Assessment (EIA) of the Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang’an) Demonstration Area* is posted in the areas involved.The announcement contains project overview, environmental impact, proposed counter measures and the contact information of the assessment unit etc.Posting announcement help the public understand the works; in addition, it also facilitates public failed to fill the questionnaires to give opinions on the project construction and environmental protection.

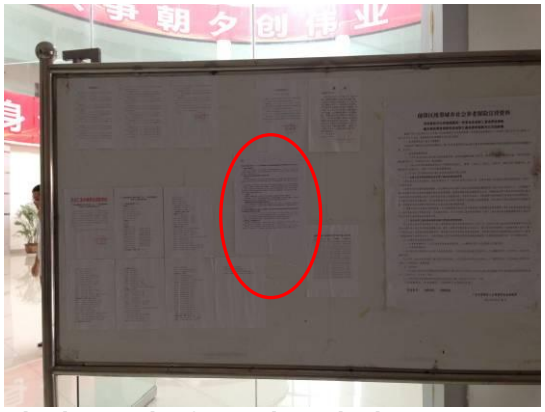



Figure 11.3.1-1 EIA Public Consultation and Information Disclosure

C Interviews and Public Meetings

During Project survey, selected and focused public meetings are held along the Project, including symposium of residents of Xinqiao Township at Xinqiao Township Government's meeting room, symposium of residents of Qianfeng Town at Qianfeng Town Government's meeting room.The public opinions from different villages and towns were adopted so as to provide references for Project design, construction and operation and the implementation of EIA.In the symposium, the assessment unit first introduces the Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area, then explains in detailed the positive impacts such as environmental improvement and convenient traffic, etc. due to the project construction, and negative impacts such as land requisition and demolition, water and soil loss, impacts on landscapes, ecological destruction, traffic block, noise, air and wastewater, etc. due to the project construction and operation, and proposed environmental protection measures; finally the assessment unit explains and answers some issues and concerned questions proposed by the public.Through symposium the assessment unit and the public make adequate and effective communications and exchanged opinions.

(1) Symposium of Xinqiao Township

Public attending the symposium are mainly villagers of involved villages in Xinqiao Township like Chunlei Village, Jingwan Village, Gaofeng Village, and Yongxing Village.The participants are aged between 40 and 60 years old, mostly having junior or high school diploma.The participants concern mostly the road direction and orientation and all express supporting the project construction after being explained in detail by the environmental assessment personnel; they think the project will facilitate traffic and the construction of South and North Binhe Road will provide a good place for leisure, and the construction of wastewater interceptors along the South and North Binhe Road will improve the water quality of Luxi River and beautify local environment.Meanwhile residents hope strengthen landscaping and perform civilized construction.

(2) Symposium of Qianfeng Town

Public attending the symposium are mainly villagers of involved villages in Qianfeng Town like Jijian Village, Longzhen Village, Qianhong Village.The participants are aged between 40 and 70 years old, mostly having junior or high school diploma. In the symposium, EIA personnel introduce in detail the Project profile, the possible impacts and solutions; residents all express supporting the Project construction after the introduction.They think road construction will improve traffic, landscape renovation works will provide a good place for leisure and exercise, and beautifying environment will increase the well-being rating of their lives, villagers are satisfied with the Project construction.Meanwhile, villagers attending the symposium put forward the following opinions: require civilized construction, arrange rationally construction time, and take dust fall measures like watering in construction to prevent dust pollution in construction as possible.

Figure 11.3.1-2 Public Consultation Symposium in Qianfeng District

D Public opinion questionnaires

Upon the publication of the questionnaire (abridged edition) on the newspapers and internet, the assessment unit gave out public consultation questionnaires to the public and units directly or indirectly affected along the Project. A total of 270 questionnaires were handed out to local residents and 260 of them were recovered, with recovering ratio of 96.2% (see appendix for statistics for basic information about the interviewees); A total of 7 questionnaires were handed out to the units and 7 of them were recovered, with recovering ratio of 100.0%.See the figure below for details of public opinion questionnaires.

During the process of giving out the questionnaires, the assessment unit introduced the project overview to the public and made detailed explanations on the necessity of the project construction, the positive impacts on local economic development and traffic, negative impacts (such as land acquisition and demolition, traffic block, noise and wastewater pollution) and proposed environmental protection measures; the assessment unit made the explanations on some issues of concern proposed by the public.

利用世行贷款川渝合作（广安）示范区前锋区工业园区基础设施建设项目公众意见调查问卷表（团体）

单位名称：

填表人		联系电话	
单位地址			

一、建设项目情况简述

本项目位于广安市前锋区，为广安市前锋区工业园区基础设施建设项目，本工程包含 3 个子项目，分别为道路工程（新建广安前锋区工业园区内 3 条道路，分别为工业大道、滨河北路、滨河南路），沿滨河南北路截污干管、产溪河景观改造工程。

二、建设项目对环境可能造成的影响及主要防护措施

1、施工期

施工期的不利影响主要有：施工扬尘对环境空气质量的影响；施工车辆噪声和施工机械噪声对周围环境的影响；施工生产废水和生活污水对地表水的影响；施工占地对地表植被的破坏，施工弃渣产生的水土流失等。

主要防治措施：针对施工扬尘，合理安排施工时间，临近敏感点需设置施工围挡，施工期间采取洒水抑尘等措施；施工期噪声分为交通噪声和施工机械噪声，应加强管理，根据周围居民的作息时间，合理安排施工，尽量不在夜间进行高噪声设备的施工作业，施工生产废水经过隔油沉淀处理后排放，生活污水经化粪池预处理后交由当地农民用作农家肥或排入农灌沟渠，基本上对地表水的影响较小，施工结束后及时对取弃土场进行生态修复，恢复原有使用功能。

2、运营期

运营期的不利影响主要有：汽车尾气对大气环境的影响；道路噪声对周边居民区的影响等。

主要防治措施：针对大气应对污染源采取控制措施，加强道路两侧绿化，对道路噪声的影响，应合理规划布局同时加强对机动车马活、行驶速度的管理，从源头上减少出现噪声扰民情况的发生。

现征求项目沿线公众对本项目实施中环境保护方面的意见，请在同意的选项上画“√”，如果您有其他意见请写在下面空白处或另附页。

1、贵单位是通过何种渠道了解本项目的？ A、网络 B、电视 C、报纸 D、专门宣传资料 E、听说

2、贵单位对本项目的建设持何种态度？ A、支持 B、无所谓 C、不支持

如果您选择不支持本项目，请说明主要原因：

3、贵单位认为本项目建设的正面影响主要体现在哪些方面？

A、满足城市规划需求 B、促进经济旅游开发 C、增加就业机会 D、改善交通条件 E、其他

4、贵单位认为本项目建设施工期影响主要体现在哪些方面？

A.机械噪声 B. 施工扬尘 C. 水土流失 D. 施工占用土地 E. 施工车辆造成现有道路拥挤 F. 增加工作机会 G.外来施工人员增加，带来安全问题 H、其他

5、贵单位认为本项目建设在运营期的主要影响是：

A.汽车尾气排放 B. 噪声污染 C.固体废物影响 D.地表水污染

7、对于本项目施工及运营期造成的影响，贵单位所持的态度是？

A、可谅解 B、可谅解但须有所减缓措施 C、不表态

7、如果本项目的建设对您的居住环境有一定的影响，贵单位希望采取何种措施？

A、采取治理措施 B、优化工程方案 C、经济补偿或搬迁 D、合理规划布局 E、种植绿化带 F、其他

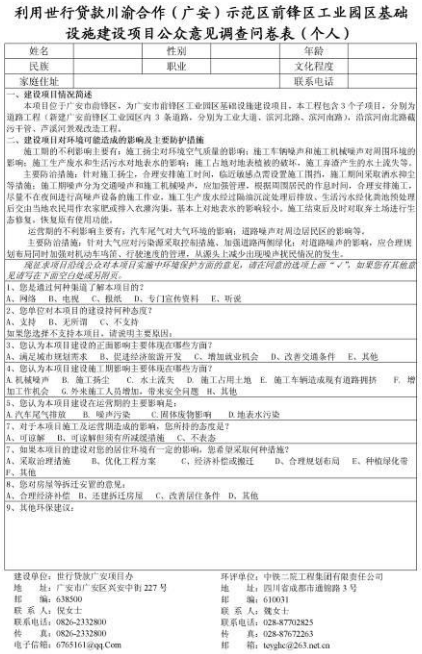
8、贵单位对房屋等拆迁安置的意见：

A、合理经济补偿 B、还建拆迁房屋 C、改善居住条件 D、其他

9、其他环保建议：

建设单位：世行贷款广安项目办
地　　址：广安市广安区兴安中街 227 号
邮　　编：638500
联 系 人：倪女士
联系电话：0826-2332800
传　　真：0826-2332800
电子信箱：6765161@qq.com

环评单位：中铁二院工程集团有限责任公司
地　　址：四川省成都市通锦路 3 号
邮　　编：610031
联 系 人：魏女士
联系电话：028-87702825
传　　真：028-87672263
邮　　箱：teyghc@263.net.cn



利用世行贷款川渝合作（广安）示范区前锋区工业园区基础设施建设项目公众意见调查问卷表（个人）

姓名		性别		年龄	
民族		职业		文化程度	
家庭住址				联系电话	

一、建设项目情况简述

本项目位于广安市前锋区，为广安市前锋区工业园区基础设施建设项目，本工程包含 3 个子项目，分别为道路工程（新建广安前锋区工业园区内 3 条道路，分别为工业大道、滨河北路、滨河南路），沿滨河南北路截污干管、产溪河景观改造工程。

二、建设项目对环境可能造成的影响及主要防护措施

施工期的不利影响主要有：施工扬尘对环境空气质量的影响；施工车辆噪声和施工机械噪声对周围环境的影响；施工生产废水和生活污水对地表水的影响；施工占地对地表植被的破坏，施工弃渣产生的水土流失等。

主要防治措施：针对施工扬尘，合理安排施工时间，临近敏感点需设置施工围挡，施工期间采取洒水抑尘等措施；施工期噪声分为交通噪声和施工机械噪声，应加强管理，根据周围居民的作息时间，合理安排施工，尽量不在夜间进行高噪声设备的施工作业，施工生产废水经过隔油沉淀处理后排放，生活污水经化粪池预处理后交由当地农民用作农家肥或排入农灌沟渠，基本上对地表水的影响较小，施工结束后及时对取弃土场进行生态修复，恢复原有使用功能。

运营期的不利影响主要有：汽车尾气对大气环境的影响；道路噪声对周边居民区的影响等。

主要防治措施：针对大气应对污染源采取控制措施，加强道路两侧绿化，对道路噪声的影响，应合理规划布局同时加强对机动车马活、行驶速度的管理，从源头上减少出现噪声扰民情况的发生。

现征求项目沿线公众对本项目实施中环境保护方面的意见，请在同意的选项上画“√”，如果您有其他意见请写在下面空白处或另附页。

1、您是通过何种渠道了解本项目的？

A、网络 B、电视 C、报纸 D、专门宣传资料 E、听说

2、您单位对本项目的建设持何种态度？

A、支持 B、无所谓 C、不支持

如果您选择不支持本项目，请说明主要原因：

3、您认为本项目建设的正面影响主要体现在哪些方面？

A、满足城市规划需求 B、促进经济旅游开发 C、增加就业机会 D、改善交通条件 E、其他

4、您认为本项目建设施工期影响主要体现在哪些方面？

A.机械噪声 B. 施工扬尘 C. 水土流失 D. 施工占用土地 E. 施工车辆造成现有道路拥挤 F. 增加工作机会 G.外来施工人员增加，带来安全问题 H、其他

5、您认为本项目建设在运营期的主要影响是：

A.汽车尾气排放 B. 噪声污染 C.固体废物影响 D.地表水污染

7、对于本项目施工及运营期造成的影响，您所持的态度是？

A、可谅解 B、可谅解但须有所减缓措施 C、不表态

7、如果本项目的建设对您的居住环境有一定的影响，您希望采取何种措施？

A、采取治理措施 B、优化工程方案 C、经济补偿或搬迁 D、合理规划布局 E、种植绿化带 F、其他

8、您对房屋等拆迁安置的意见。

A、合理经济补偿 B、还建拆迁房屋 C、改善居住条件 D、其他

9、其他环保建议：

建设单位：世行贷款广安项目办
地　　址：广安市广安区兴安中街 227 号
邮　　编：638500
联 系 人：倪女士
联系电话：0826-2332800
传　　真：0826-2332800
电子信箱：6765161@qq.Com

环评单位：中铁二院工程集团有限责任公司
地　　址：四川省成都市通锦路 3 号
邮　　编：610031
联 系 人：魏女士
联系电话：028-87702825
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邮　　箱：teyghc@263.net.cn

Figure 11.3.1-3 Sampling Tables of Public Consultation Questionnaires

11.3.2 Summary of public consultation

1. Investigation and statistics of opinions from the units

(1) Investigation of the units

The investigation included the opinions from seven units or organizations. See table below for the statistics of the investigated units.

Table 11.3.2-1 Statistics of Respondents from Public Participation Units

SN	Description	Contact person	Contact information
1	Village committee of Chunlei Village, Xinqiao Township	Mr/Mrs Zhou	1598262****
2	Village committee of Xinqiao Village, Xinqiao Township, Qianfeng District, Guang'an City	Mr/Mrs Tian	1589239****
3	Village Committee of Jingwan Village	Mr/Mrs Zhou	1592826****
4	Yongxin Village of Xinqiao Township, Qianfeng District, Guang'an City	Mr/Mrs Chen	1878266****

5	Village committee of Gaofeng Village, Xinqiao Township	Mr/Mrs Hu	1354849****
6	Village Committee of Qianhong Village	Mr/Mrs Lan	1590843****
7	Village Committee of Longzhen Village, Longzhen Town, Qianfeng District	Mr/Mrs Zhang	1388262****

(2) Main opinions from the investigated units

For seven investigated units or organizations, they would support the project construction. The investigated units or organizations expected that the construction would be performed as soon as possible and obtained understanding and support on the environmental issues, such as fugitive dust, noise. Furthermore, the following requirements and suggestions were proposed:

- Pay attention to environmental health during construction; perform safety and civilized construction; and reduce environmental pollution (such as waste) produced by the construction.
- Reasonably arrange construction schedule and site arrangement, and reduce the impact of noise viberation during the construction and operation period.

2. Investigation and statistics of opinions from the residents

(1) Conditions of the respondents

See Table 11.3.2-2 for the statistics of conditions of the respondents, and see appendix for the statistics of basic information about the respondents.

Table 11.3.2-2 Statistics for Respondents Involved in Public Consultation

Item	Age					Education background				Ethnicity		
	Under 20	21~40	41~60	Above 61	Fill in no information	Junior school diploma or below	Senior high school and vocational school diploma	College diploma or above	Fill in no information	Han	Others	Fill in no information
Percent (%)	0.38	19.62	55.00	21.15	3.85	79.62	11.15	1.92	7.31	95.00	0.00	5.00

Item	Gender			Occupation										
	Male	Female	Fill in no information	Farmer	Unemployed person	Worker	Teacher	Student	Civil servant	Freelancer	Clerk	Retiree	Medical personnel	Fill in no information
Percent (%)	78.46	18.08	3.46	74.23	5.77	8.46	0.00	0.00	0.00	2.31	0.77	0.00	0.77	7.69

It can be seen from the above table that copies of questionnaires to be given out are proportional to the number of the affected residents along the line. Age structure, occupation, educational background, etc. of the respondents are characterized by favorable representativeness and rationality.

(2) Public consultation survey and analysis

See Table 11.3.2-3 for the specific survey results.

Table 11.3.2-3 Statistics for Public Consultation Questionnaires Results

SN	Contents	Opinions	Percent (%)
1	Through which channels do you know the Project?	A. Network	21.92
		B. TV	7.31
		C. Newspaper	3.46
		D. Special publicity materials	51.54
		E. Learning from others	24.23
2	What is your attitude toward the project construction?	A. Support	92.69
		B. Do not care	7.31
		C. Oppose	0
3	What do you think of the major positive impacts of the project construction?	A. Satisfy the requirements for urban planning	53.85
		B. Promote economic and tourism development	41.54
		C. Increase the employment	16.92
		D. Improve traffic conditions	18.46
		E. Others	2.69
4	What do you think of the major impacts during the construction period?	A. Mechanical noise	61.54
		B. Construction fugitive dust	38.85
		C. Water and soil loss	17.31
		D. Land occupation by construction	5.77
		E. Congested roads caused by construction vehicles	5.38
		F. Increase the employment	3.46
		G. Security problems to be caused with migrant construction workers increased	6.92
		H. Others	1.15
5	What do you think of the major impacts during the operation period?	A. Automobile exhaust gas emission	31.92
		B. Noise pollution	73.08
		C. Impacts of Solid Wastes	3.46
		D. Surface water pollution	12.69
6	What is your attitude toward the impacts caused during the construction and operation period?	A. Excusable	40.77
		b. Excusable and mitigation measures to be taken	58.08
		C. No comment	1.15
7	If the project construction had a certain impact on your living environment, what measures are taken?	A. Take treatment measures	33.08
		B. Optimize the project scheme	13.85
		C. Economic compensation or relocation	60.00

SN	Contents	Opinions	Percent (%)
		D. Reasonably plan the layout	21.54
		E. Establish the green belt	4.23
		E. Others	0.00
8	What is your opinion on house demolition and relocation?	A. Reasonable economic compensation	35.77
		B. Compensation building for demolished houses	69.62
		C. Improve the living condition	16.92
		E. Others	0.00

A total of 270 questionnaires were handed out to local residents and 260 of them were recovered. The results show that 92.69% respondents hold supportive, instead of oppositional attitudes toward the Project. Furthermore, 7.31% respondents do not care.

The respondents thought the implementation of Project met the requirements for the urban planning, and it was conducive to improving economic and tourism development, increasing the employment, improving traffic conditions, and providing convenience for production and life. Furthermore, series of measures were expected to be taken in order to reduce the environmental impacts, such as treatment measures taken, optimization of the project scheme, economic compensation or relocation. The residents would provide enormous supports for the construction and expected that the construction can be started as quickly as possible.

11.4 Implementation of Public Opinions

EIA report objectively reflected the public opinions, which were reported to the design department in time so as to provide design guidance, optimize the design scheme and reduce the impact of the works. It was recommended that the Owner shall closely cooperate with local governments, take full account of opinions and demands, and analyze their rationality and possibility of solving the problems so as to reasonably adopt the public opinions. See the table below for the implementation of the public opinions at different stages.

Table 11.4 Table of Implementation of the Public Opinions

the Public Opinions	Stages	Units	Implementation Condition
Infrastructure project for Qianfeng Industrial Park in World Bank Loan funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area was taken as a popular-support project, the project construction had prominent significance so that the Project shall be carried out as soon as possible.	Design and construction stages	The assessment unit, Designer, Owner and Contractor	The EIA unit, Designer and Owner are accelerating the first-phase preparations. So far, the feasibility study report and EIA report are prepared. It is suggested that the next phase of work would be conducted by the Owner as soon as possible, so that the Project will be commenced and completed quickly in order to solve the problem of heavy traffic in urban areas.

the Public Opinions	Stages	Units	Implementation Condition
The advanced construction method was adopted in order to minimize the impact of fugitive dust, noise and vibration, etc.	Design and construction stages	The assessment unit, Designer, Owner and Contractor	Reasonable operation time was selected, low noise and vibration equipment and construction methods were adopted, noise attenuating measures taken; if the Construction was performed near the houses with worse building structures, low vibration equipment would be adopted, or the vibration operation avoided in order to reduce the impacts on surface structures; ground and muck car flushed, spoils covered, and construction barriers established.
The effective measures were adopted to minimize the noise interference during the operation period.	Design and construction stages	The assessment unit, Designer, Owner and Contractor	Asphalt pavement was designed and the green belts were constructed on both road sides to effectively reduce the noise impacts of the road.
The road landscape design management was strengthened to create a good urban living condition.	Design and construction stages	The assessment unit, Designer, Owner and Contractor	Landscape design and green coverage was in accordance with the local customs and culture and landscape characteristics of Qianfeng District.
Series problems, such as traffic block and inconvenient traffic, were properly resolved.	Design and construction stages	The assessment unit, Designer, Owner and Contractor	The Owner and Contractor shall reasonably make construction organization plan. If some roads were closed, transportation of neighboring residents shall be taken into consideration, and reasonable traffic organization scheme was formulated.

Through public consultation, the assessment unit knew the public's attitudes to and understanding of the Project, and the information was reported to the Designer and Owner. During the construction and operation period, the Owner shall strengthen the commutations with the public, and reasonable environmental requests proposed by the public shall be satisfied in time.

11.5 Summary of Public Consultation

The public opinions were asked in the report via network publicity, symposium and public consultation questionnaires.

A total of 7 questionnaires were handed out to the units and 7 of them were recovered, with recovering ratio of 100%.The investigated units or organizations would support the project construction.

A total of 270 questionnaires were handed out to local residents and 260 of them were recovered, with recovering ratio of 96.2%.For the individuals to be investigated, 92.69% respondents held supportive, instead of oppositional attitudes toward the Project. Furthermore, 7.31% respondents did not care.

The statistical results showed that the public had a certain understanding of the project via network, TV, newspaper, interview with the respondents by the environmental assessment personnel, etc. In general, the public showed their support for the Project construction along the line. They thought that infrastructure project for Qianfeng Industrial Park in World Bank Loan funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area was of great significance in improving the transportation and environment in Qianfeng. The public thought the environmental impacts mainly included noise, solid wastes and air pollution and effective treatment measures shall be taken. In the report, Series of measures were taken, such as construction of green belt and uniform collection and disposal of solid wastes, thus effectively reducing the impacts of

noise, air pollution and solid waste on the environment.

12 Induced and Cumulative Environmental Impact Assessment

The infrastructure construction in the Project will promote the process of urbanization and industrialization and the EIA results show that the degree and scope of direction impact from project activities are limited while the induced and cumulative environmental impacts are the main challenge of the Project. Without reasonable planning and implementation, fast urbanization and industrialization, the surrounding environment quality will be adversely affected and local communities will suffer long term influence. In general, the induced and cumulative impacts are beyond the scope of direct impact of a project. The Project will indirectly facilitate the urban expansion and industrial development, which is one of the reasons to study said induced and cumulative impacts in this assessment. However, different from the past, present development activities may be superimposed with possible development activities in the future, producing cumulative environmental impact.

According to the project design, the phased EIA tasks during the project preparation include preliminarily screening and assessing the cumulative environmental impact and preparing the terms of reference for detailed assessment in the next stage. And during the project implementation, detailed assessment on cumulative environmental impact will be carried out with technical assistance.

12.1 Assessment Scope and Period

1 Assessment scope

This assessment covers the whole Qianfeng Industrial Park and the planned urban area of Qianfeng District, in accordance with the *Overall Plan of Qianfeng Industrial Park of Guang'an District, Guang'an City (2011-2020)* (November, 2011). By 2020, the planned area will cover Danwan Village, Xinqiao Village, Lujian Village, Houqiao Village of Xinqiao Township to the south, Xinqiao Energy & Chemical Industry Concentration Area to the west, Yanshi Village, Lianmeng Village, Qianfeng Village, Longtang Village of Qianfeng Town to the east, Daya Village, Lishi Village, and Suoluo sub-district office of Daishi Town to the north, with an total area of 23.86km^2.

According to the *Regulatory Plan of Qianfeng New City of Guang'an (2013-2030)* under preparation, the planned new urban area of Qianfeng District covers Wuliu Avenue to the east, West Ring Road to the west, Xiaoliangcheng Road to the north and Xinqiao ETDZ and railway yards road to the south. By 2030, the construction area is planned to be reduced from 23.86km^2 that is planned for 2020 to 16.49km^2.

2 Assessment period

In the principle of considering the past, current and future foreseeable activities, the cumulative environmental impact assessment is divided into the following periods:

1 Emphasize on the review of development and operation activities in Qianfeng old town area and ETDZ of Qianfeng District occurred before this assessment stage (April 2014);

2 Analyze the future activities (2014-2020) associated with the Project

which will possibly occur in Qianfeng Light Textile and Supporting Industrial Park and the north area of the Electromechanical Machining and Supporting Industrial Park.

12.2 Review and Status Analysis of Constructed Area

12.2.1 Overview of constructed area in Qianfeng District

Qianfeng District is located in the southeast of Guang'an City, it boundaries Qujiang River to the west, adjoins Huaying Mountain to the east, connects Huaying city to the south and reaches Quxian County of Dazhou City to the north. It covers 505.77km^2, with east-west width about 38km, and south-north width about 26km.On February 22, 2013, approved by the State Council, Qianfeng District of Guang'an City was established; it governs one sub-district, seven towns and five townships. Located in the southeast of Qianfeng District, Qianfeng Industrial Park was established in 2006. The Park is focused on the development of auto parts matching, electronics, and textile and clothing industries, targeted at forming electromechanical industry cluster to serve as the pillar industry cluster of the Industrial Park.By April 2014, the built up area of the county downtown covers 2.65 km^2, with a resident population of 170,000.

By April 2014, the built up area of the urban area of Qianfeng County covers 6.15km^2, with a resident population of 170,000.Currently, farmland, woodland, town and village land as well as land for mining and industry and garden plot are mainly used in Qianfeng District. Table 12.2.1-1 gives a detailed statistics of land utilization status.

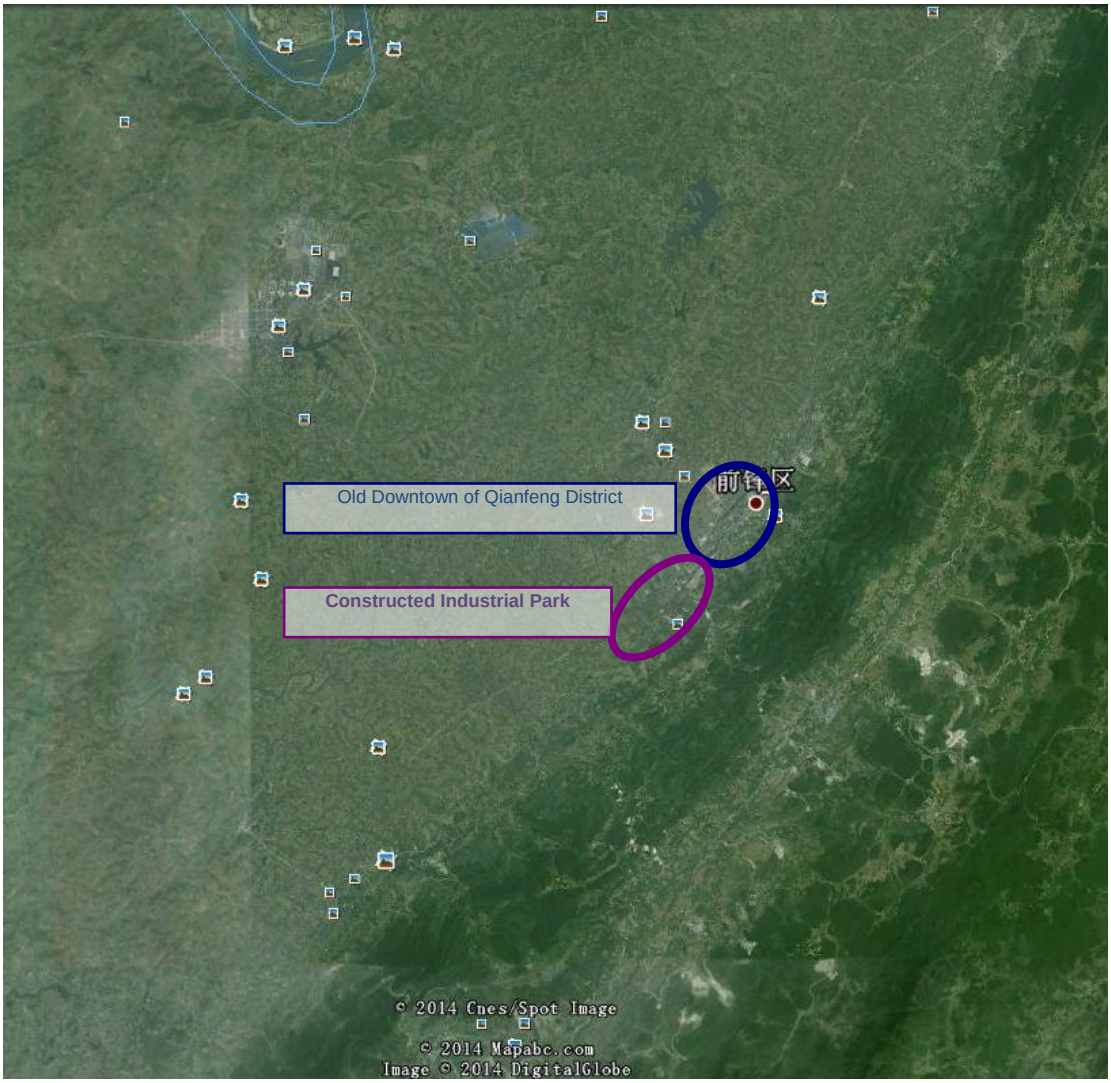


Figure 12.2.1-1 Status quo of Qianfeng District

Table 12.2.1-1 Land Utilization Status

SN	Land Category		Area (ha.)	Percentage (%)
1	Residential land		80.78	13.13%
2	Land for public management and service facilities		10.72	1.74%
	Including	Administrative land	1.25	0.20%
		Land for education and scientific research	8.22	1.34%
		Land for primary school and middle school	8.22	1.34%
		Land for medical treatment and public health	1.25	0.20%
3	Land for commercial services		10.00	1.63%
	Including	Commercial land	8.88	1.44%
		Land for business affairs	0.00	0.00%

SN	Land Category		Area (ha.)	Percentage (%)
		Land for utilities and sales network	1.12	0.18%
4	Industrial land		244.70	39.77%
5	Land for logistics and warehouse		10.21	1.66%
	Including	Land for Class I logistics and warehouse	6.37	1.04%
		Land for Class III logistics and warehouse	3.84	0.62%
6	Land for road and traffic facilities		60.24	9.79%
	Including	Land for municipal roads	59.33	9.64%
		Land for traffic hub	0.91	0.15%
7	Land for utilities		1.74	0.28%
	Including	Land for supply	1.74	0.28%
		Land for environmental facilities	0.00	0.00%
8	Land for green areas and squares		16.30	2.65%
	Including	Protective green area	15.18	2.47%
		Land for squares	1.12	0.18%
Total			615.26	/

3 Settled Enterprise overview

Qianfeng Industrial Park is located in the south of Qianfeng District; currently there are 29 enterprises settled, these mainly are engaged in automobile, motorcycle parts processing, textiles, clothing, etc.

Table 12.2.1-1 Statistic of Industrial Enterprise in the Industrial Park

SN	Enterprise	Production scale and type	Wastewater quantity (10000t/a)	COD(t/a)	Ammonia nitrogen (t/a)	Treatment level of wastewater
1	Guang'an Yongfan Metal Products Co., Ltd.	Automobile, motorcycle parts processing	0.18	0.28	0.02	Up to standard
2	Sichuan Huasheng Explosionproof Diesel Engine Manufacturing Co., Ltd.	Huasheng machinery	0.12	0.12	0.018	Up to standard
3	Sichuan Ai Ruishun Steel Structure Co., Ltd.	Steel structure processing	0.18	0.28	0.02	Up to standard
4	Sichuan Guang'an Hengli Casting Co., Ltd.	An annual output of 20,000 tons heat resistant materials	0.0528	0.0528	0.008	Up to standard

SN	Enterprise	Production scale and type	Wastewater quantity (10000t/a)	COD(t/a)	Ammonia nitrogen (t/a)	Treatment level of wastewater
5	Guang'an Jin You Da Cable Science and Technology Group	Supply materials production line	0.48	0.48	0.072	Up to standard
6	Sichuan Guang'an Paper Packaging Co., Ltd.	Paper packaging production line	0.12	0.12	0.018	Up to standard
7	Guang'an Detai Glass Products Co., Ltd.	An annual output of 35 million high-grade glass bottles	0.72	0.72	0.11	Up to standard
8	Sichuan Guang'an Huibo Glass Products Co., Ltd.	An annual output of 38 million decoration firing glass bottles	0.72	0.72	0.11	Up to standard
9	Guang'an Huaqing Plastic Industry Co., Ltd.	An annual output of 40 million pieces of plastic woven bag	0.07	0.07	0.006	Up to standard
10	Guang'an Changxing Cement Co., Ltd.	Phase I annual output of 2 million ton cement clinker production line	0.74	/	/	Up to standard
11	Guang'an Ocean Star Glass Co., Ltd.	An annual output of 100,000m^2 tempered glass production line	0.462	0.42	0.06	Up to standard
12	Sichuan Juxin Building Materials Technology Co., Ltd.	Cement additives production line				Up to standard
13	Sichuan Ming Lin Building Material Co., Ltd.	An annual output of 900,000 m^3 concrete production line	0.125	0.125	0.02	Up to standard
14	Guang'an Beiteng Environmental Technology Co., Ltd.	An annual output of 6000t new SCR catalyst base material projects	0.12	0.12	0.018	Up to standard

SN	Enterprise	Production scale and type	Wastewater quantity (10000t/a)	COD(t/a)	Ammonia nitrogen (t/a)	Treatment level of wastewater
15	Guang'an Hengda Textile Co., Ltd.	Textile	0.48	0.48	0.072	Up to standard
16	Guang'an Huifeng Shoes Co., Ltd.	Shoe manufacturing	2.976	2.97	0.46	Up to standard
17	Guang'an Fuhui Shoes Co., Ltd.	An annual output of 5 million shoes production line	2.88	2.88	0.43	Up to standard
18	Guang'an Jizhong Automotive Interior Parts Co., Ltd.	Leather, imitation leather, velvet series seats and car seat assembly production line	0.9	0.9	0.14	Up to standard
19	Sichuan Jiajun Leather Co., Ltd.	High-end purses, handbags production line	0.025	0.025	0.003	Up to standard
20	Guang'an Xiaohong Garments Limited	An annual output of 3 million knitted garments	1.05	1.05	0.17	Up to standard
21	Guang'an Huaqiang Garment Import and Export Co., Ltd.	An annual output of 900,000 children's garments	0.12	0.12	0.018	Up to standard
22	Sichuan Guang'an Hengli Chemical Industry Co., Ltd.	An annual output of 200,000t of membrane wrapping control-releasing fertilizer	0.87	0.81	0.122	Up to standard
23	Guang'an Xieli Biological Pharmaceutical Co., Ltd.	Artemisinin project	0.11	0.11	0.015	Up to standard
24	Guang'an Chunye Agricultural Development Co., Ltd.	An annual output of 20,000t pickle bean paste	0.1752	0.18	0.026	Up to standard
25	Guang'an Hecheng Agricultural Development Co., Ltd.	Pepper and agro-processing production line	0.1851	0.186	0.028	Up to standard

SN	Enterprise	Production scale and type	Wastewater quantity (10000t/a)	COD(t/a)	Ammonia nitrogen (t/a)	Treatment level of wastewater
26	Sichuan Juhui Logistics Ltd.	Public logistics platform in the Park	0.02	0.02	0.002	Up to standard
27	Yayu Industry	Automobile, motorcycle parts processing	0.48	0.48	0.072	Up to standard
28	Donyang Mingda	Automobile spare parts processing	0.24	0.24	0.036	Up to standard
29	Special cement plant					Production Suspended

12.2.2 Discharge of main pollutants

Pollutants discharge data of the settled enterprises show that all enterprises have met discharge standard for pollutants.According to environmental statistics of the settled enterprises in the Park in 2011 provided by Guang'an Environmental Protection Bureau, statistics of pollutants discharge of the settled enterprises in the Park are as follows:

Water pollutants discharge of the settled enterprises is: COD 259.15t/a, and ammonia nitrogen 31.76t/a.

Rural non-point source emissions are: COD 111.2t/a, and ammonia nitrogen 17.2t/a.

Atmospheric pollutants emissions are: SO_2 328.446t / a, NO_X 105.750t / a, smoke dust 2,541.798 t / a.

12.2.3 Retrospective assessment of environmental quality in constructed area

In order to better identify the environmental impacts of developed projects, this retrospective assessment will compare with data on existing environmental quality in planning environmental impact assessment by setting same positions of monitoring points as those of planning environmental impact assessment to intuitively express the variation in environmental quality. The planning environmental impact assessment passed the review by Sichuan Provincial Environmental Protection Department in 2011.

1. Observation and assessment of existing ambient air quality

(1) Arrangement of monitoring points

1 Observation and assessment of existing ambient air quality

(1) Arrangement of monitoring points

The ambient air monitoring points are arranged based on the function division. The first stage sampling was performed in April 2012 with 4 monitoring points arranged in the whole area; see Table below and atmospheric monitoring site map for the specific location of each monitoring point.

Table 12.2.3-1 Atmospheric Monitoring Site Map

No. of Monitoring site	Location	Item
1#	Zhujia Village Primary School	PM_{10}、SO_2、NO_2
2#	Residential district in Qianfeng Town	
3#	Honghui Village Primary School of Qianfeng Town	
4#	Daishi Town	

(2) Comparison of monitoring results

See the table below for the monitoring results of existing ambient air quality.

Table 12.2.3-2 Results of Comparing Ambient Air Quality

Monitoring Point	Pollutant	Standard Value	Original Concentration Range	Up to standard (Yes/No)	Current Concentration Range	Up to standard (Yes/No)	Variation
1#	PM_{10}	0.15	0.085-0.110	Yes	0.073-0.123	Yes	+/-
	SO_2	0.5	0.020-0.035	Yes	0.007-0.011	Yes	-
	NO_2	0.2	0.009-0.018	Yes	0.005-0.020	Yes	+/-
2#	PM_{10}	0.15	0.094-0.108	Yes	0.103-0.133	Yes	+/-
	SO_2	0.5	0.029-0.044	Yes	0.007-0.012	Yes	-
	NO_2	0.2	0.009-0.030	Yes	0.005-0.018	Yes	-
3#	PM_{10}	0.15	0.086-0.110	Yes	0.100-0.137	Yes	+/-
	SO_2	0.5	0.029-0.044	Yes	0.007-0.013	Yes	-
	NO_2	0.2	0.010-0.037	Yes	0.005-0.013	Yes	-
4#	PM_{10}	0.15	0.088-0.131	Yes	0.071-0.121	Yes	-
	SO_2	0.5	0.017-0.036	Yes	0.007-0.016	Yes	-
	NO_2	0.2	0.016-0.022	Yes	0.005-0.020	Yes	-

Note: “-” indicates improvement of air quality while “+” indicates the deterioration.

According to above table, the concentration of PM_{10}, SO_2 and NO_2 drops in general mainly due to the fact that when Qianfeng District is established, the pollution control on industrial dust and smoke in the air has been strengthened, dust removal and desulfurization of pollution source is improved and living fuels has gradually transformed from solid coal to gaseous fuel or electricity. Through a series of control measures, the ambient air quality in Qianfeng District has been significantly improved.

2. Monitoring and assessment of existing surface water environment quality

(1) Arrangement of monitoring sections

The sampling was performed in March 2012 for planning environmental impact assessment and in July 2014 for this assessment. In a bid to better understand the existing water

environment quality in the Park, each of the rivers is monitored on site for the present situation. See the table below for monitoring section and point arrangement for existing river and canal water environment quality and Figure 12.2.3-1 for the layout of water quality monitoring sections.

Table 12.2.3-3 Layout of Existing Water Environment Quality Monitoring Points

Section No.	Surface water	Section Location	Item
1	Luxi River	500m upstream Qianfeng section of Luxi River	pH value (dimensionless), COD, BOD5, NH3-N, volatile phenol, fecal coliform, petroleum
3		100m downstream the WWTP of Energy & Chemical Industry Concentration Area	
4		500m upstream the confluence where Luxi River merges into Qujiang River	

(2) Monitoring results of existing surface water environment

See the table below for the monitoring results of existing surface water quality.

Table 12.2.3-4 Results of Comparing Surface Water Environment Quality

Monitoring Point	Pollutant	Standard Value	Original Concentration Range	Up to Standard (Yes/No)	Current Concentration Range	Up to standard (Yes/No)	Variation
1#	pH (dimensionless)	6-9	7.72-7.76	**ND**	7.36-7.87	**ND**	+/-
	COD	20	17.5-17.8	**ND**	10.3-11.9	**ND**	-
	BOD5	4	4.0-4.2	**ND**	2.9-3.1	**ND**	-
	NH3-N	1.0	0.560	**ND**	0.056-0.073	**ND**	-
	ss	/	11.4-11.8	/	None	/	-
	Petroleum	0.05	None	**ND**	None	**ND**	/
2#	pH (dimensionless)	6-9	7.78-7.81	**ND**	7.24-7.47	**ND**	-
	COD	20	18.1-18.3	**ND**	12.8-13.9	**ND**	-
	BOD5	4	4.2-4.4	Exceeding 0.2-0.4	3.0-3.3	**ND**	-
	NH3-N	1.0	0.657	**ND**	0.042-0.050	**ND**	-
	Volatile Phenol	0.005	0.0003	**ND**	None	**ND**	-
	Fecal coliform	10000	9200	**ND**	3500	**ND**	-

	Petroleum	1.0	None	**ND**	None	**ND**	/
3#	pH (dimensionless)	6-9	7.80-7.83	**ND**	7.57-7.82	**ND**	-
	COD	20	16.4-16.8	**ND**	13.9-15.8	**ND**	-
	BOD5	4	3.8-3.9	**ND**	3.0-3.5	**ND**	-
	NH3-N	1.0	0.454	**ND**	0.028-0.042	**ND**	-
	Volatile Phenol	0.005	None	**ND**	None	**ND**	/
	Fecal coliform	10000	1100-1800	**ND**	3500	**ND**	+/-
	Petroleum	1.0	None	**ND**	None	**ND**	/

Notes: 1. ND standards for “not detected”; 2. “-” indicates improvement of air quality while “+” indicates the deterioration.

It is known from the above table that water quality factors at the monitoring sections in July 2014 meet the standards for category III water area in the *Environmental Quality Standards for Surface Water* (GB3838-2002).

The main reason is that in Qianfeng District, supporting wastewater interceptor network works of WWTP is being constructed to accelerate the construction of wastewater treatment and supporting facilities, and urban drain system is being reconstructed to realize the implementation of rain sewage diversion and improve the urban wastewater collection rate. In addition, the wastewater from the enterprises must be discharged into nearby water bodies after the wastewater is treated up to Class I standard in *Integrated Discharge Standard of Pollutants*.

Through improvement, reconstruction and construction of rain sewage pipe network, the wastewater collection rate has been effectively improved and up-to-standard discharge by all enterprises in accordance with the discharge standards is also helpful to improve the water quality of all rivers in Linshui County.

3. Monitoring and assessment of existing groundwater environment quality

(1) Arrangement of monitoring sections

The sampling was performed in March 2012 for planning environmental impact assessment and in July 2014 for this groundwater status monitoring. In a bid to better understand the existing groundwater environment quality, two groundwater monitoring points are arranged according to the direction of groundwater flow in the assessed area and proposed geological site location. See the table below and Figure 15.2.3-1 for the layout of water quality monitoring sections.

Table 12.2.3-5 Layout of Existing Groundwater Environment Quality Monitoring Points

SN	Location	Item
1	Farmers’ wells in Shuangshi Village	pH, chloride, Fe, ammonia

2	Farmers' wells in Suzhai Village	nitrogen, zinc, arsenic, mercury, chromium (VI), cadmium, lead

(2) Monitoring results of existing groundwater environment

See the table below for the monitoring results of existing groundwater quality.

Table 12.2.3-6 Results of Comparing Groundwater Environment Quality

Monitoring Point	Pollutant	Standard Value	Original Concentration Range	Up to Standard (Yes/No)	Current Concentration Range	Up to Standard (Yes/No)	Variation
Farmers' wells in Shuangshi Village	PH value	6.5-8.5	7.13-7.15	Yes	7.63	Yes	+/-
	Chloride	250	3.92-4.57	Yes	21.0	Yes	+
	Fe	0.3	ND	Yes	ND	Yes	/
	NH_3-N	0.2	0.083-0.119	Yes	ND	Yes	-
	Zn	1.0	0.003-0.005	Yes	ND	Yes	-5
	As	0.05	1.68×10^{-3}-1.72×10^{-3}	Yes	ND	Yes	/
	Hg	0.001	1.02×10^{-4}-1.08×10^{-4}	Yes	ND	Yes	/
	Cr (VI)	0.05	ND -0.004	Yes	ND	Yes	/
	Cd	0.01	ND	Yes	ND	Yes	/
	Lead	0.05	5.65×10^{-3}-5.96×10^{-3}	Yes	ND	Yes	/
Farmers' wells in Suzhai Village	PH value	6.5-8.5	7.16-7.19	Yes	7.24	Yes	-
	Chloride	250	18.5-19.4	Yes	15.7	Yes	-
	Fe	0.3	ND	Yes	ND	Yes	/
	NH_3-N	0.2	0.066-0.095	Yes	0.02	Yes	-
	Zn	1.0	0.003-0.009	Yes	ND	Yes	-
	As	0.05	1.69×10^{-3}-1.71×10^{-3}	Yes	ND	Yes	/
	Hg	0.001	1.02×10^{-4}-1.07×10^{-4}	Yes	ND	Yes	/
	Cr (VI)	0.05	ND -0.004	Yes	ND	Yes	-
	Cd	0.01	ND	Yes	ND	Yes	/
	Lead	0.05	5.76×10^{-3}-5.96×10^{-3}	Yes	ND	Yes	-

Notes: 1. ND standards for "not detected"; 2. "-" indicates improvement of air quality while "+" indicates the deterioration.

It is known from the above table that groundwater monitoring factors in this monitoring meet the class III standard in the *Quality Standard for Ground Water* (GB/T14848-93). The monitoring results show that the groundwater quality is not improved; the water environment quality is up to the standard. This indicates that all enterprises have paid attention to the protection of groundwater resources in the

construction process, without arbitrary wastewater discharge, and the groundwater environment is well protected.

4 Monitoring and assessment of existing ambient noise

(1) Arrangement of monitoring points

According to the land use status and plan of Industrial Park, the construction content is mainly road works; comparing the noise monitoring location in EIA for original plan, 3 monitoring points are arranged in the southeast built up area of the Park.

(2) Monitoring results of existing acoustic environment

See the table below for the monitoring results of existing acoustic environment quality.

Table 12.2.3-7 Results of Comparing Acoustic Environment Quality

Monitoring Point	Monitoring Results											
	Day						Night					
	Original monitoring value	Standard	Up to standard (Yes/No)	Current monitoring value	Up to standard (Yes/No)	Variation	Original monitoring value	Standard	Up to standard (Yes/No)	Current monitoring value	Up to standard (Yes/No)	Variation
1#	53.8	65	Yes	51.4	Yes	No obvious changes	44.3	55	Yes	42.2	Yes	No obvious changes
2#	52.7	65	Yes	50.8	Yes		42.7	55	Yes	40.6	Yes	
3#	48.9	65	Yes	47.7	Yes		40.5	55	Yes	41.3	Yes	

Standards for category III area shall apply to the assessment. Namely, ≤65 decibels during the day, ≤55 decibels at night. It is known from the above table that the noise level in the monitoring area meet class III standard in the Environmental Quality Standard for Noise (GB3096-2008). It is also known from above table that the acoustic environment quality does not change much, all noise indicators meet acoustic environment standard.

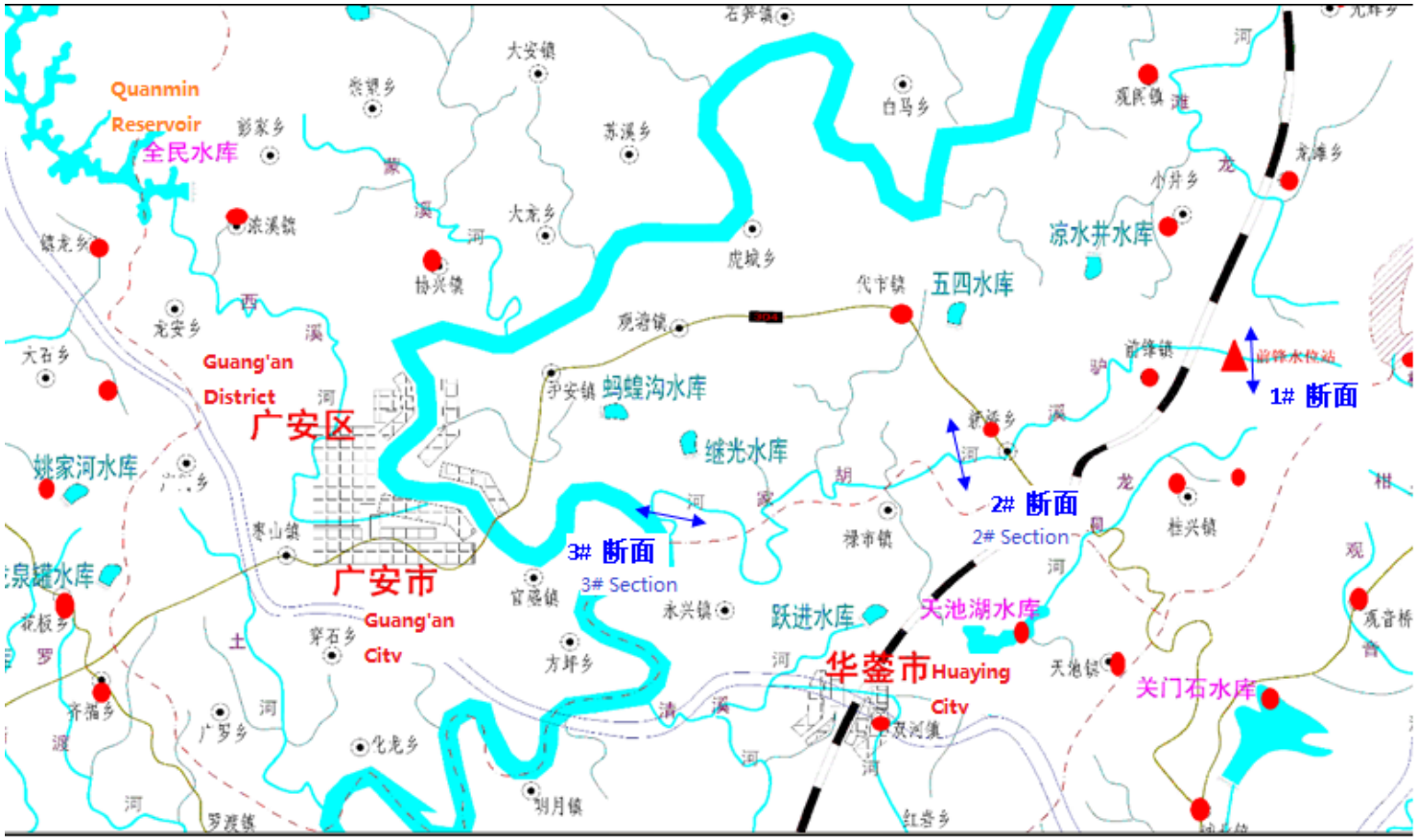


Figure 12.2.3-1 Location Plan for Surface Water Monitoring Points

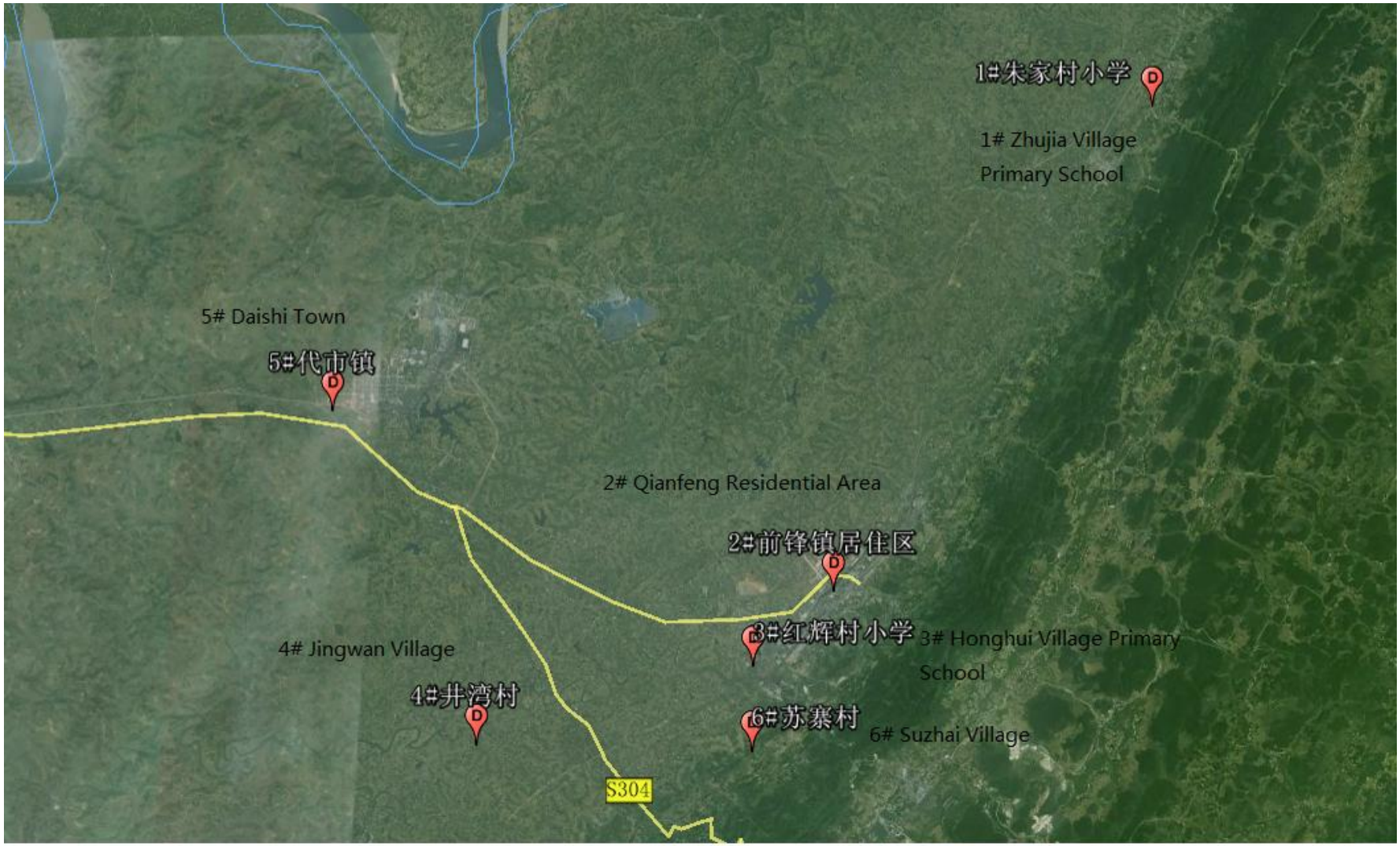


Figure 12.2.3-2 Location Plan for Noise, Air and Groundwater Monitoring Points

12.3.4 Summary

At present, the old town of Qianfeng District and the built up area of Industrial Park all together covers an area of 22.65km^2.Survey on air pollutants, water pollutants, solid waste in the built up area shows that water consumption is 0.41×104t/d; sewage quantity is 0.33×104t/d with CODcr discharge about 326.91t/a and NH3-N about 48.96t/a; and SO2 328.446t/a, NOX 105.750t/a, smoke dust 2541.798 t/a in air pollutants.The solid waste production is 1.46×10^{4}t/a and the dangerous waste shall be transported to competent organization for treatment.

In this assessment, the surface water, ambient air, groundwater and acoustic environment in the assessed area are monitored (in July 2014) and the monitoring results show that all environmental factors in the area meet the requirements of quality standards.Compared with the monitoring data in Planning Environmental Impact Assessment (PEIA), surface water, ambient air, and groundwater indicators improve to varying degrees, while acoustic environment monitoring result has no obvious change.

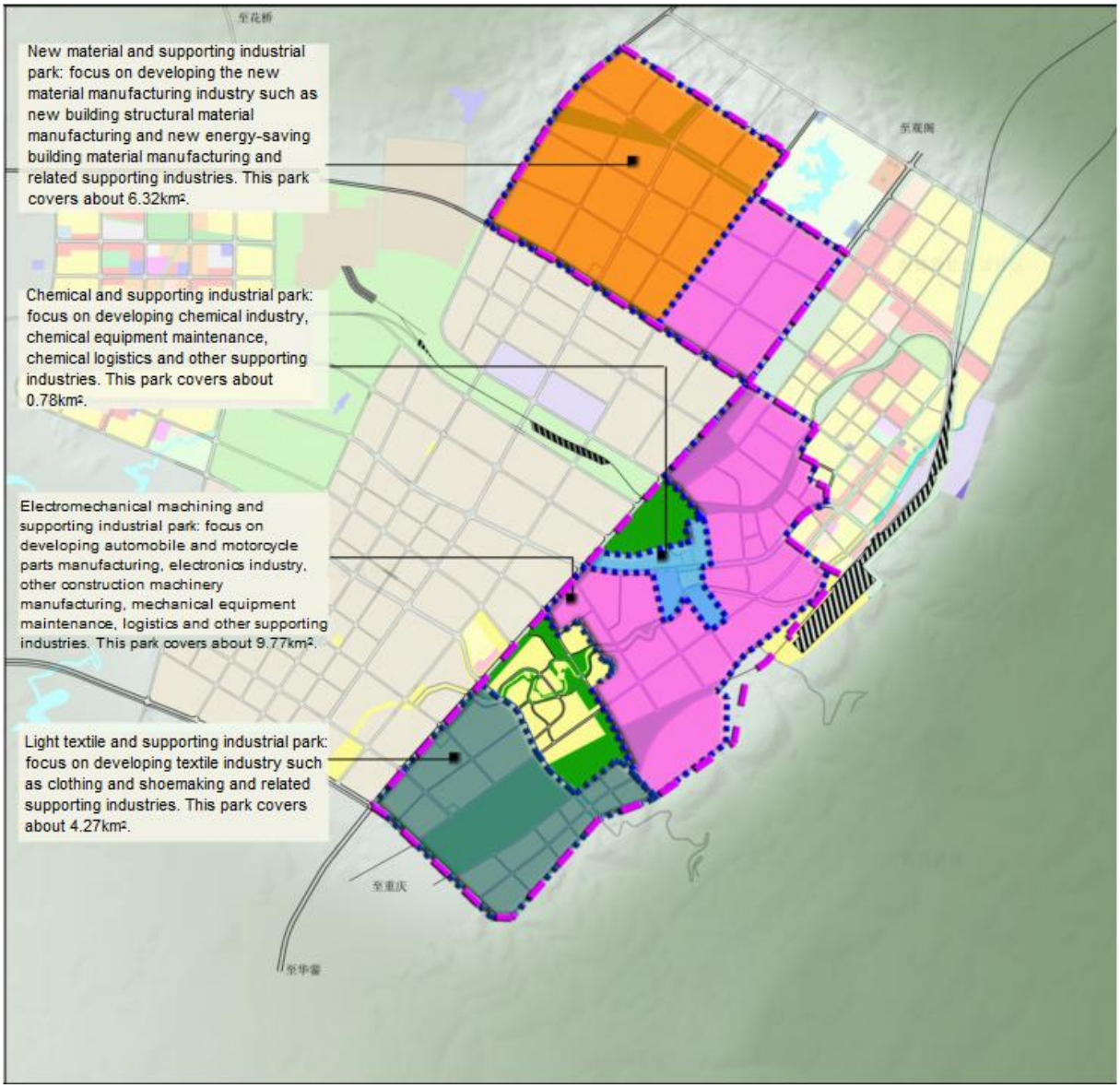
As it can be seen from the comparison, the construction of industrial parks and towns causes no significant impact and the good regional environment quality shows that the concept of attaching equal importance to the development and environmental protection has been adhered consistently, which are mainly reflected in the following aspects: ① strictly check enterprises to settle in the Park and ensuring the majority of them are light-pollution, labor sensitive and science and technology driven enterprise; ② actively utilize clean energy to reduce the air pollutant emissions from the source; and ③ effectively support the development of QETDZ with completion of environmental protection infrastructures such as the wastewater treatment plants and landfills.

12.3 Pollution Source Analysis on Proposed area (2014-2020)

12.3.1 Overview of planning

According to the *Overall Plan of Qianfeng Industrial Park (2011-2020)* prepared in 2011, Qianfeng Industrial Park is divided into two parts, i.e., south side and west side of the existing urban area. It is planned that by 2020, the built up area will achieve 23.86km^2. Except some green areas, the other lands is proposed to be used to develop some industries in the Industrial Park, including machinery manufacturing and logistics (9.77km^2 planned), building materials (6.32km^2 planned), light textile (including clothing and shoes, 4.27km^2 planned), and a small amount of chemical and chemical equipment manufacturing (0.78km^2 planned). See Figure 12.3.1-1a for industry layout plan in Qianfeng.

According to the information provided by relevant authorities of Qianfeng District, the development of Qianfeng Industrial Park during 2015-2019 will be focused on the area on the south of the urban area, with main development projects including light textile and supporting industrial park, the southeast area of electromechanical processing and supporting industrial park and Guang'an Port-Qianfeng Avenue (the section connecting Keta Road to Industrial Avenue).


至花桥
New material and supporting industrial park: focus on developing the new material manufacturing industry such as new building structural material manufacturing and new energy-saving building material manufacturing and related supporting industries. This park covers about 6.32km².
至观阁
Chemical and supporting industrial park: focus on developing chemical industry, chemical equipment maintenance, chemical logistics and other supporting industries. This park covers about 0.78km².
Electromechanical machining and supporting industrial park: focus on developing automobile and motorcycle parts manufacturing, electronics industry, other construction machinery manufacturing, mechanical equipment maintenance, logistics and other supporting industries. This park covers about 9.77km².
Light textile and supporting industrial park: focus on developing textile industry such as clothing and shoemaking and related supporting industries. This park covers about 4.27km².
至重庆
至华蓥

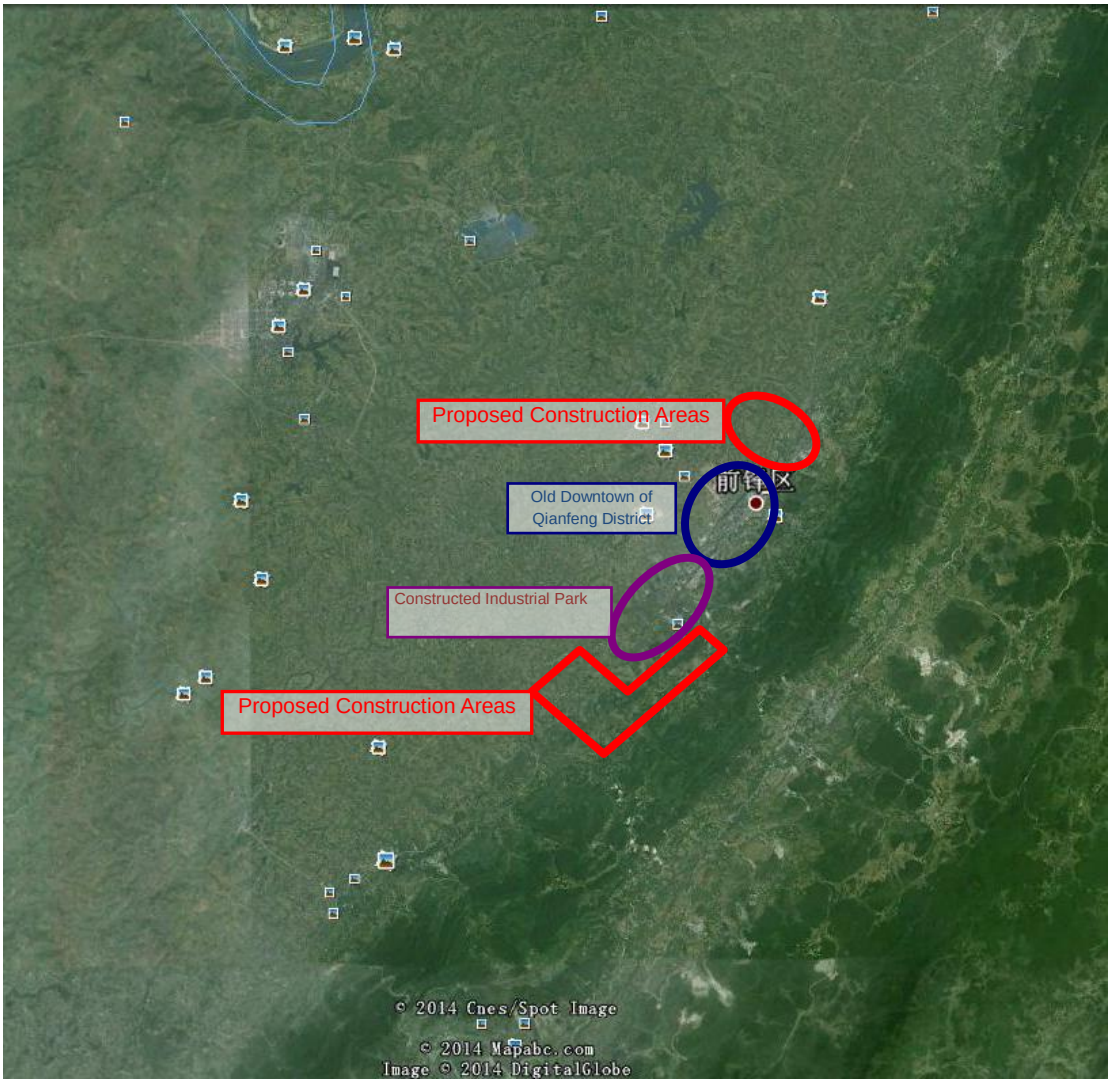
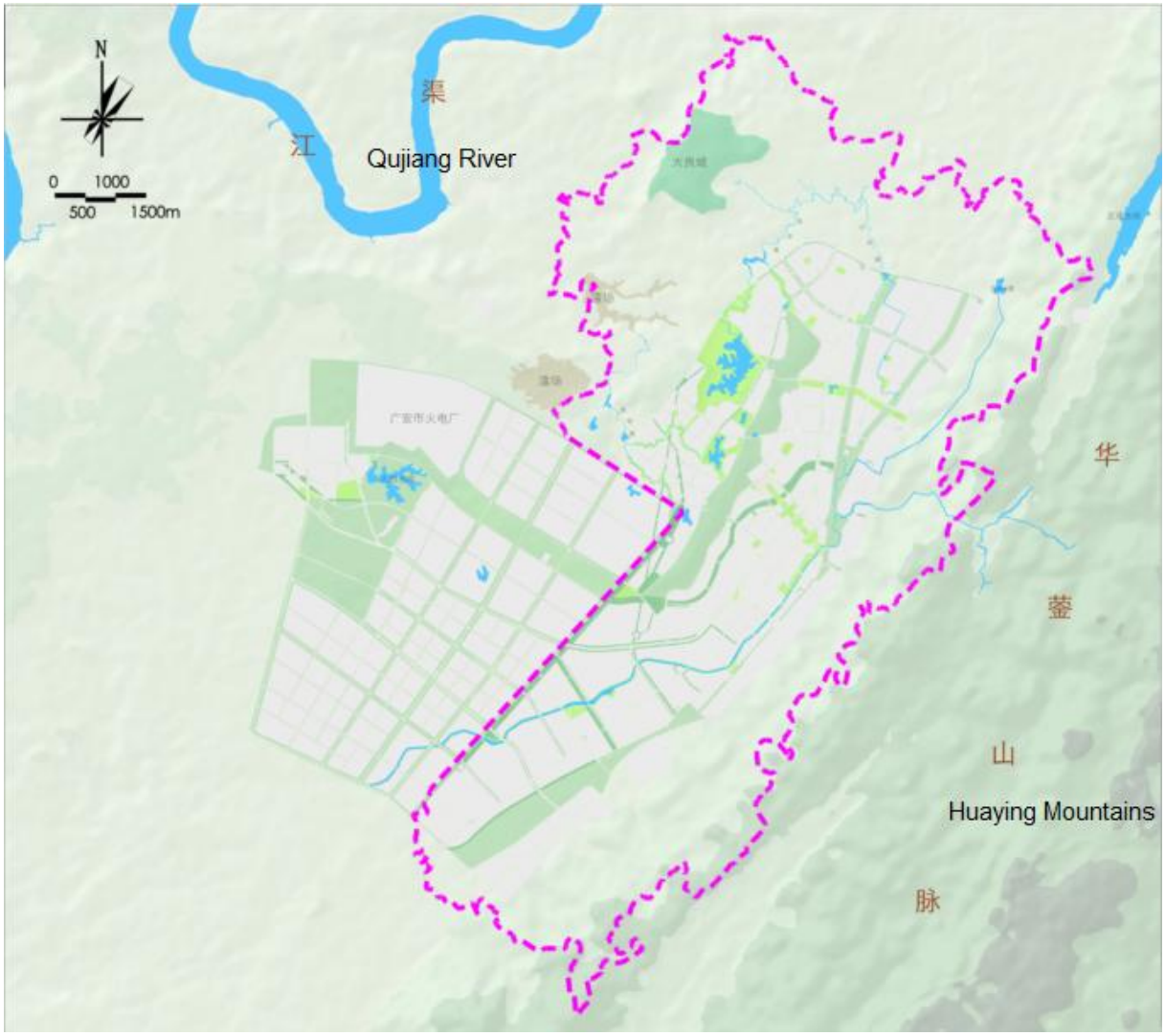


Figure 12.3.1-1 2014-2019 Proposed Areas

Currently, a new round of regulatory plan for the central urban area is being carried out in Qianfeng District, and adjustments are made to the planning area and scope as specified in the *Regulatory Plan of Qianfeng New City of Guang'an (2013-2030)*.

The new central urban area will cover Wuliu Avenue to the east, West Ring Road to the west, Xiaoliangcheng Road to the north and Xinqiao ETDZ and railway yards road to the south. By 2030, the new urban area will be around 16.49km^2, including the Industrial Park. In order to coordinate with the *Regulatory Plan of Qianfeng New City of Guang'an*, the overall plan for Qianfeng Industrial Park will be further adjusted, which will mainly focus on space layout optimization, construction speed slowdown and land area reduction. Such adjustment is reasonable and it may reduce the pressure on the environment and resources due to rapid development. Figure 12.3.1-1c shows the development boundary of Qianfeng New City.



12.3.1-1c Planning for Qianfeng New City

12.3.2 Pollution sources prediction

According to the investigation of existing pollution sources, there has been no enterprise settled in the plots for development in Qianfeng Industrial Park. Therefore, the pollution source prediction in the planning environmental impact assessment and feasible study report will be based on the analogy analysis with constructed area of similar nature and the estimated discharge amount of pollutants.

1. Prediction of air pollution source

The air pollutants are predicted based on two scenarios:

① The settled enterprises use natural gas as the energy for industrial purpose, which is clean energy producing few pollution. In such scenario, no prediction is required due to the little effect of pollution.

② In most unfavorable scenario, i.e., all settled enterprises use coal instead of natural gas, the impact will be predicted. According to the environmental statistics of planning environmental impact assessment in 2011, the emission intensity per unit of area is estimated via the

statistics on the SO_2 and soot emissions from enterprises using coal-fired boilers to obtain discharge coefficient of 33.58 t/a•km^2 and 22.25 t/a•km^2 for SO_2 and NO_X respectively.

Based on the above prediction principle, by the end of planning period, the area of industrial land will be 0.99km^2 and the pollutant emissions will be 43.32 t/a and 18.70 t/a for SO_2 and NO_X respectively.

2. Prediction of water pollution source

By 2019, the daily average water consumption in assessed area will be 4,200m^3/d, among which the consumption for domestic and public use accounts for 1,300m^3/d, consumption of industrial use accounts for 800 m^3/d and consumption for other use accounts for 2,100m^3/d; the annual water consumption will be 1,533,000 m^3 and the water drainage will be about 1,226,400 m^3.

3. Prediction of solid waste production

(1) Prediction of domestic waste

It is predicted that the population of residents in assessed area will increase by 40,000 in 2020 and at per capita domestic waste of 1.0kg produced per day, the production of domestic waste will be 4t/d (1,825 t/a).

(2) Prediction of general industrial solid waste and dangerous solid waste production

Prediction equation: $V_{工} = S_1 \times M$

$V_{工}$: Solid waste production (t/a)

S_1 : Discharge coefficient of industrial solid waste (t/ha/a)

M : Area of industrial land (ha)

The discharge coefficient for the general industrial solid waste and dangerous solid waste, the area of land planned for comprehensive use and the predicted production of general industrial solid waste and dangerous solid waste in the demonstration park are determined through analogy and shown in the table below.

Table 12.3.2-1 Prediction of Industrial Solid Waste Production

Area of Industrial Land (ha)	General Industrial Solid Waste		Dangerous Solid Waste	
	Discharge Coefficient (t/ha/a)	Production (t/a)	Discharge Coefficient (t/ha/a)	Production (t/a)
192.89	12	2314.7	0.2	38.58

The general industrial solid waste in assessed area is mainly comprehensively utilized, domestic waste transported to the landfill and dangerous solid waste transported to competent organization for treatment.

4 Change in nature of land use

Currently, the developed and constructed area is 6.15km^2 in the old downtown of Qianfeng and the Industrial Park, and the Industrial Park has

been half done.

According to the existing *Overall Plan of Qianfeng Industrial Park of Guang'an District, Guang'an City (2011-2020)*, by 2020, 23.86km^2 will be constructed in the Industrial Park; this means 17.71km^2 of farmland, forestland or grassland will be used for industry, road traffic, etc.

While according to the *Regulatory Plan of Qianfeng New City of Guang´an (2013-2030)* under preparation, by 2030, 16.49km^2 will be constructed in Qianfeng New City (including the Industrial Park); this means 10.34km^2 of agricultural land not for construction purposes will be used for construction. The constructed area and construction speed will be significantly reduced, so the pressure on the environment and resources will also be reduced accordingly.

12.3.3 Overview of enterprises to be settled

According to the industrial space plan layout of overall planning of Qianfeng Industrial Park, industry positioning of the Park are mainly auto parts matching, electronic products, garments, textile, shoemaking, and new materials, etc.At present, enterprises settled in the Park are mainly of auto parts matching, electronic products. From 2014 to 2020, main industries to be developed in the Park will still be auto parts matching, electronic products; meanwhile the south area of the Park will be developed into a light textile and supporting industrial park for garments, textile and shoemaking industries.

12.3.4 Summary

Through the prediction on water pollutants, air pollutants and solid wastes in the proposed area, the water consumption will be 3.67.03×10^{6}t/a, the wastewater quantity will be 3.08×10^{4}t/a, and the air pollutant emissions will include 43.32t/a of SO_2 and 29.24t/a of NO_X.Domestic garbage will be 1825t/a, general industrial solid wastes will be 0.23×104t/a，and hazardous wastes will be 38.58 t/a which shall be delivered to qualified unit for treatment.

12.4 Environmental Impacts Prediction in Proposed Areas (2014~2020)

12.4.1 Prediction and assessment of ecological impact

(1) Ecological environment impact of land acquisition

Qianfeng District features pretty flat terrain; the type of land used for the development is primarily the cultivated land and secondarily the forest land and grassland; the absolute amount and proportion of land to be used for development are pretty large in the existing land use.

After the construction of the Park, the cultivated land, forest land and grassland will be converted to industrial use, fundamentally changing the nature of local agriculture and the nature of land use. This will greatly reduce the production scale of farmland, compromising the potential productivity; the farmland will be changed in quantity, i.e., the relative area will be reduced, bringing some impact to local agro-ecology. Rural households inside the Park mainly rely on working outside and farming for economic income, so the acquisition of certain amount of land in the Project certainly will influence their income and standard of living to a certain degree.

Change in nature of land use is an expected result of urbanization development.The Industrial Park is located in the south of Qianfeng District.

According to *Zoning Plan of Qianfeng District, Guang'an City (2013-2030)*, the Park land has been adjusted to industrial land in nature which conforms to the development planning of the Regulatory Plan for Guang'an Western Jeans Textile, Garments Technology, Commercial and Trading Industrial Park, this is, the change in nature of land use in this area is within the control range of local urban construction and land use planning.

Table 12.4.2-1 Construction Land Composition in the Urban Area of Qianfeng District by 2030

SN	Name of Land			Code of Land	Planned Land Area	
					Area (ha.)	Percentage in All Urban Construction Lands (%)
1	Residential land			R	410.0	29.87
	Including	Class II residential land		R2	294.58	21.46
		Commercial & residential land		RB	115.44	8.41
2	Land for public management and service facilities			A	144.16	10.50
	Including	Administrative land		A1	17.71	1.29
		Land for cultural facilities		A2	14.66	1.07
		Land for education and scientific research		A3	75.38	5.49
		Including	Land for secondary specialized school	A32	25.84	1.88
			Land for primary school and middle school	A33	49.54	3.61
		Land for sports		A4	12.71	0.93
		Land for medical treatment and public health		A5	18.40	1.34
		Land for social welfare facilities		A6	5.30	0.39
3	Land for commercial and service facilities			B	112.35	8.19
	Including	Land for commercial facilities		B1	55.73	4.06
		Land for business facilities		B2	46.09	3.36
		Land for sports & entertainment		B3	9.08	0.66
		Land for utilities and sales network		B4	1.45	0.11
4	Land for logistics and warehouse			W	160.72	11.71
	Including	Land for Class I logistics and warehouse		W1	136.67	9.96
		Land for Class III logistics and warehouse		W3	24.05	1.75
5	Land for road and traffic facilities			S	313.70	22.85
	Including	Land for municipal roads		S1	253.42	18.46

SN	Name of Land		Code of Land	Planned Land Area	
				Area (ha.)	Percentage in All Urban Construction Lands (%)
		Land for traffic hub	S3	49.25	3.59
		Land for traffic stations	S4	11.03	0.80
6	Land for utilities		U	3.10	0.23
7	Green area and square		G	228.54	16.65
	Including	Green area in the park	G1	181.58	13.23
		Protective green area	G2	41.81	3.05
		Land for squares	G3	5.15	0.38
Total	Total planned area			1649.29	/

It can be observed from the layout of land use of Qianfeng District that since the agricultural land, forest land and grassland will be converted to construction purpose, fundamentally changing the nature of local agriculture and the nature of land use. The area of various types of lands has increased, but the proportion of some land types always stays the same, especially for green area, the percentage of which is significantly increased. It fully shows protection and emphasis on green area in the development process of Qianfeng District.

(2) Analysis of impact on vegetation

Presently, plants inside the undeveloped part of proposed area are mainly field crops, including arbors, shrubs and low weeds; there is no rare and endangered animals and plants with ordinary biodiversity; there is no sensitive area such as scenic spots and reserves within 5km.Regional development and construction will change the cultivated land and vegetation in the Park in the quantity and area.

In the execution of planning schemes, the variation of land type will directly reduce the cultivated land, as well as the quantity and area of vegetation. Currently, the land in the Park is mainly cultivated land, providing a simple ecosystem neither densely covered with natural vegetation nor planted with artificial forest. The development and construction on this land will change the cultivated land in quantity, namely smaller relative area, compromising the potential productivity to a certain degree, but this will not cause the loss of natural vegetation and vegetation with outstanding ecological value. As a result, the execution of planning schemes exerts little impact on regional surface vegetation.

12.4.2. Prediction and assessment of impact on air environment

(1) Prediction mode

In this assessment, the Aermod model (ver.07026) recommended in the *Guidelines for Environmental Impact Assessment - Atmospheric Environment* (HJ2.2-2008) is adopted for calculation.Aermet model (ver.06341) is used for meteorological pretreatment. AerMAP model (ver. 09040) is used for terrain pretreatment.

(2) Predictive range and factors

In this assessment of impact on air environment, the area 5km extending outward from the proposed boundary will be determined as the predictive range; and the predictive factors are SO_2 and NO_2.

(3) Prediction results

It is known from the prediction results that the maximum hourly concentration of SO_2 is 15mg/m^3 with highest percentage of ground concentration in standard concentration being 32.46%. The maximum hourly concentration of NO_2 is 0.46mg/m^3 with highest percentage of ground concentration in standard concentration being 22.4%, which satisfy the requirements of environmental function division.

In the planning, the impact on air environment is predicted for the most unfavorable conditions (i.e., all industrial enterprises utilize coal as the energy source). It is predicted that the hourly, daily and long-term maximum ground concentrations satisfy the requirements of Class II standard in *Ambient Air Quality Standard* (GB3095-1996) after superimposing the background concentration in the circumstance of discharging up-to-standard pollutants such as SO_2 and NO_2 from the QETDZ. Therefore, construction in the Park will neither bring significant impact on regional air environment quality nor change the function level thereof.

12.4.3. Prediction and assessment of impact on surface water environment

(1) Impact on WWTP

The industrial wastewater and domestic sewage in Qianfeng District and residential areas in Qianfeng enter into the WWTP of Qianfeng District; the discharge of wastewater from such wastewater treatment plant follows Class IA standard in the *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002), which will normally cause no pollution of receiving water bodies.

(2) Impact of project construction on natural drainage

In the land development, there is no river being occupied, so the natural width, the flow direction and river width will not be changed; the land development has little impact on the natural drainage.

The system of diverting storm water from wastewater is applied in the planning and construction of pipe network, namely, the storm water runoff on the road of Park is connected with storm water pipe network and flows into river after sedimentation, which having small impact on the quantity of natural water bodies.

The implementation of wastewater interceptors and wastewater pipe network may have some impact on the quantity of natural water bodies, but this may prevent wastewater from directly flowing into the river to affect the water quality. Therefore, the implementation of project remains beneficial for the environments.

12.4.4. Prediction and assessment of impact on acoustic environment

The regional noise is affected by industrial noise, traffic noise, population density and other factors and may change correspondingly with the socio-economic development. At present, the change in overall regional noise is predicted according to the change in regional population density

with the following predictive mode:

$$\Delta L_{eq} = 10 \lg\left(\frac{\rho_2}{\rho_1}\right)$$

Where, ΔL_{eq} – predicted variation of regional noise, dB(A);

ρ_2 – predicted annual average population density in the region, person/km^2;

ρ_1 – baseline annual average population density in the region, person/km^2.

In consideration of only the variation of population density, the predicted value of regional noise in target year of planning in QETDZ is shown in the table below.

Table 12.4.4-1 Predicted Value of Regional Noise of Proposed Area in Target Year

Description	Item	Existing Average in 2014	Predicted Value in 2020
The base	Average population density (person/km^2)	3708	5500
	Day (dB (A))	48.5	50.2
	Night (dB (A))	43.1	44.8

It is known from above regional prediction results that the noise level in Park increases with the population density. The day and night noise levels in QETDZ increases to some extent at the end of planning period compared with those during the base year and satisfy the requirements of applying Class II standard.

The day and night noise levels in QETDZ increases to some extent at the end of planning period (2020) compared with those during the base year and satisfy the requirements for applying Class II standard.

The traffic noise has a significant impact on the residential district, so corresponding control measures shall be taken against road noise that having significant impact on buildings requiring low noise inside the regional environment.

12.4.5 Environmental Impact Analysis of Solid Wastes

(1) Domestic waste

After the construction of Qianfeng Industrial Park and residential area, the resident population is expected as 40,000 and with daily domestic waste production of 4t, the design capacity of garbage disposal plant is 300t/day which is able to accommodate and dispose the garbage.

(2) General industrial solid waste

The industrial solid waste production in the Park is predicted to be about 38.58t/a. The general industrial solid waste will be recycled as possible according to the requirements of reclamation of wastes. The general solid waste inside the QEDTZ mainly includes the byproducts and substandard products from the production of transportation equipment manufacturing industry and new building materials industry, which may be used as raw

materials and sold as substandard goods, and even recycled to realize the reclamation of solid waste.

(3) Hazardous waste

The hazardous waste production in the Park is predicted to be around 38.58t/a, and no disposal site is planned in the park area for such waste. The hazardous waste produced may be delivered to competent organization by nature for disposal so as to ensure that the impact of disposal on surrounding environment will be minimized.

12.4.6 Impacts on Groundwater Environment

Qianfeng District belongs to Central Sichuan Fold Belt simple hydrogeological zone, the groundwater of the assessed area is divided into two categories according to the water-bearing media and occurrence condition, namely, clastic rock pore-fissure water and bedrock fissure water. It is an area of poor and simple type groundwater source.Groundwater source in Qianfeng District is poor and there is no concentrated water supply source in the District, also there is no national or local governmental groundwater related reserve.The construction of Qianfeng Industrial Park and residential area is basically ground works which will not change the flow field and level of groundwater, therefore presenting no environmental hydrogeological problems.

Groundwater in the park area is supplemented by atmospheric precipitation and surface water bodies. It is therefore analyzed that the execution of planning schemes influences the regional groundwater mainly in the mechanism of:

① The initial rainwater of enterprise, for the high pollutant concentration will affect the groundwater through surface water infiltration;

② Break, poor anti-seepage or damage of pipeline and water pond for production, storage and transportation of enterprises, causing the leakage of dangerous substances and groundwater pollution through infiltration;

③ Discharge of WWTP tailwater under accident condition into water bodies, affecting the groundwater through flow or infiltration.

④ Construction of roads and factories, transforming the ground in park area from natural soil into impervious areas such as cement floor and asphalt pavement, which may bring some influence on the supplementation of groundwater in park area. However, Qianfeng District is lack of groundwater, so the construction barely has any effect on portable water of residents.

12.4.7. Analysis of impact on social environment

According to the economic, social and employment analysis, the construction of the Industrial Park may provide jobs for residents inside and surrounding the Park. During the development of few other industrial zones, there are examples of social impact that incomprehensive consideration in planning, incomplete facilities or defective social management measures make it unable to effectively deal with the large incoming population.

According to Industrial Park planning, the plan positioning of the Park is as follows: Guang'an Western Jeans Textile and Garments Technology, Commercial and Trading Industrial Park is a key project of Qianfeng Industrial

Park; while the overall positioning of the Park is a modern, ecological comprehensive industrial area targeted at undertaking the gradient transfer of eastern industries, characterized by the development of labor-intensive light textile, garments and supporting industries, and with complete supporting service in exhibition, trading, logistics, research, education, and commerce.

According to the planning, the residential district will be provided with good facilities for water supply and drainage, wastewater treatment, waste collection and treatment, electricity supply, communication, gas supply, landscaping, medical care, education and entertainment. It will be able to provide the incoming population with good dwelling, living, infrastructure and environmental protection conditions. Besides, dormitories, health and care and other facilities and services for workers will be provided inside the factory according to China's relevant regulations on labor protection to ensure their dwelling and living conditions.

According to the contents of resettlement action plan and institutional enhancement, employment training schemes and labor market information system will be developed during the implementation of the Project. The capability building will take into consideration the code of conduct, health, culture and so on. The trainings will be helpful for the establishment of civilized, safe and harmonious development area.

12.4.8 Impact Analysis on Physical Cultural Resources

According to the *Regulatory Plan of Qianfeng New City of Guang'an* under preparation, Daliang Fortress is located in the northwest corner of the planned Qianfeng New City. As a protected district-level cultural relic, it is a military fortress built in Southern Song Dynasty to resist the invasion of Mongol army in the mid-13th century, on mesa at the southeast of Qujiang River. There are only several gates left now and a natural village around with a population of about 800.

Daliang Fortress is about 40km from the downtown area of Guang'an City, 10km from existing downtown area of Qianfeng. Since it is not located in Qianfeng Industrial Park, it will not be greatly affected by the construction activities of the Project.

According to the regulations on historical and cultural preservation in *Zoning Plan of Qianfeng District of Overall Urban Planning of Guang'an City (2013-2030)*, Daliang Fortress, as a protected district-level cultural relic, is defined with protection area and construction control area, and construction projects irrelevant to the protection of cultural relics shall not be carried out within the scope of protection and its historical pattern and original appearance shall not be altered and damaged. In order to protect the environment of the cultural relics within the construction control area, the construction indicators such as nature, form and density are strictly controlled. In addition, the plan indicates that most of the historical and cultural heritages of Qianfeng District are scattered within the vast rural areas, but lack of protection efforts and resources for special protection, running its own course. Besides, it is suggested to fully tap the historical resources of Daliang Fortress, conduct necessary archaeological excavations, apply for municipal scenic area under the mature conditions and develop tourism.

Daliang Fortress is located within Qianfeng New City and the *Regulatory Plan of Qianfeng New City* shall coordinate with the *Overall Plan of Guang'an City*,

following the planning requirements of heritage conservation. During the preparation of *Regulatory Plan of Qianfeng New City* and the development of Qianfeng New City, the protection and tourism development of Daliang Fortress shall be further researched and valued.

12.4.9 Analysis of impacts on urban planning

According to *Zoning Plan of Qianfeng District of Guang'an City (2013~2030)*, The designated city function of Qianfeng District is: sub-center of Guang'an major city, industrial highland, city and industry integration demonstration new town, landscape garden city, and east Sichuan dynamic new town.The urban spatial structure is "one heart and five areas, two belts and multiple spots".The one heart: it is the central urban district of Qianfeng, where city functions and large public facilities like administrative-office, business and commerce, culture and sports, science and technology, education and training bases, exhibition designing are arranged around Liangshuijing Wetland Ecological Park and Dazhiyan Ecological Park, forming ecological leisure and business service centers. Five areas: in accordance with the terrain and the guidance of planning function, the Qianfeng urban area is divided into five areas, namely, new town area, old town area, Daishi area, Qianfeng Industrial Park Area, and logistics park area.Each area has considerable population size and perfect urban functions; each area is compact, independent, however, connected with each other.Two belts: based on mountains, river system and important traffic channels, two important urban public function development belts are formed; one is the east urban development belt connecting the old town, east new town and Qianfeng Industrial Park, the other is the west urban development belt connecting the urban business sub-center, Liangshuijing Wetland Ecological Park, and urban commerce sub-center.Multiple points: according to the features and resource endowment of each area, neighborhood unit node spaces are planned along the two belts to provide convenient daily public services to residents.

12.4.8 Summary

The development and construction of the planning area will produce impact on the water environment, atmospheric environment, solid waste and other environment.According to analysis and prediction, From 2014 to 2020, 30.68km^2 of farmland, woodland, grassland in Qianfeng Industrial Park and residential area will convert to residential land, industrial land, transportation land, etc.Prediction data show that, for atmospheric environment, maximum hourly concentration of SO_2 is 0.15mg / m^3, and the ratio of the above value to the standard value is 32.46%. Maximum hourly concentration of NO_2 is 0.46mg / m^3, and the ratio of the above value to the standard value is 22.4%. By 2020, noise prediction data in Qianfeng Industrial Park and residential area is 50.2dB(A) in daytime, and 44.8dB(A) at night; Domestic garbage will be 1825t/a, general industrial solid wastes will be 2,300t/a，and hazardous wastes will be 38.58 t/a which shall be delivered to qualified unit for treatment. Class 1A standard of *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002)* shall apply to WWTP effluent, which shall have no pollution to the receiving water body in normal condition.Groundwater resource in Qianfeng District is poor, so residents and enterprises don't use groundwater as water supply, therefore the urban expansion will not impact the life and production of residents and enterprises. The above analysis shows that the impact of urban expansion on the environment is limited and controllable.

12.5 Potential Problems Caused by Induced and Cumulative Impact and Counter-Measures

12.5.1 Urban green land loss

1 Impact of urban expansion on green area

Currently, the developed and constructed area is 6.15km^2 in the old downtown of Qianfeng and the Industrial Park, and the Industrial Park has been half done. While according to the *Regulatory Plan of Qianfeng New City of Guang´an* under preparation, by 2030, 16.49km^2 will be constructed in Qianfeng New City (including the Industrial Park); this means 10.34km^2 of agricultural land not for construction purposes will be used for construction and the constructed area will achieve 23.86km^2 as compared with the old plan. The constructed area and construction speed will be significantly reduced, so the pressure on the environment and resources will also be reduced accordingly. Despite this, urban expansion will still cause loss of cultivated land, forest land, grassland and greenbelt.

2 Mitigation Measures

(1) Conduct road landscaping works design in implementing road works to forge urban linear landscape; make landscaping works a hard-and-fast rule in building factories.These may supplement the loss in biomass and green areas due to the construction of Industrial Park and beautify urban landscape.

(2) Green space system shall be taken in account in the development of planning. The construction of Qianfeng New City and Qianfeng Industrial Park shall conform to the requirements for the plan. In the *Overall Planning for Qianfeng Industrial Park of Guang'an District in Guang'an City*, it is proposed that the greening system planning of Qianfeng Industrial Park shall proceed from establishing landscape park, standing out natural landscape features, building a park focusing on mountain greening and public lawn and linked by river, road and railway, sufficiently using the group urban space layout, combining the greening with the surrounding mountainous region, forest land, farmland, vegetable plot, etc., forming a greening network system integrating the urban and rural, and finally forming a distinctive green park. According to the planning objective, Jiangjiayan Park, the core of the Industrial Park and the comprehensive service central park is planned to be set in Qianfeng District, and several roadside green spaces are to be set in the important joints combining with the road greenbelt and water greenbelt. The proposed park green space area covering 166.82 hm^2 account for 6.99% the construction land. While according to the regulatory plan of Qianfeng new city under compilation, land for green areas and squares with an area of 228.54 ha accounts for 16.65% the construction land, including three large-scale green areas, numerous theme parks and community parks. The plan also requires to arrange 15m wide protective greenbelt around substation, gas pressure regulating station and water supply pump station, 8m wide protective greenbelt around the waste transfer station, 15m wide protective greenbelt between the water supply pump station and surrounding areas, 20~30m wide protective greenbelt on two sides of the trunk road and 50m wide protective greenbelt on two

sides of the branch line for coal transport. Single side of the passageway for flood discharge shall be controlled based on 10m-wide protective greenbelt no less than 20m, with other branches no less than 10m.

The construction of green space system on one hand strengthen the landscape effect of the road and water system and change people's opinion on the inherent image of industrial park; on the other hand, it can be used as a green channel to the industrial park, and functions as isolation between functional areas, increasing the vegetation amount and area and reducing biomass loss.

12.5.2 Impact of city on environment

The expansion and construction of cities inevitably pollutes the water, air and acoustic environment to a certain degree.See 12.3 and 12.4 for detailed analysis.By analyzing the resources carrying capacity and the environmental carrying capacity, it is possible to determine the carrying capacity of resources and environment on the basic life of residents and the development of Qianfeng Industrial Park; it embodies the sustainable development idea.

1 Analysis of resources carrying capacity

(1) Analysis of water resources carrying capacity

Water used in the Industrial Park is mainly from Qianfeng Town Water Plant and Hedong Water Plant with Longtan River as the water supply source; the original design capacity of Qianfeng Town Water Plant is 3000m^3/d which cannot meet urban demand with the establishment of new Qianfeng District; therefore, the Qianfeng Town Water Plant adds a new water supply source from Daishi Water Plant of Beijing Enterprises Water Group Limited. The Hedong Water Plant was begun to build in the end of 2011, and was completed in October, 2013, it is planned to be put into operation in the end of 2014, with a capacity of 10000 m^3/d, and water source from Longtan River.

The water source Longtan River is originated from Gaoling Village, Guanghui Township in the west side of Huaying Mountain; it runs 30km with a drainage area of 158km^2 and a main channel gradient of 9.26%, its water storage capacity can sufficiently meet the water demand of the Park and support the implementation of the Park plan.

(2) Analysis of power resources carrying capacity

According to load prediction and referring to the outline of the Overall Planning of Qianfeng Industrial Park in GETDZ, and considering to supply power to the off-planning area, a 220kV substation with planning capacity of 2X180MVA and a 110kV substation with planning capacity of 2X63MVA will be built in the planning area.

The safe distance between substation and residential estate shall be no less than 20m.

Power demand in the planning area is very big and so does heating demand.Considering rich coal resource in the area, a cogeneration power plant with a capacity of 2X50MW is suggested by the plan to be built in the area.To improve energy efficiency, combined heat, cold and power supply should be applied, this power plant not only

provides self-use electricity for the Industrial Park, but sells electricity to large power grid.

(3) Analysis of natural gas resources carrying capacity

As a recognized clean and high-quality energy source, natural gas has become an important energy source for modern urban life and industrial production.Natural gas can be connected from the existing provincial DN150 medium pressure gas pipe by DN150 pipe to gas distribution station. According to the overall planning of the Industrial Park, a DN150 gas main will be led out of the gas distribution station to be laid in circular along the proposed road in the Park.Residents and public users can set up low-medium pressure regulator station to adjust the medium gas pressure to low gas pressure for use; and enterprises can set special pressure regulator as required to adjust the gas pressure.

2. Analysis of environmental carrying capacity

The environmental capacity of receiving water bodies is calculated as follows: according to the drainage destination demonstration in the preceding chapter, the drainage destination of WWTP of Qianfeng District and Western Jeans Industrial Zone is Luxi River, where the water environment capacity of COD and NH_3-N is 595.4t/a and 78.47t/a respectively. It is predicted that the discharge of wastewater from WWTP of Qianfeng District and Western Jeans Industrial Zone follows Class IA standard with annual discharge of 365 t/a and 36.5 t/a for COD and NH_3-N.All these values are within the range of water environment carrying capacity of Luxi River.

(2) Analysis of air environment carrying capacity

In this assessment, the multi-source and A-P value method are applied to estimate the environment capacity of regional NO_2, of which the calculated minimum value will be taken as the final value. Statistical results are shown in the table below:

Table 15.5.2-1 Estimated Results of Air Environment Capacity (Unit: t/a)

Indicator	Method of Calculation	Total Environmental Capacity	Predicted Total Amount of Emission	Residual Environmental Capacity
NO_2	Annual concentration up to standard	862.6	18.7	843.9

According to above estimated results, the total environmental capacity of regional NO_2 is about 862.6t/a.

According to the prediction in the preceding section, the predicted total amount of NO_2 emission is 18.7t/a in short term after the execution of planning scheme, which is within the range of regional air environment carrying capacity.

3. Mitigation measures

 Mitigation measures for air environment impact

(1) Reasonably arrange the enterprises to be settled in the Park strictly according to the proposed leading industries and the

layout of industrial land.

(2) Strengthen the control over industrial waste gas pollution in the five aspects: ① promoting cleaner production; ② optimizing the structure of energy utilization by using natural gas in preference; ③ making sure the effective control of waste gas from enterprises' technology; ④ improving the environmental management and surveillance; and ⑤ perfecting the emergency response mechanism in case of accident discharge.

(3) Regularly monitor the enterprises that may produce air pollutants in the park area to ensure the normal implementation of enterprises' waste gas treatment and the emission of up-to-standard waste gas.

(3) Design slow traffic system on the both sides of road, which include pedestrian traffic and non-motorized traffic. The slow traffic system is environmental-friendly and beneficial to personal safety, producing no environmental pollution and conductive to physical activity. Moreover, the slow traffic is integrated with the concepts of fairness and harmony, people foremost and sustainable development. It cannot be replaced by motorized traffic for its roles in improving the short-distance travel efficiency, filling a gap in the bus service, promoting the sustainable traffic development and guaranteeing the travel convenience of vulnerable groups. It competes and cooperates with private motorized traffic and public traffic to constitute the urban passenger transport system.

(4) Strengthen atmospheric environmental management; strictly review and restrict high energy consumption and high pollution industrial project, constantly reduce energy consumption per unit output value and pollution emission standard, and encourage the development and utilization of clean energy.

(5) Shut down small businesses that atmospheric pollution emission exceeds the standard value and the projects which are involved in catalogue of outdated production capacity, technologies and products to be phased out. Energetically promote cleaner production, and boost ISO14000 environmental management system certification in order that resources utilization is shifted from the mode of being extensive to that of being intensive.

(6) Strengthen the management on civilized construction; adopt commercial concrete for urban construction and conduct such dust control measures as closed operation, clean car operating on the road, watering for dust fall so as to control construction fugitive dust.

- Mitigation measures for surface water environment impact

(1) Apply the system of diverting wastewater from clean water and storm water from wastewater by enterprises in the Industrial Park;

(2) Popularize cleaner production processes by enterprises in the Industrial Park;

(3) Implement fully the emission declaration and permit system;

(4) Make sure that wastewater from enterprises in the park area must be discharged to WWTP for further treatment after the wastewater is treated up to Class III standard in *Integrated Wastewater Discharge Standard* so as to realized discharge of up-to-standard wastewater.

(5) Strengthen the water environment protection of rivers and canals in the park area;

(6) Develop proper emergency response plan in case of WWTP accident discharge;

(7) The long-term WWTP treatment capacity may be adjusted according to the actual settlement of enterprises in the Park to make sure the WWTP is capable of receiving the production and domestic wastewater in the Park and avoid pollution of nearby water bodies like rivers.

(8) Complete the construction of existing supporting wastewater interceptor works of WWTP; accelerate the construction of wastewater treatment and supporting facilities, renovate urban wastewater treatment system, apply the system of diverting wastewater from rain water so as to improve municipal wastewater collection rate; establish WWTP, regional wastewater collection, treatment and discharge system in different areas.

- Mitigation measures for groundwater environment impact

(1) Enterprises apply proper ground anti-seepage measures according to possible pollutants form production in the overall principle of higher anti-seepage level and lower infiltration coefficient for regions with more severe pollution and higher probability of accident.

(2) Wastewater from enterprises shall be first treated in respective wastewater treatment facilities until the wastewater satisfy the requirements of being received by the WWTP and then enter into the WWTP where it shall be treated up to standard before discharge. It is forbidden to discharge wastewater arbitrarily. The wastewater under accidental condition and fire-fighting wastewater shall be discharged into the accident pool, guided in batches into respective wastewater treatment facilities until the wastewater satisfy the requirements of being received by the WWTP then enter into the WWTP where it shall be treated up to standard before discharge.

(3) Strengthen the maintenance and management of WWTP to ensure the long-term stable discharge of up-to-standard wastewater after centralized treatment and prevent the accidental discharge of wastewater from severely affecting the surface water and groundwater;

(4) Perform strict quality inspection during the construction of proposed area and strengthen the anti-seepage treatment of pipeline and structures in the design and construction to make sure the engineering and pipeline construction are in line with

design requirements and guarantee both the quality and quantity.

- Noise control measures

  (1) Measures for industrial noise control, arrange reasonably to the noise level at boundary is up to standard;.

  (2) Measures for construction noise control, arrange the construction time reasonably;

  (3) Measures for traffic noise control, buildings sensitive to noise, including residential and school buildings should not be planned or constructed on both sides within 30m from the main roads and main traffic artery of proposed area; besides green belt of 20-50 wide shall be established to mitigate the impact of traffic noise by means of range attenuation and noise reduction by afforestation.

  (4) Measures for controlling noise of social activities.

- Solid waste management and disposal measures

  (1) Strengthen the management of general industrial solid waste, realize reclamation of waste and used materials, explore approaches of comprehensive utilization, strengthen the disposal and exchange management of industrial solid waste, establish the information system for industrial solid waste production, direction of flow, storage, disposal and exchange and encourage the waste recycling among production enterprises in the Park;

  (2) Implement the system of hazardous waste production, declaration and registration, and the permit system for the business of hazardous waste storage, collection, disposal and facility utilization. The whole process management shall be provided in the collection, transport, storage, utilization, treatment, disposal of hazardous waste.

  (3) Establish the waste collection system, waste storage system, waste transport system and waste treatment system and realize harmless disposal of domestic waste.

12.5.3 Impact of urban construction on natural drainage

In the land development, there is no river being occupied, so the natural width, the flow direction and river width will not be changed; land leveling is required before land development, which may change the landform to a certain degree and have some impact on the natural runoff inside the county downtown. The system of diverting storm water from wastewater is applied in the planning and construction of pipe network, namely, the storm water runoff on the road of Park is connected with storm water pipe network and flows into river after sedimentation, while the wastewater flows in to the WWTP for discharge into natural water bodies after being treated up to standard; therefore, this development in Qianfeng District has limited impact on the quantity of natural water bodies.

The construction of roads and factories will transform the ground in park area from natural soil into impervious areas such as cement floor and asphalt pavement and the hardened ground reduces the permeability of natural soil layer, which may, to some extent, hinder the direct supplementation of aquifer by atmospheric precipitation.

2. Mitigation measures

Since natural soil has transformed into impervious areas such as cement floor and asphalt pavement, the hardened ground reduces the permeability of natural soil layer, which may, to some extent, hinder the direct supplementation of aquifer by atmospheric precipitation. So the relations between infrastructure construction and natural drainage and groundwater recharge are fully considered during construction development.

Therefore, during the park construction, factors such as the infiltrating green area, the pervious ground and the urban drainage capacity may be considered to improve urban natural drainage rate.

Infiltrating green area: during the urban construction, the green area near the factory and road will be lower than the road and factory levels, through which the storm water runoff from surrounding hardened ground flows naturally into the green area to supplement the groundwater.

Pervious ground: pervious asphalt pavement is considered for the road in the implementation of road works; measures such as pervious colored pavement brick are taken for the pedestrian path; impervious pavement in catchment area are improved by using porous materials instead of completely hardened ground to increase the amount of infiltration and supplement the groundwater.

Urban drainage: with reference to the actual situation in urban area of Qianfeng District, the design repetition period of rainfall, P, in planning is recommended to be: P= 2-3 years for general residential district and roads; P= 3-5 years for the central area, artery and square; and P= 10 years for the extremely important area. During the planning design, the impact of rain storm to the city is fully taken into consideration to ensure the drainage capacity of the city.

12.5.4 Farmland loss caused by urban construction

1 Impact modes

Urban expansion will intrude into the farmland and currently, the developed and constructed area is 6.15km^2 in the old downtown of Qianfeng and the Industrial Park, and the Industrial Park has been half done. According to the *Regulatory Plan of Qianfeng New City of Guang'an* under preparation, by 2030, 16.49km^2 will be constructed in Qianfeng New City (including the Industrial Park); this means 10.34km^2 of agricultural land not for construction purposes will be used for construction. In other words, there will be over 10km^2 of farmland, forest land and grassland converted to urban construction area by 2030. Farmers' land will vanish in the process of urban development, and be replaced by industrial enterprises and centralized residential areas, etc. But the constructed area will achieve 23.86km^2 as compared with the old plan, and the constructed area and construction speed will be significantly reduced, so the pressure on the environment and resources will also be reduced accordingly.

According to investigation, residents´ income of Qianfeng District is largely from nonfarm income like migrant workers and so on, other incomes account relatively low proportion, indicating the affected are less dependent on the land. The overall impact of the losses caused by farmland is limited, but the impact on some area and rural population shall

be fully valued.

2. Mitigation measures

Economic compensations are provided for the acquisition of housing and farmland. The establishment of local enterprises provides employment opportunities and increases income of local workers. The infrastructure improvement at project site may attract external enterprises which need to recruit may local works for their development, thus create creating many new jobs, providing employment opportunities for local low-income groups, vulnerable groups and women, and providing jobs for land-lost farmers to increase their income and improve the living standard of local residents.

For the projects occupying high yield farmland, the farmland with equivalent number and quality as the occupied basic farmland may be reclaimed in way of “Reclaming as much as the occupied land”. If there are no conditions for reclamation or the reclaimed land does not meet the requirements, fees for reclamation of cultivated land shall be paid in accordance with the provisions as a special fund for reclamation of new land. The topsoil of the plough layer of adjusted farmland shall be used in the newly reclaimed land, poor land or other cultivated land for soil amelioration in accordance with the requirements by local people's governments at and above the county level during construction.

12.4.4 Addressing Cumulative Environmental Impact

1 Environmental Management

Shut down small businesses in that atmospheric pollution emission exceeds the standard value and the projects which are involved in catalogue of outdated production capacity, technologies and products to be phased out.

Qianfeng District was born in 2013. At present, Administration of Work Safety and Environmental Protection Bureau of Qianfeng District, Guang’an is established, and the number of persons in charge of environmental protection is about 30. In the future development and construction, the establishment of authorities shall be further improved, taking into full consideration the development of Qianfeng District. Environmental monitoring and supervising of Qianfeng District is ensured to be conducted.

2 Implementation of Environmental Protection Measures

In the process of urban development, environmental impacts shall be eliminated, and specific environmental protection measures shall also be implemented and managed.

(1) When the urban planning is carried out or adjusted by the planning department, the percentage of urban green areas in the total planning area shall be fully taken into consideration. During the process of planning land, it is avoided to incorporate high yield farmland into the planning area; in the construction and development of Qianfeng District, Qianfeng Housing Urban-Rural Development Bureau shall implement the construction of greenbelts works according to the planned green areas by the planning department.

(2) According to the enterprise settlement in Linshui County, Qianfeng Water Affairs Bureau shall promptly adjust the treatment capacity of WWTP for effective wastewater collection and treatment in the park.

(3) Qianfeng Housing Urban-Rural Development Bureau shall pay attention to the construction of the pipeline works in Linshui County, such as wastewater pipe network, rainwater pipe network and water supply pipe network, to effectively collect wastewater from different areas in Qianfeng so that wastewater is transmitted to WWTP for further effective treatment; the repetition period of rainfall in Linshui County shall be taken into account, so as to ensure adequate drainage capacity provided by the rainwater pipe network to reduce the impact of rain storm to the city;

(4) During the implementation of road works by Qianfeng Housing Urban-Rural Development Bureau, the utilization of new materials, such as infiltrating green areas, pervious asphalt pavement, pervious colored pavement brick, is required for the construction of the road works to reduce the impacts of pavement hardening on natural drainage.

(5) Qianfeng Bureau for Environmental Health establish the waste collection system, waste storage system, waste transport system and waste treatment system, and focus on the capacity of the waste landfill so as to be subject to hazard-free treatment for general industrial waste and domestic garbage.

The source of capital mainly includes self-raised funds and loans.

12.4.5 Detailed cumulative environmental impact assessment – A strategic environmental and social assessment

During preparation of EIA of the Project, induced and cumulative environmental impact assessment is conducted based on the available data. However, given the actual situation of Qianfeng District as a new area, the insufficient of data available, and various urban and industrial developments planning currently under preparation and perfection, the current induced and cumulative environmental impact assessment is only a preliminary one. On the other hand, the pressure and impact of rapid urbanization and industrialization on the environment, resources and society have to be coped with seriously. Therefore, in the technical assistance part of the Project a second-stage induced and cumulative environmental impact assessment is devised. This assessment shall, based on preliminary assessment, further collect data, conduct research and consultation, and carry out detailed cumulative environmental impact assessment. The assessment will closely coordinate with various ongoing planning and will cover environmental and social issues, thus is considered a strategic environmental and social assessment. The TOR (term of reference) shall include the following:

Terms of reference for the induced and cumulative impact assessment
The rapid assessment method is proposed for this assessment and the impact assessment shall be performed in combination with other factors of technical assistance project, in particular the preparation of strategic urban plan. The assessment procedures include: **1** Components introduction and background:

Terms of reference for the induced and cumulative impact assessment
Describe the proposed project component, its background and other components and activities that may have any cumulative effect; use the environmental assessment report and other documents, such as overall urban planning of Qianfeng District (zoning plan of Qianfeng District), regulatory plan of Qianfeng New City, relevant environment function zoning, resource utilization, historical cultural areas and cultural relic protection, by the consultant. In the induced and cumulative impact assessment (CIA), determine the sequence of component planning and construction, the sequence of affiliated and local infrastructure construction and the possible industrial type and development status. Identify the potential impact on important environmental factors and put forward geological information (including the administrative boundary or watershed), evaluation space and time limit by the consultant for cumulative impact assessment. Component introduction includes: (1) Known components Components that have been implemented inside the assessment area for World Bank loan and other regions, for which the description covers the scale, overview and scheduled implementation time of current stage; the World Bank loan funded components in the same area and the overview of proposed construction area in current period; the urban infrastructure related to the known components including the proposed roads, power transmission lines and gas transmission lines; and for which the environmentally sensitive area, main stakeholders and affected residents in the region shall be identified. (2) Past, present and future possible components After the determination of assessment scope and environmental impacts, the past, present and future possible components and activities in particular time and space frames shall be analyzed. The assessment of other components and activities shall consider: Assessing all components proposed or planned to be implemented in the assessed area; · Determining the time period of past, present, proposed and proposed future components; • Assessing the **a**pproved components, components to be approved and components proposed or being designed in the area for cumulative impact assessment; • Assessing the potential industrial development pattern and its potential pollution load in the area for cumulative impact assessment; • Assessing the environmental factors of reasonably foreseeable social and environmental cumulative impacts, in particular components exerting direct impact on the water resource, land resource and biodiversity and drawing basic maps for the future development of existing and future components and expansion area. (3) Identification of important environmental and social issues Identify the cumulative impacts of urban expansion in assessment scope to important resource, such as on the groundwater, the biodiversity and the life of

Terms of reference for the induced and cumulative impact assessment

local people, all of which are usually known as valued ecosystem components (VECs) and determined through consultation with potential affected groups, local government authorities, non-governmental organizations and experts and scholars to make sure that they could be measured with relevant indicators. The potential VECs and indicators may include:

Damage of urban green area, green belts and natural habitats caused by urban expansion;

Automobile exhaust due to urban road construction and increased number of vehicles and noise from running vehicles; impact of factory construction in ETDZ to the quality of ambient air and acoustic environment;

Natural soil with good permeability used for the ground in the region prior to the development and construction; but the ground will be hardened in the urban construction. The hardened ground reduces the permeability of natural soil layer and the concrete has poor permeability, which may, to some extent, hinder the direction supplementation of aquifer by atmospheric precipitation.

The farmland owners will lose their land due to the urban expansion, which may impact the income source and sustenance of farmers to some extent.

Urban expansion and infrastructure constrguction exerts effects on physical cultural resources (such as Daliang Fortress).

(4) Baseline map

Use geographic information system or other tools to mark the selected VECs. Develop the plan on the required indicators for status, environmental carrying capacity, urban development trend and urban expansion for each VEC within the time frame.

2 Impacts Assessment

The degree of induced and cumulative impacts shall be assessed. For this, the method used is similar to the environmental assessment, but the components within given time and space frames are assessed in the induced and cumulative impact assessment as well as other components and activities.

The assessment includes the impacts during the construction and the planning and development stages. The assessment of each environmental factor and cumulative impact considers the typical parts of environmental assessment, i.e., the degree, frequency, duration, order of magnitude, uncertainty and possibility. The assessment method is subject to the qualitative analysis and the analysis on available quantitative data obtained via data collection or analogy; the assessment may consider the map overlay method to analyze the future industrial development and additional load of environmental system, such as the WWTP.)

3 Determie impact degree or scope

The degree and scope of cumulative impact is determined. The impact degree shall be determined according to the preset threshold limits, laws, rules or policies, or the professional judgment and consultation based qualitative assessment and the degree or scope of cumulative impact must stand up to scrutiny.

The assessment consultant shall define the impact degree and scope, following

Terms of reference for the induced and cumulative impact assessment

them in the past, present and planned components. The impact degree or scope of each VEC in any past, present and future components is subject to assessment, as well as the cumulative impact of induced development.

4 Development of impact mitigation measures

Reasonable and feasible methods are analyzed to mitigate or avoid significant induced and cumulative impacts. Corresponding action plans (including the time, organization and duties and budget) are developed according to the analysis conclusions to clarify the mitigation measures and incorporate such measures in to the environmental management plan. For example, the available environmental impact mitigation measures for the urban region development or the development and construction of industrial park include:

- Full consideration of landscaping area in factories during the construction and green belt creating surrounding the industrial park;
- Riparian parks for main rivers of Qianfeng District, such as Luxi River; full consideration of green belt and green area in the center of street in the design of urban streets to form green corridors in Qianfeng District and bring benefits to the urban ecological environment and landscaping;
- Emphasis on protection or bypassing of high yield farmland during the planning and expansion of city and ETDZ;
- Full consideration of phased WWTP construction and adjustment of WWTP capacity according to the population increase and enterprise settlement in Qianfeng Industrial Park and residential area to satisfy the urban expansion requirements;
- Full consideration of new materials in road construction (i.e., pervious asphalt pavement), full consideration of infiltrating green area (lower than the factory and road level) in road and factory construction and use of porous materials in catchment area instead of completely hardened pavement to reduce the possible impact on groundwater supplementation by atmospheric precipitation;
- Development of more complete, normative and stringent requirements on water and air pollutant emission by local environmental department for factories inside the Industrial Park;
- Strengthened surveillance by local environmental department on water drainage and gas emission from enterprises inside the ETDZ and development of environmental detection plan for better understanding of pollutant discharge in park area;
- Development of other traffic systems, such as slow traffic, and consideration of bicycle path and pedestrian path;

It is suggested that the adaptive management method for impact be included since the high uncertainty of impact or the lack of information may result in incomprehensive assessment.

12.6 Conclusion

The induced and cumulative environmental impacts are preliminarily assessed through the comprehensive analysis based on the terms of reference and the

summary of general urban planning, planning environmental impact assessment and status survey. It is know from the screened main induced and cumulative environmental impact factors that the cumulative impact in Qianfeng District and residential areas will be significant by 2020. Due to the limited available materials, there is a lack of detailed and complete data and materials concerning the environmental and social impacts of the infrastructure construction and the industry and commerce development of Western New City and Eastern New City. It is difficult to conduct more definitive and quantitative analysis, so the particular cumulative impact assessment combined with the actual regional development and basic data is required during the construction period.

13 Conclusions

13.1 Project Background and Composition

13.1.1 Project background

The Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project meets the need to realize the national economic development strategy. As required in the notice issued by the National Development and Reform Commission, the Ministry of Finance, the World Bank loan shall be actively applied to the infrastructure construction for Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area. In the second half of 2011, Guang'an City launched the loan application for the Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project (including Qianfeng and Linshui Components) and in the early half of 2012, the Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project was included in the World Bank Loan Funded National Plan for 2013-2015.

According to *China's Memorandum for Proposed Infrastructure Project for Sichuan-Chongqing Cooperation Demonstration Area* dated June 2013, the Infrastructure Project for Qianfeng Industrial Park of Guang'an is one of the components in the Sichuan-Chongqing Cooperation: (Guang'an) Demonstration Area Infrastructure Development Project .

13.1.2 Items

The development of Project is targeted at meeting the current and prospected development demands of Qianfeng and supporting the improvement for traffic, wastewater treatment, labor skills and investment promotion services. For this purpose, the Project will support the following activities:

(a) The overall length of public space and interceptor works on both sides of Luxi River at the central downtown will be 2.5km; (b) the overall length of the Industrial Avenue connecting Qianfeng Railway Station and the central downtown will be 3.3km; (c) the overall length of North and South Binhe Road (including rain pipe, wastewater interceptor, landscaping and lighting) and greenbelt on both sides of downstream Luxi River will be 8.24km and 5km respectively.

13.2 Existing Environmental Quality

1 Ecological environment

The Project is located in Qianfeng District, at present the project area is largely rural land and the natural vegetation is basically artificial vegetation, ecosystem in the project area is simple. According to investigation, the Project area does not involve any culture relic protection site, natural reserve, forest Park, water-source reserve and other ecologically sensitive areas.The assessed area is free of large wild beasts due to the frequent human activities. However, mustelidae and rodent animals such as mustela sibirica, lepus capensis, house mouse and other common species are distributed in the woodland, shrubwood and farmland in low mountainous and hilly areas.

2 Acoustic environment

(1) Road works component

According to site investigation and the status monitoring result, the noise status is 42.7~64.7dBA during the day and 37.2~61.6dBA at night. Two sensitive areas in Daijiayuanzi, Group 5, Eli Village as well as Group 1 and 2 of Jijian Village are apparently affected by railway noise due to close to Xiangyang-Chongqing railway; the noise status is 64.1~64.7dBA during the day (up to the standard) and 60.7~61.6dBA at night (exceeding 5.7~6.6dBA). Group 3 and Group 8 of Chunlei Village are affected by highway noise due to close to National Highway G304, with large noise at present.

Other sensitive areas are located in the countryside, where there is no intensive noise source but noise mainly comes from social activities. The noise status is 42.7~60.6dBA during the day and 37.2~54.1dBA at night, both meeting the standard.

(2) Wastewater Interceptor Works

Wastewater interceptors are under South and North Binhe Road, with same acoustic environment investigation result as Binhe Road. According to the status monitoring result, the noise status is 42.7~60.6dBA during the day and 37.2~52.7dBA at night, with excellent acoustic environmental quality.

(3) Landscape Works

The river course for landscape works is being reconstructed and later landscape will focus on landscape building. At present, noises are mainly from engineering construction and social life. The sensitive areas distributed on both sides are mainly Qianfeng Town's residential buildings, with the bottom floor as shops and 2-6 floors as residential area. According to the status monitoring result, the noise status is 54.8dBA during the day and 48.3dBA at night, meeting the requirements of Class-II standards, with excellent acoustic environmental quality.

3 Air environment

Status monitoring shows that indexes of each monitoring point within the air assessment scope all meet standard, satisfying relevant Class 2 standard of *Ambient Air Quality Standard (GB3095-2012)*.Air quality in Project area is pretty good.

4 Surface water environment

Monitoring results show that water environment quality of Luxi River is pretty good, all water quality indexes meet Class 3 standard under *Environmental Quality Standard for Surface Water (GB3838-2002)*.

5 Groundwater environment

Monitoring is performed in farmers' wells in Shuangshi Village, Suzhai Village and Jingwan Village, results show that groundwater quality is pretty good in Qianfeng District, all water quality indexes meet Class 3 standard of GB/T14848-93.

6 Domestic waste

There is no refuse landfill in Qianfeng District, only a household garbage transfer station is available; the road garbage and domestic garbage, after

being cleared and collected to garbage transfer station is transferred to Guang'an Puan Refuse Processing Plant for treatment.

13.3 Environmental Impact and Countermeasures during Construction

1 Ecological environment

Impact Analysis: As the construction continues, some plant species within the scope of land requisition will disappear and the vast majority of plant species will be greatly reduced, so the regional biodiversity will be affected hereby. However, all damaged vegetation types are common types in the assessed area, without national key protected rare or endangered plants and wild plants. Therefore, infrastructure construction in QETDZ has little impact on the flora and vegetation type, which will not lead to the extinction of existing species and vegetation types in the region. After the construction period, the vegetation will be gradually restored through landscape construction, and it will make up the loss of plant species diversity.

The direct impact on terrestrial animals is mainly from group activities of construction personnel and disturbance on animals during construction; while the indirect impact refers to the damage to vegetation and soil due to the construction of industrial enterprises, resulting in the loss of some terrestrial animal habitats.

The subgrade filling, expanding excavation of river course, temporary piling of spoils and housing demolition during construction will crush and damage the surface vegetation, disturb the topsoil structure and change the existing terrain. New water and soil loss may be caused under the action of gravity, raindrop hit, current scour and other exterior forces.

Prevention measures: Plants and trees in the middle and on the sides of roads shall be transplanted and protected, completely destroying the existing vegetation and planting new ones is not preferred, instead, they shall be temporarily transplanted and replanted according to greening design.Be aware to protect trees and green belt in the adjacent areas during construction;

Road construction shall be conducted within the right-of-way as possible; earth-pile and stock-pile shall not intrude into the farmland nearby;

As for the ruins belt caused by demolition in construction, this shall be handled by carrying out orderly demolition zone by zone and to avoid messy landscape, and barrier or protective plate (wood, glass, and iron sheet, etc.) may be used as fence to reduce landscape pollution;

reasonable allocation shall be made for excavation and backfilling construction; excavation and backfilling construction shall not be done in rainy days to prevent water and soil loss by rainwater washing from polluting the water body and blocking drainage pipe;

Meeting the construction demand, land occupation shall be minimized as possible and construction schedule shall be rationally arranged. After work finished, clean the construction site in time, withdraw from the occupied land, restore the original road and greening;

Reasonably arrange the construction period to avoid rainy season construction so as to minimize soil erosion.

Strengthen construction management and supervision and regulate construction activity to reduce construction land occupation and vegetation loss and reduce damage to wildlife habitat. Regulate construction activity and perform construction reasonably and orderly; optimize construction organization by gradually advancing construction in one direction in the same construction section, staggering the construction peak between two adjacent construction sections to avoid large scale concurrent construction in the same area and to reduce disturbance of terrestrial ecological environment by disordered construction.Strengthen environmental protection publicity and education and wildlife protection knowledge propaganda on the construction staff by multiple means like announcement, leaflets, blackboard newspaper and meetings to improve environmental awareness; forbid constructors from hunting frogs, snakes, wild animals, birds and other wildlife and engaging other activities hazardous to ecological environment protection.

The subgrade filling, expanding excavation of river course, temporary piling of spoils and housing demolition during construction will crush and damage the surface vegetation, disturb the topsoil structure and change the existing terrain. New water and soil loss may be caused under the action of gravity, raindrop hit, current scour and other exterior forces. According to related contents in the *Water and Soil Conservation Plan for the Infrastructure Project for Qianfeng Industrial Park in World Bank Loan Funded Sichuan-Chongqing Cooperation (Guang'an) Demonstration Area*, the Project may produce a possible water and soil loss of 21844t, in which 20940t may be caused during construction and construction preparation. The prediction amount of water and soil loss during the construction period accounts for 95.86% of total prediction amount. Therefore, construction period is critical to prevent water and soil loss.

Prevention measures: Plants and trees in the middle and on the sides of roads shall be transplanted and protected, completely destroying the existing vegetation and planting new ones is not preferred, instead, they shall be temporarily transplanted and replanted according to greening design. Be aware to protect trees and green area in the adjacent areas during construction. Road construction shall be conducted within the right-of-way as possible; earth-pile and stock-pile shall not intrude into the farmland nearby.

As for the ruins belt caused by demolition in construction, this shall be handled by carrying out orderly demolition zone by zone and to avoid messy landscape, and barrier or protective plate (wood, glass, and iron sheet, etc.) may be used as fence to reduce landscape pollution;

Reasonable allocation shall be made for excavation and backfilling construction; excavation and backfilling construction shall not be done in rainy days to prevent water and soil loss by rainwater washing from polluting the water body and blocking drainage pipe;

Meeting the construction demand, land occupation shall be minimized as possible and construction schedule shall be rationally arranged. After work finished, clean the construction site in time, withdraw from the occupied land, restore the original road and greening;

Reasonably arrange the construction period to avoid rainy season construction so as to minimize soil erosion.

Strengthen construction management and supervision and regulate construction activity to reduce construction land occupation and vegetation loss and reduce damage to wildlife habitat. Regulate construction activity and perform construction reasonably and orderly; optimize construction organization by gradually advancing construction in one direction in the same construction section, staggering the construction peak between two adjacent construction sections to avoid large scale concurrent construction in the same area and to reduce disturbance of terrestrial ecological environment by disordered construction. Strengthen environmental protection publicity and education and wildlife protection knowledge propaganda on the construction staff by multiple means like announcement, leaflets, blackboard newspaper and meetings to improve environmental awareness; forbid constructors from hunting frogs, snakes, wild animals, birds and other wildlife and engaging other activities hazardous to ecological environment protection.

The ecological impact on the region due to water and soil loss is mainly as follows:

(1) The damage of surface vegetation causes some impact on the ecological environment in project area. The cultivated land, forest land, water area, wasteland and other soil conservation facilities with soil and water conservation function occupied for the construction of main works cover an area of 46.69hm^2, and surface vegetation destruction in the project area reduces the percentage of forestry and grass coverage, which will exert some impact on the ecological environment in the project area.

(2) Impact on river course

Some project pipelines are laid along Luxi River. If the water and eroded soil flow into the river along the slope during construction, the river course may be blocked and it may impact the downstream of the dam.

(3) Impact on the project area and surrounding production and living environment

For the construction in new district of the town and the industrial park, protective measures are not taken, so greater soil and water loss will adversely impact the surrounding production and living environment while impacting the construction schedule.

2. Acoustic environment

If a single construction machinery is used, the noise level at place where is 35m away from the construction site may achieve the value specified in Noise Limits for Construction Site (GB12523-90) in the day and that 218m away from the construction site may achieve the standard limit at night. But in the actual construction process, a variety of machines are often used at the same time, so the noise will have a boarder scope of impact. Within around 5-30m in average from the boundary of construction site in the noise sensitive area, the construction noise of have greater impact on surrounding acoustic environment. In the daytime, the first row of residential buildings on both sides of the road will produce different levels of impacts and the impact on rest of the residents is particularly obvious at night. Therefore, measures must be strictly taken to minimize the impact of construction noise on the environmental protection target. When the project is completed, the impact of construction noise will no longer exist,

so the adverse impact of the construction noise on environment is temporary.

Prevention and control measures: Reasonable and scientific construction site layout is a major way in reducing construction noise. Place the fixed noise sources on the construction site collectively to reduce the scope of noise impact. Arrange construction time reasonably in accordance with the provisions of the *Emission Standard of Environment Noise for Boundary of Construction Site* (GB12523-2011). Forbid construction operation with high-noise machinery at night (22: 00~6: 00). Adjust construction time as appropriate or take temporary noise reduction measures like setting up temporary noise barrier (i.e., temporary wood sound barrier) or adopting semi-underground construction and so on when performing construction near residential area. For worksite requiring continuous construction operation, the Contractor shall contact in time the environmental protection department according to specific situation to apply for nighttime construction certificate as per regulations and strive for public support as much as possible by issuing announcement.

3. Air environment

The pollution to ambient air during the construction of the Project is mainly from: first, the fugitive dust produced by lime-soil mixing, concrete mixing and vehicle transport during construction; and second, the asphalt smoke produced by pavement. The road dust caused by transport vehicle has an impact within 20-50m.During demolition, dust cloth fence is applied for enclosed construction and watering is conducted for dust fall, so that the impact range of demolition dust may be controlled in an enclosed area. Besides, the earth-rock excavation and infrastructure construction create a certain amount of fugitive dust. The impact distance of smoke pollutants emitted when conducting asphalt pavement is around 100m from the downwind; but according to the construction organization, the asphalt pavement operation time is short and its impact is temporary.

In summary, ambient air pollutants, mainly including road dust caused by transport vehicle and construction dust, are generated during the construction links like land leveling, subgrade construction, pavement, material transport, handling and mixing and asphalt pavement. Therefore, different levels of impacts on the air environment for the surrounding resident households will be produced during the construction period, but the impact is temporary.

Prevention and control measures:

(1) The Project site management shall strictly refer to the construction site management principle of “Six Musts” and “Six Mustn’ts”. Six Musts include the wet work, the barrier circling on urban road, the road hardening, provision of washing facilities, provision of sufficient cleaning workers, and cleaning the construction site regularly; and Six Mustn’ts include vehicles living without mud, slag vehicle not overloaded, no throwing or littering of construction sediment, no concrete mixing on site, no water left on the ground, and no waste burning on site, so that the construction site dust pollution can be effectively controlled.

(2) Provide dust-proof measures like construction barrier at concrete

mixing station, or mix concrete inside building to effectively control dust pollution.

(3) Water in due time the construction site on non-rainy days, including the road section in construction and major transportation road. Watering frequency shall be determined by the site supervision personnel according to the actual situation.

(4) Powder material like cement, lime shall be packed in tanks or bags, bulk transportation of such material is prohibited, dust scattering in transportation is prohibited; while in storage, they shall be stored in warehouse or covered with tarpaulin.

(5) Provide dust-proof mat at exits of construction site; clean the body and tires of transport vehicles out of the construction site. Forbid overload of soil, sand, stone; the loading height shall not exceed that of the carriage plate and the loaded material shall be covered with tarpaulin to prevent them from falling along the way.

(6) In case of a wind velocity above level 4 when it is prone to producing dust, it is suggested that the Contractor should temporarily stop earth-rock excavation and take measures like covering, wetting the stockpile to effectively reduce dust pollution;

(7) Collect and transport the construction waste in time, and cover those which cannot be collected and transported temporarily; tightly cover vehicles transporting sand, stone, cement, earth which are apt to produce dust to prevent falling and leaking.

(8) Provide dust mask for construction personnel to reduce health damage by dust.

(9) Water the temporary storage yard regularly to reduce the impact of dust on the surrounding environment; set up closed enclosure with height no less than that of the piled up material around; divide the boundaries between the material area and road and clean up the scattered materials in time to keep the road neat and clean the road in time.

(10) For soil piled up for over 48 hours in road and pipeline construction, take dust control measures such as using dust-proof covers.

(11) Transport vehicles for spoils shall have enclosed bucket; vehicle cleaning platform shall be provided on the inner side at the entrance and exit for transport vehicles and shall be equipped with proper drainage facilities; before leaving the construction site, vehicles shall have their tires and the bodies washed to remove the soil.

4. Surface water environment

Wastewater during the construction period mainly derives from construction wastewater, domestic sewage produced by construction personnel and wastewater produced by pipeline closed water test. The main pollutant of construction wastewater is SS, which may be reused after sedimentation, while that of domestic sewage includes SS, COD and oil, which upon treatment in sedimentation tank or septic tank may be discharged into water bodies or used as agricultural fertilizer for the surrounding area. The domestic sewage is prohibited to be directly

discharged into nearby water bodies during the construction period.

Control measures:

(1) Construction wastewater in the Project is reused after treatment and is not directly discharged into local water bodies, and domestic sewage is discharged after treatment in septic tank or used as agricultural fertilizer, which in general will not impact the waters quality.

(2) The Contractor of the Project shall make simple processing to muddy water like filtering and sedimentation, and direct discharge is prohibited; the Owner shall strengthen construction management to perform civilized construction.

(3) Domestic waste, construction waste, maintenance garbage would produce pollution if directly discharged into the waters, therefore, they shall be recycled, sorted, stored and treated. The usable materials like most paper, wood, metal and glass wastes shall be reused or sold to garbage buyer, and the unusable shall be handed over to environmental health department for harmless treatment, incineration, landfill, stockpiling, etc.

(4) Residual and waste oils produced in construction shall be collected, recycled and disposed with different vessels; aggregate wash water and concrete batch plant wash water produced in subgrade construction after sedimentation and treatment shall be reused for watering the construction site to reduce dust.

(5) Leakage and pressure test shall be performed after the connection of pipeline works and clean water shall be used in the pressure test of pipes; the pollutant in water from pressure test is mainly SS, which may be collected as dust suppression water or landscaping water after sedimentation.

(6) Well-up water produced in the excavation of WWTP structures shall be used in construction after sedimentation.

5. Impact on groundwater

The Project mainly includes new road works, wastewater interceptor works and WWTP works, of which the construction in general will not lead to changes in groundwater level and will not block the groundwater flow.

Control measures:

(1) Strengthen sewage and production wastewater treatment during construction; the domestic sewage of construction personnel shall be used for agricultural irrigation or recycling after pre-treatment and the production wastewater after sedimentation shall be used for dust suppression in the construction.

(2) Bulk yard shall be covered to prevent water and soil loss from polluting groundwater.

(3) The Contractor shall make scientific schedule and carry out reasonable construction to shorten the construction period and further reduce the impact of pumping and discharging of groundwater.

(4) Organize construction by sections to prevent the additive effect on the falling groundwater level due to the excessive concentration of

dewatering wells in some section.

(5) Increase the number of drain wells as appropriate, choose reasonably the locations of drain wells to minimize the distance from the pipeline in construction so as to reduce the impact scope of falling groundwater level.

(6) Construction of the foundation of sewage wells shall be arranged in non-flood season to reduce the adverse impact of a lower groundwater depth on construction.

6 Solid waste

The Project involves demolition of buildings and structures within the scope of land acquisition, covering an area of 169,179m^2 and basically of farmers' houses. Construction waste mainly consists of broken bricks, concrete, mortar, pile head and packaging materials, which generate demolition waste of about 113,000m^3. Construction waste produced during construction period shall be transported to the Bureau for Environmental Health of Qianfeng District, Guang'an City for centralized treatment.If untreated and stacked randomly, construction waste and domestic waste produced during construction will impact the soil, air, water environment and landscape along the Project area.

Control measures:

(1) Domestic waste produced in construction shall be classified and collected and shall be collected, transported and disposed collectively by local environmental health department.

(2) Upon completion of works, dismantle the temporary facilities in the construction area, remove construction waste and all sorts of sundry, clear up and level up the domestic waste, simple toilet, and sump, perform disinfection for these with carbolic acid and caustic lime, and restore the construction site.

(3) The contractors shall specially designate personnel to take charge of the collection of production waste; the scrap iron, scrap steel, waste wood pieces shall be stacked at the location specified; random piling and stacking is prohibited; wastes shall be collectively reclaimed and subject to centralized treatment.

(4) In the process of transportation, the domestic waste and building materials shall be enclosed or covered to prevent garbage, sandstone, earth from falling along the way or into the river.

13.4 Environmental Impact and Environmental Protection Measures during the operation period

1. Ecological environment

The natural vegetation will be permanently occupied by the proposed road works with the nature of land use changed, and through natural succession or artificial cultivation, it will be gradually restored to secondary vegetation type with corresponding vegetation features, but the quality of secondary vegetation is superior to the original vegetation. When the road in put into service, the construction of industrial park will be stepped up, furthering the reduction of original vegetation in local region.

During the operation period, the ecological landscape impact is the major impact of works on ecological environment. When the roads and wastewater interceptors are put into service, the status of land use will be changed leading to the variation in the landscape of original rural hills converted and the original landform for the construction of industrial park.

2 Acoustic environment

Impact analysis: according to the prediction results, after the Project constructed, noise in sensitive areas on both sides of roads will increase to varying degree; of which, noise increase in sensitive areas on both sides of urban branch road is not obvious, but that in the monitoring spots on both sides of urban trunk road is large.

Suggestions on noise pollution prevention: Article 12, Chapter 2 of the Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise provides that the urban planning department shall, in determining architectural layout, provide a reasonable noise-proof distance between the buildings and traffic artery in accordance with national acoustic environmental quality standard and civil building design code and propose corresponding planning and design requirements; Article 37, Chapter 5 provides that for new noise-sensitive buildings on both sides of urban traffic artery, certain distance shall be reserved from the road in accordance with national regulations and traffic noise mitigation measures shall be taken; Article 5(2) of Technical Policies for the Prevention and Control of Ground Traffic Pollution (HF[2010] No.7) provides that for noise-sensitive buildings besides roads and tracks, the functions of rooms in a building shall be reasonably arranged to reduce traffic noise impact, for instance, kitchen and restroom and the like in residential apartment shall be located on the side facing the road or tracks. ”

According to the said principles, land use on urban roadsides shall be properly planned and the function of land use along the road shall be strictly controlled; Based on the predicted noise value at varied distance and the predicted distance at which traffic noise meets the standard, it is suggested that acoustic-sensitive buildings like residential areas, schools and hospitals shall not be placed at the first row within 15m of the road centerline. In addition to reasonable planning of land function on roadsides, architectural layout and sound-proof design shall be strengthened to ensure the inside environment of noise-sensitive buildings meets requirements for use.

3. Air environment

Impact analysis: during the operation period, the automobile exhaust has little impact on the quality of regional ambient air along the road, satisfying the Class II standard in *Ambient Air Quality Standard* (GB3095-2012).

Besides, after the implementation of road reconstruction works, the cement pavement is replaced by asphalt pavement. This improves the driving environment, so the engine operates in good status with less pollutant emissions. The works mitigates the pollution load of automobile exhaust to regional air environment instead of polluting the air environment.

Control measures: enforce strict exhaust emission inspection system and restrict traffic of vehicles with excess emissions; organize transport route

scientifically; restrict traffic of ultra-limit slag cars; strengthen road management and road maintenance and keep road in good operation condition and reduce traffic jam. Strengthen landscaping on road sides and plant trees capable of absorbing (or adsorbing) toxic gases like CO, NO_2, etc. to reduce air pollution caused by road traffic.

4. Surface water environment

Impact analysis: when the road works is completed and the road is put into service, the road runoff is collected and sedimented by the storm water collection system established on both sides of the works and then drained into the river, having little impact on the water environment in project area.

The treated WWTP tailwater satisfy the requirements of Class IA standard in *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002), so the discharge of tailwater is predicted to have little impact on Luxi River.

Control measures: collect and sediment runoff on the road surface by the storm water collection system established on both sides of the works and discharge it into the river. The No. 3 WWTP wastewater meets the Class IA standard of GB18918-2002 after treatment in improved oxidation ditch and The No. 2 WWTP wastewater meets the Class IA standard of GB18918-2002 after treatment with “CASS” technology and is discharged in to Luxi River.

5. Groundwater environment

Impact analysis: the impact on groundwater during the operation period of the Project is mainly from the wastewater interceptors and wastewater pipelines.

Control measures: perform strict inspection on the design and construction quality during the project engineering to prevent groundwater pollution from the source and avoid any leakage from wastewater interceptors and wastewater pipelines due to defective material, tube making, welding and misoperation.

Take anti-seepage measures for WWTP, such as HDPE film + impervious concrete for the wastewater collection unit, treatment structures, sludge treatment unit and chemical adding room to prevent the pollution of groundwater environment.

Enhance anti-seepage treatment for the pipe network, bond corner, bearing and joint while keeping proper records for the concealed works and perform regular leak detection and monitoring.

Work out an anti-seepage plan by areas, conduct anti-seepage design targeted at different areas and take reasonable anti-seepage measures.

Develop an emergency plan for the risk accidents of groundwater and identify the closure and intercepting measures that should be taken under the condition of risk accident.

6. Solid waste

The solid waste mainly includes transport materials falling onto the ground during vehicle driving, sludge, waste on the screen and grit produced by WWTP and domestic waste produced by the staff.

Clean up the road in time to collect the waste and hand it to local environmental health department for unified treatment; dispose the dewatered sludge by landfilling, for which the sludge is transported to Pu'an Domestic Waste Landfill in Yuechi County for disposal together with the waste on screen of WWTP and the domestic waste of staff.

13.5 Induced and Cumulative Environmental Impact Assessment

The induced and cumulative environmental impact assessment covers Qianfeng Industrial Park and Qianfeng New City in the urban area of planned Qianfeng District from 2020 to 2030. Qianfeng Industrial Park is included in Qianfeng New City.

Currently, the developed and constructed area is 6.15km^2 in the old downtown of Qianfeng and the Industrial Park, and the Industrial Park has been half done. According to overall plan of Qianfeng Industrial Park prepared in 2011, by 2020, 23.86km^2 will be constructed in the Industrial Park; this means 17.71km^2 of farmland, forestland or grassland will be used for industry, road traffic, etc. While according to the *Regulatory Plan of Qianfeng New City of Guang'an* under preparation, by 2030, 16.49km^2 will be constructed in Qianfeng New City (including the Industrial Park); this means 10.34km^2 of agricultural land not for construction purposes will be used for construction by 2030. The induced and cumulative impact brought by infrastructure construction during urban expansion and pollutant emission increase in the development process of the Industrial Park may be significant in the long run, mainly reflected in the change of land usage, vegetation loss and changes in environmental quality.

The induced and cumulative environmental impact will be further assessed on the basis of current preliminary assessment during the implementation of the Project.

13.6 Conclusion

In accordance with *Guidance Catalogue for Industry Structure Adjustment* (2005) (Order 40 of National Development and Reform Commission of the People's Republic of China), the Project is a government-supported project, in line with the industrial polies of China and local urban planning; and there is neither significant environmental constraint nor environment risk. The impact of project implementation on the environment may be avoided and mitigated provided that the environmental protection measures proposed in this report are carefully taken and the environmental management is strengthened during the construction period, the Project is feasible from the prospective of environmental protection.