SFG2444 V5

The World Bank Financed

Fengxin Water Environment Management Project
Environmental Assessment Report

CERI eco Technology Co., Ltd.

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1 Overview

1.1 Project Introduction

Project Name	The World Bank-financed Fengxin County Water Environment Management Project				
Construction Unit	Fengxin County Leading Group Office of The World Bank-financed Fengxin County Water Environment Management Project				
Legal Representative	/		Contact Person	Hong Yingbin	
TEL.	13970521987	Fax	/	Zip code	330700
Construction Site	Urban Area of Fengxin County				
Approval Department	/		Registered Number of Approval	/	
Type of construction	New ■ Reconstruction and Expansion □ Technical Renovation □		Industrial category and code	Pipeline Engineering E4852	
Occupied area (m2)	/		Green area (m^2)	/	
Total Investment (10,000 yuan)	19707.71	Environmental Protection Investment in the total (10,000 yuan)	238.3	Ratio of the Environmental Protection Investment to the Total Investment	1.2%
EIA Cost (10,000 yuan)	/	Expected commissioning date	2023		

1.2 Project Background

Fengxin County is located in northwestern Jiangxi Province and at the upstream of Nanliao River which is the tributary of Gan River's Xiu River. In order to reduce pollutants being discharged into the Poyang Lake via Nanliao River, and to improve water quality management in Fengxin County, the PLG Office of the World Bank-financed Fengxin County Poyang Lake Basin Town Water Environment Management Project intends to apply for loans from the World Bank to implement Fengxin County Water Environment Management Project.

Currently, the major pollution source of Fengxin County is urban domestic waste, followed by agricultural and industrial waste. Agriculture pollution control is not considered in this project as agricultural pollutant emission spreads in the region and there is few agricultural activities in the urban area. Besides, soil testing and formulated fertilization and

organic fertilizers are used within the entire county. Fengxin's industries are mainly located in the Fengxin Industrial Park in southeastern part of Fengxin's urban area. A sewage treatment plant has already been established in the Industrial Park. The East District is a newly built district with perfect pipe network which achieves diversion of rainwater and sewage. But the drainage network construction in the South District and the North District lags so far behind that most sewage, after collection and without effective treatment, is directly discharged into the nearest water and flows into the Liao River. Therefore, this project is mainly for resolving drainage issues in the North District and the South District.

The implementation of the project will bring us a more comprehensive urban drainage system to safeguard ecological safety of urban water environment, improve the urban diversion system of rainfall and sewage and increase sewage collection and treatment rate. Therefore, pollution of water bodies of Poyang Lake Basin will be reduced from the source and sustainable urbanization will be achieved.

According to provisions and requirements of *Environmental Impact Assessment Law of the People's Republic of China*, *Regulations on Administration of Environmental Protection in Construction Projects*, *Circular on Strengthening Administration of Environmental Impact Assessment for Development Projects Financed by International Financial Organizations* and World Bank Safeguard Policies, the project EIA should be carried out, commissioned by the project owner and implemented by Beijing Jingcheng Jiayu Environmental Technology Co., Ltd.

After accepting the commission, EIA institutes investigated the construction site to collect necessary information and analyze relevant data, then formulated this EIA report according to relevant national environmental laws, regulations and technical specifications together with features of the area where the project is located. This report is now submitted for approval by the World Bank and Fengxin County Department of Environmental Protection.

1.3 EIA Objectives

The EIA aims for illustration of the project's positive environmental impacts, for identification, screening and predictive analysis of the potential negative environmental impacts, and for proposing targeted and effective mitigation measures and EMP to address unavoidable major negative impacts. In addition, the EIA also provides a basis for independent review of the project by the World Bank, comprehensive administration, decision-making and management of the government and the environmental management departments.

1.4 Basis for EIA Preparation

1.4.1 National Environmental Protection Laws and Regulations

(1) *Environmental Protection Law of the People's Republic of China* (April, 2014);

(2) *Environmental Impact Assessment Law of the People's Republic of China* (September, 2003);

(3) *Law of the People's Republic of China on Water Pollution Prevention and Control* (June, 2008);

(4) *Law of the People's Republic of China on Atmospheric Pollution Prevention and Control* (August, 2015);

(5) *Law of the People's Republic of China on Prevention and Control of Ambient Noise Pollution* (March, 1997);

(6) *Law of the People's Republic of China on the Prevention and Control of Environment Pollution Caused by Solid Wastes* (June, 2013);

(7) *Law of the People's Republic of China on Land Administration* (August, 2004);

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

(9) *Law of the People's Republic of China on the Protection of Cultural Relics (revision)* (June, 2015);

(10) *Water Law of the People's Republic of China* (August, 2002);

(11) *Law of the People's Republic of China on Flood Control (amendment)* (April, 2015);

(12) *Law of the People's Republic of China on Soil and Water Conservation* (December, 2010);

(13) *Law of the People's Republic of China on Urban and Rural Planning* (October, 2007);

(14) *Regulation on the Implementation of the Water and Soil Conservation Law of the People's Republic of China* (August, 1993);

(15) *Regulations of the People's Republic of China on Nature Reserves* (October 9, 1994);

(16) *Regulations on Scenic and Historic Areas* (State Council Decree No. 474, September 19, 2006);

(17) *Measures for the Administration of National Wetland (Trial Implementation)* (Lin Shi Fa [2010] No.1, February 21, 2010);

(18) *Provisions on Administration of Wetland Protection* (State Forestry Administration Decree No. 32, March 28, 2013);

(19) *Regulations on Basic Farmland Protection* (State Council Decree No.257, 1998);

(20) *Regulations of the People's Republic of China on River Channel Administration* (State Council Decree No. 3, March, 1988);

(21) *National Ecological Environment Protection Program* (Guo Fa [2000] No. 38, November, 2000);

(22) *Regulations on Administration of Environmental Protection in Construction Projects* (State Council Decree No. 253, November 29, 1998)

(23) *Administration of Environmental Impact Assessment of Construction Projects by Means of Classification Catalogue* (April, 2015);

(24) *Interim Procedures of Public Participation in Environmental Impact Assessment* (SEPA Huan Fa [2006 No. 28], March 18, 2006);

(25) *Decision of State Council on Implementing Scientific Outlook on Development and Strengthening Environmental Protection* (Guo Fa [2005] No. 39);

(26) *Opinions on Enhancing Supervisions of Resource Development and Ecological Environmental Protection* (State Environmental Protection Administration Huan Fa [2004] No. 24);

(27) *Regulations on Control and Management of Pollution in Drinking Water Source Protection Zones* (October, 2010);

(28) *Guiding Catalogue on Industrial Restructuring (2011 Version)* (Revised in 2013);

(29) *Circular on Strengthening Administration of Environmental Impact Assessment for Development Projects Financed by International Financial Organizations* (June, 1993);

1.4.2 Local Environmental Protection Laws and Regulations

(1) *Regulations of Jiangxi Province on Environmental Protection in Development Projects (amendment)* (September 17, 2010);

(2) *Regulations of Jiangxi Province on Environmental Pollution Prevention and Control* (January 1, 2009);

(3) *Methods of Jiangxi Province for Prevention and Control of Pollution to Domestic Drinking Water Sources* (August 1, 2006);

(4) *Jiangxi Surface Water (Environment) Functional Zoning (Approved Draft)* (Document of Jiangxi Provincial People's Government [2007 No. 35], June 29, 2007);

(5) *Regulations on Environmental Protection of Poyang Lake Ecological Economic Zone* (May 1, 2012);

(6) *Methods of Jiangxi Province for Land Acquisition Administration* (December 22, 2001).

1.4.3 EIA Technical Guidelines and Specifications

(1) *Technical Guidelines on EIA: General Principles* (HJ2.1-2011);

(2) *Technical Guidelines on EIA: Atmospheric Environment* (HJ2.2-2008);

(3) *Technical Guidelines on EIA: Surface Water Environment* (HJ/T 2.3-93);

(4) *Technical Guidelines on EIA: Groundwater Environment* (HJ610-2016);

(5) *Technical Guidelines on EIA: Acoustic Environment* (HJ 2.4-2009);

(6) *Technical Guidelines on EIA: Ecological Impacts* (HJ 19-2011);

(7) *Technical Guidelines on Assessment of Environmental Risks of Development Projects* (HJ/T 169-2004);

(8) *Technical Specifications for Ecosystem Status Evaluation* (HJ/T 192-2006);

(9) *Technical Specifications For Regionalizing Environmental Noise Function* (GB/T15190-2014);

1.4.4 World Bank Safeguard Policies

Correlation analysis was conducted in the EIA work between this project and World Bank safeguard policies/procedures. Results are shown in Table 1-1.

Table 1-1 World Bank Safeguard Policies

World Bank Operation Policies (OP)/Procedures	Whether Referred to	If Yes, Why?
OP/BP 4.01 Environmental Assessment (EA)	√	This policy was referred to in this project. This is a water environment management project, which aims for reducing the pollutant inflow into surface water to improve local environmental quality, thus leading to environmental benefits; meanwhile, it will bring some negative impacts such as: (1) common influence caused by construction; (2) noises of the equipment during the operation period.
OP/BP 4.04	×	This policy was not referred to in this project. The project site is located in

Natural Habitat		the urban area, without involving any natural habitat.
OP/BP 4.36 Forestry	×	This policy was not referred to in this project. The project will not have any impact on the health and quality of forests, nor will it damage interests of the masses and people's dependency on forests who enjoy the forest ownership.
OP/BP 4.09 Pest Management	×	This policy was not referred to in this project. Pesticide purchase is not needed in this project, and no additional pesticide will be used.
OP/BP 4.11 Physical Cultural Resources	×	This policy was not referred to in this project. The construction site is located in the urban area which, according to site survey and investigation, does not involve any material culture resource.
OP/BP 4.10 Ethnic Minorities	×	This policy was not referred to in this project. The project area involves neither indigenous nor any ethnic minority area.
OP/BP 4.12 Involuntary Resettlement	√	This policy was referred to in this project. The construction activities will temporarily or permanently occupy some land.
OP/BP 4.37 Dam Safety	×	This policy was not referred to in this project. The construction neither involves any dam, nor does it rely on any existing dam or dams under construction.
OP/BP 7.50 International Waters	×	The proposed project site is located in Fengxin County, Yichun City, Jiangxi Province of China and does not involve any international waters.
OP/BP 7.60 Disputed Area	×	The project site is located entirely in Jiangxi Province, without involving any disputed area.
BP 17.50 Information Disclosure	√	Public consultation and information disclosure were conducted for EIA documents.
IFC Environmental, Health and Safety General Guidelines	√	IFC *Environmental, Health and Safety General Guidelines* applies to this project.
IFC Environmental, Health and Safety Guidelines for Water and Sanitation	√	IFC *Environmental, Health and Safety Guidelines for Water and Sanitation* applies to this project.
IFC Environmental, Health and Safety Guidelines for Waste Management Facilities	√	IFC *Environmental, Health and Safety Guidelines for Waste Management Facilities* applies to this project.

1.4.5 Relevant Project Documents

(1) Project Feasibility Study;
(2) Project Resettlement Plan;
(3) Project Social Impact Assessment.

1.5 EIA Contents and Key Points

Pursuant to requirements of domestic EIA technical guidelines and the World Bank's safeguard policies, the EIA report focuses on answering the following questions:

(1) Engineering characteristics of the project and major environmental problems that may arise;

(2) The project's major environmental protection targets (sensitive points);

(3) Potential positive environmental benefits and negative environmental impacts through the implementation of this project;

(4) Measures to mitigate negative impacts caused by this project;

(5) Alternatives analysis;

(6) Environmental Management Plan (EMP).

1.6 EIA Standards

The IFC *Environmental, Health and Safety General Guidelines* (EHS) contains standards and requirements about gas emission, noise and acoustic environment quality, waste water, waste management, and occupational health and safety.

The assessment criteria was finalized by comparing and analyzing the applicable domestic standards with those in the World Bank's *Environmental, Health and Safety Guidelines*. Specific comparative analysis and results are shown in the following content.

1.6.1 Environmental Quality Standards

1.6.1.1 Ambient Air

According to EHS, the ambient air quality should meet required standards in national laws. Were there no national standards, the latest *World Health Organization Air Quality Guidelines* or other internationally recognized standards should be applied. See Table 1-2. China has issued *Ambient Air Quality Standards* (GB3095-2012). Classified according to functional zones of ambient air quality, the project site belongs to the category II zone, and category II standard in *Ambient Air Quality Standards* should be applied. See Table 1-3.

Table 1-2 Ambient Air Quality Standards in EHS (μg/m3)

Item	Average Cycle	Guidance Value	Standard
SO_2	24h	125 (target value of phase I) 50 (target value of phase II) 20 (guidance value)	WHO's *Global Air Quality Guideline*
	10min	500 (guidance value)	
NO_2	1a	40 (guidance value)	
	1h	200 (guidance value)	
PM_{10}	1a	70 (target value of phase I) 50 (target value of phase II) 30 (target value of phase III) 20 (guidance value)	
	24h	150 (target value of phase I) 100 (target value of phase II) 75 (target value of phase III) 50 (guidance value)	
$PM_{2.5}$	1a	35 (target value of phase I) 25 (target value of phase II) 15 (target value of phase III)	

	24h	10 (guidance value) 75 (target value of phase I) 50 (target value of phase II) 37.5 (target value of phase III) 25 (guidance value)	

Table 1-3 Ambient Air Quality Standards (μg/m^3)

Item	Environmental Quality Standards (μg/m^3)			Basis
	1-hour Average	Daily Average	Annual Average	
SO_2	500	150	60	Category II standard in *Ambient Air Quality Standards* (GB3095-2012)
NO_2	200	80	40	
TSP	--	300	200	
PM_{10}	--	150	70	

Comparative analysis shows that hourly average value and annual average value of NO_2 in Chinese national standards are equal to EHS guidance values; hourly average value and annual average value of PM_{10} in Chinese national standards are equal to phase I target values in EHS; 24-hour average value and annual average value of $PM_{2.5}$ in Chinese national standards are equal to phase I target values in EHS; 24-hour average value of SO_2 in Chinese national standards is under phase I target value in EHS.

According to EHS, the ambient air quality should reach the standards in national laws, so relevant standards shown in Table 1-3 are applied in this project.

1.6.1.2 Water Environment

The surface water environment quality of Nanliao River, Southern Ditch, Dazhai Ditch and Beizhizhen Ditch implements category III standard in *Environmental Quality Standard for Surface Water* (GB3838-2002). Specific limits are shown in Table 1-4.

Table 1-4 Surface Water Environment Quality Standards (Unit: mg/L, excluding pH)

Assessment Factor	Standard limits in *Surface Water Environment Quality Standards* (GB3838-2002)
	Category III
pH	6-9
COD	≤20
BOD_5	≤4
TN	≤1.0
NH_3-N	≤1.0
TP	≤0.2 (lake and reservoir: 0.05)
Petroleum	≤0.05

1.6.1.3 Acoustic Environment

Standard limits of relevant indicators of acoustic environment quality in Chinese national standards and noise guideline values in EHS are shown in Table 1-5.

Table 1-5 Comparison of Acoustic Environment Quality Standards (dB(A))

Acoustic Environment Quality Standards (GB3096-2008)				EHS Noise Guideline Value		
Implementation Area	Type of Function Zone	Day 6:00-22:00	Night 22:00-6:00	Receptor	Day 7:00-22:00	Night 22:00-7:00
Area for residential, commercial, and industrial use	Category II	60	50	Area for living, working and education	55	45
Areas along both sides of transportation arteries	Category 4a	70	55	Industrial and commercial facilities	70	70

The project site is located in the South District and the North District of Fengxin County, a mixing zone for residential and commercial use. Furthermore, the Jiutiange electric pumping station and Huangshagang electric drainage station are located along both sides of transportation arteries. After comparative analysis, it is decided to implement *Acoustic Environment Quality Standards* (GB3096-2008) for the project. The project acoustic environment quality executive standards are shown in Table 1-6.

Table 1-6 Executive Standards of Acoustic Environment Quality (dB(A))

Item	Category	Implementation Area	*Acoustic Environment Quality Standards* (GB3096-2008)	
			Day	Night
Acoustic environment	Category II	The sewage lifting pump station at the west side of Jingyi Road in the South District and zones outside the category 4a area	60	50
	Category 4a	Jiutiange electric pumping station and Huangshagang electric drainage station	70	55

1.6.1.4 Soil

Dredging will be conducted for the Southern Ditch, Dazhai Ditch and Beizhizhen Ditch. At present, no existing standard system has been established in China for bottom silt dredging. But commonly used standards include *Soil Environment Quality Standards* (GB15618-1995), *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84), *Soil Environment Quality Standards for Exhibition Sites (provisional)* (HJ350-2007) and *Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant* (CJ/T362-2011). In the US, *Standards for Sludge Disposal and Utilization* (40CFR Part 503) issued by EPA is mainly applied. In EU countries, *Guidelines for Sludge Utilization in Agriculture* (Directive 86/278/EEC) issued by European Committee for Standardization is applied. Comparative analysis of above standards from home and abroad was conducted.

Table 1-7 Comparison of Sludge Standards from Home and Abroad (mg/kg)

Item / Standard	Category	pH	Cd	Cu	Pb	Cr	Zn	Ni
Standard in *Soil Environment Quality Standards* (GB/15618-1995)	Category I	Natural background	0.20	35 (farmland) — (orchard land)	35	90 (paddy field and dry land)	100	40
	Category II	<6.5	0.30	50 (farmland) 150 (orchard land)	250	250 (paddy field) 150 (dry land)	200	40
		6.5-7.5	0.30	100 (farmland) 200 (orchard land)	300	300 (paddy field) 200 (dry land)	250	50
		>7.5	0.60	100 (farmland) 200 (orchard land)	350	350 (paddy field) 250 (dry land)	300	60
	Category III	>6.5	1.0	400 (farmland) 400 (orchard land)	500	400(paddy field) 300 (dry land)	500	200
Standards for Control of Pollutants in Sludge for Agricultural Use (GB4284-84)	—	＜6.5	5	250	300	600	500	100
	—	≥6.5	20	500	1,000	1,000	1,000	200
Soil Environment Quality Standards for Exhibition Sites (Provisional) (HJ350-2007)	Category A	—	1	63	140	190	200	50
	Category B	—	22	600	600	610	1,500	2,400
Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant (CJ/T362-2011)	—	5.5-8.5	20	1,500	1,000	1,000	3,000	200
Standards for Sludge Disposal and Utilization (40 CFR Part 503) (United States)	—	—	85	4,300	840	—	7,500	420
Guidelines for Sludge Utilization in Agriculture (Directive 86/278 / EEC) (European	—	—	20~40	1,000-1,750	750-1,200	—	2,500-4,000	300-400

Item / Standard	Category	pH	Cd	Cu	Pb	Cr	Zn	Ni
Union)								

Note: (1) Pursuant to *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84), (dry) sludge that meets the standard should not be used above 2,000kg/mu/year;

(2) Pursuant to *Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant* (CJ/T362-2011), sludge that meets the standard should not be used above 30t/hm^2.

According to the above standards, heavy metal is the major pollutant control index. Therefore, heavy metal limit values in various standards were compared in this assessment. Take Zn for example, among the six standards, the limit value in *Soil Environment Quality Standards* (GB15618-1995) is the lowest, with the category III standard being 500mg/kg (>6.5); the limit value (1,000mg/kg) in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84) is the second lowest; the limit value in *Soil Environment Quality Standards for Exhibition Sites (provisional)* (HJ350-2007) is the third lowest, with category B standard being 1,500mg/kg; the limit value (3,000mg/kg) in *Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant* (CJ/T362-2011) is the third highest; the limit value of EU standard (2,500mg/kg-4,000mg/kg) is the second highest; and the limit value of US standard (7,500mg/kg) is the highest.

In short, among the six standards, Chinese limit value shown in *Soil Environment Quality Standards* (GB15618-1995) is the lowest, followed by the limit values in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84), *Soil Environment Quality Standards for Exhibition Sites (provisional)* (HJ350-2007) and *Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant* (CJ/T362-2011). The limit value of EU standard is the second highest and the limit value of US standard is the highest. This shows that China's *Soil Environment Quality Standards* (GB/15618-1995) and *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84) are the most strict standards. Other domestic standards and the US standard as well as EU standard can be referred to for general and risk evaluation of sludge.

When the heavy metal index of the bottom silt does not meet category III standard in *Soil Environment Quality Standards* (GB/15618-1995) but the US standard or other standards, the sludge is not classified as hazardous waste and can be disposed as general sludge.

1.6.2 Pollutant Discharging Standards

1.6.2.1 Air Pollutant

Construction dust is the major air pollutant during the construction period, which is disposed according to *Comprehensive Atmospheric Pollutant Emission Standards* (GB16297-1996) (monitored concentration limits for fugitive discharging). See in Table 1-8.

Table 1-8 Comprehensive Atmospheric Pollutant Discharging Standards (Excerpt)

Pollutant	Monitored Concentration Limits for Fugitive Discharging	
Particulate matter	Monitoring point	Concentration (mg/m^3)
	The highest concentration outside the boundary	1.0

1.6.2.2 Water Pollutant

The pipe network collects waste water and discharges it into Fengxin County sewage treatment plant for disposal. The effluent should reach the category IB standard in *Pollutant Discharge Standards for Urban Wastewater Treatment Plants* (GB18918-2002), and ultimately be discharged into the Nanliao river. The executive standard is shown in Table 1-9.

Table 1-9 Pollutant Discharge Standards for Urban Waste Water Treatment Plants (unit: mg/L)

Serial No.	Basic Control Item	Category IB
1	COD	60
2	BOD_5	20
3	SS	20
4	TN	20
5	NH_3-N	8 (15)
6	TP	1
7	pH	6-9

Note: The values outside the bracket are control indicators when the temperature is higher than 12℃, while values inside the bracket are control indicators when the temperature is not higher than 12℃.

1.6.2.3 Noise

Standards for Ambient Noise Emission at Construction Site Boundary (GB12523-2011) applies to construction noise; category IV standard in *Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008) applies to noise at Jiutiange electric pumping station and Huangshagang electric drainage station; category II standard in *Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008) applies to noise at the sewage lifting pump station located at the west side of Jingyi Road in the South District. Specific standard limits are given in Table 1-10.

Table 1-10 Standards for Noise Emission (Unit: dB(A))

Item	*Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008)		*Standards for Ambient Noise Emission at Construction Site Boundary* (GB12523-2011)
	Category II	Category IV	Construction site noise emission standards
Day	60	70	70
Night	50	55	55

1.6.2.4 Solid Waste

Pollutant Control Standards for Storage and Disposal Sites of General Industrial Solid Waste (GB18599-2001) applies to disposal of general solid waste. *Standards for Pollution Control at Hazardous Waste Storage Site* (GB18597-2001) applies to hazardous wastes generated in the laboratory. Requirements of EHS and the World Bank's relevant safeguard policies should also be met.

1.7 Environmental Impact Factors and Assessment Factors

Matrix is applied to identify key environmental issues of the project, which is shown in Table 1-11.

Table 1-11 Matrix of Environmental Impact Identification

Environmental Factor	Pollution Factor	Construction Period	Operation Period
Atmosphere	Particulate matter	△	—
Water	COD	—	●
	BOD_5	—	●
	SS	—	●
	NH_3-N	—	●
	TP	—	●
Noise	Noise	△	△
Solid waste	Solid waste	△	—
Social impact	Impacts on traffic and municipal facilities	▲	●
	Influence on business down the street	▲	○

Note: ▲ stands for significant negative impact; △ general negative impact; ● significant positive impact, ○ general positive impact; - no impact.

The above table shows that the main environmental impacts are:

(1) Construction period: impact by construction dust, waste water, noise, solid waste, dredging silt and other factors, as well as social impact of pipe network construction on traffic, business down the street and municipal services interruption;

(2) Operation period: mainly positive impacts on the environment. Major adverse environmental impacts are caused by operational noise of pumping stations and wastes generated by water environment monitoring system.

Through environmental impact identification, the assessment factors in this assessment are shown in Table 1-12.

Table 1-12 List of Assessment Factors

Factor	Assessment Factor of Current Situation	Impact Predictor
Atmosphere	SO_2、NO_2、PM_{10}、TSP	—
Surface water	pH、COD、BOD_5、NH_3-N、TN、TP	COD、BOD_5、NH_3-N、TN、TP
Noise	Equivalent sound level (L_{eq}(A))	Equivalent sound level (L_{eq}(A))
Ecological environment	Animal and plant resources	—
Solid waste	—	The amount of sludge and earthwork

1.8 Environmental Protection Targets

1.8.1 Acoustic and Atmospheric Environmental Protection Targets

Based on on-site investigation by the PLG, all the involved acoustic and atmospheric environmental protection targets are shown in Table 1-13.

Table 1-13 List of Acoustic and Atmospheric Environmental Protection Targets

Project Name	Impact Phase	Impact Factor	Sensitive Point	Location	No. of Household/ Population	Distance to the Project Site (m)
A) General Environmental Sensitive Objectives						
Pipe network construction	Construction period	Dust and noise during the construction	Zhonghe Community	West side of Yingxing Avenue	130	30
			Bishui Community	West side of Yingxing Avenue	120	56
			Victorian Garden Community	North side of Tonghua Avenue	110	28
			Yage Chuntian Community	South side of Xisha Road	280	33
			Weixing Binjianghuacheng Community	West side of Jiutiange Road	220	113
			Qingtian Community	North side of Fengchuan Road	65	31
			Xinyuan Community	East side of Guangshi Road	50	82
			Longshan Community	West side of Guangshi Road	90	14
			Zhongxian Shui'anlidu Community	East side of South Longshan Road	130	70
			Jinqiao Mingju Community	East side of Nongmin Street	90	30
			Bishui Garden Community	North side of Shuyuan Road	135	47
			Wenxin Community	North side of Shuyuan Road	190	40
			Xingguang Xiandai Community	South side of Shuyuan Road	360	35
			Chi'an Town	Fuyun Street	60	15
Pumping station	Operation period	Noise at pumping station	Weixing Binjianghuacheng Community	North side of Jiutiange electric pumping station	220	80
			Hengchang Huayuan Community	South side of Huangshagang flood drainage station	80	70
B) Significant Environmental Sensitive Objectives						
Pipe network construction	Construction period	Dust and noise during construction	Fengchuan No.2 Primary School	South side of Fengchuan Road	1,800	90
			Fengxin No.3 Secondary School	North side of North Longshan Avenue	3,300	120

1.8.2 Water Environmental Protection Targets

Water environmental protection targets of this project are shown in Table 1-14.

Table 1-14 Water Environmental Protection Targets

Serial No.	Protection Targets	Water Quality Planning Objective	Water Body Function
1	Nanliao River	Category III	Landscape & recreational water area and irrigation water area

Serial No.	Protection Targets	Water Quality Planning Objective	Water Body Function
2	Southern Ditch	Category III	Plan for landscape water use. Currently it is a drainage channel.
3	Dazhai Ditch	Category III	Plan for landscape water use. Currently it is a drainage channel and is used for irritation.
4	Beizhizhen Ditch	Category III	Plan for landscape water use. Currently it is a drainage channel and is used for irritation.

1.8.3 Ecological Environmental Protection Targets

Ecological environmental protection targets of each project are shown in Table 1-15.

Table 1-15 List of Ecological Environmental Protection Targets

Serial No.	Environmental Factor	Protection Targets	Overview of Protection Targets
1	Ecological environment	Terrestrial plants	Plants destroyed by permanent or temporary land occupation
		Wild animal	Project-affected wildlife
		Aquatic organism	Fish of the affected waters

1.8.4 Social Environmental Protection Targets

Social environmental protection targets of this project are shown in Table 1-16.

Table 1-16 List of Social Environmental Protection Targets

Serial No.	Targets for Protection	Overview of Protection Targets
1	Infrastructure	Existing roads and houses
2	Traffic and safety, etc.	The security of existing roads, schools, hospitals, business down the street and going out of surrounding residents during construction
3	Municipal facilities	Facilities for water supply, electric power and other municipal services

2 Project Description

2.1 Project Overview

2.1.1 Project Components

(1) Project name: World Bank-financed Fengxin County Water Environment Management Project

(2) Construction unit: Leading Group Office of The World Bank-financed Fengxin County Water Environment Management Project

(3) Construction site: the North District and the South District of Fengxin County, Yichun City of Jiangxi Province

(4) Project components: pipe network reconstruction works of the North District and the South District of Fengxin County.

The project will newly build drainage network of 35.42km. There will be: 22.27km of sewage pipeline, with the pipe diameter being DN400–DN1000; 13.15km of rainwater pipeline, with the pipe diameter being d600–d1800; one integrated sewage lifting pump station, which will be constructed in the southwestern district of the intersection of Jianshe Road and Jingyi Road; one electric drainage station, which will be constructed in the afforestation belt next to Huangshagang; one electric pumping station, which will be constructed near the Xiangjiao dam on Jiutiange Road; 864m^2 of Dazhai Ditch protection slope made of mortar flag stone; 1.296km of slab culvert for Dazhai Ditch and Southern Ditch. The dredging volume of Dazhai Ditch, Beizhizhen Ditch and Southern Ditch is 134,800m^3.

Project components and construction content are shown in Table 2-1.

Table 2-1 List of Project Components and Construction Content

Component	Item	Construction Content	Construction Type	Construction Location	Service Area
Drainage network reconstruction project	Sewage pipe network project	22.609km in total of DN400-DN1500 sewage pipeline will be installed along the road. Sewerage will be collected and discharged into Fengxin County sewage treatment plant. The current collected amount is 15,7000 m^3/d and the long-term collected amount is 20,000m^3/d.	New	South District and North District	South District and the North District
	Rainwater pipe network project	13.15km in total of d600-d1800 rainwater pipeline will be installed along the road, collecting and discharging rainwater into the Liao River.	New	South District and North District	South District and the North District
	The sewage lifting pump	Integrated sewage prefabricated pumping station of 3,000 m^3/d	New	Southwestern district of the	South District

	station at the west side of Jingyi Road in the South District			intersection of Jianshe Road and Jingyi Road	
	Huangshagang flood drainage station	Integrated prefabricated pumping station of 9,720m^3/h	New	The afforestation belt next to Huangshagang	South District
	Jiutiange electric pumping station	Integrated prefabricated pumping station of 1m^3/s	New	Near the Xiangjiao dam on Jiutiange Road	Guaranteeing water demand for irrigation of the downstream 4,500 acres of farmland
Channel regulation	Dredging, installing cover plates and optimizing the pipeline	13,480m^3 of dredging for the three drainage ditches (channels) in the North District; 2,458m of cover plates installing; 1.3km of pipeline optimizing.	Reconstruction	Beizhizhen Ditch, Southern Ditch and Dazhai Ditch	Beizhizhen Ditch, Southern Ditch and Dazhai Ditch
Other projects	Water environment monitoring and distribution system	Monitoring platform of water environment monitoring system and routine equipment in water environment monitoring and control central laboratory	New	Use existing houses of County Department of Environmental Protection	/
	Automatic monitoring station on water quality of river and lake	Container station houses, and the size of each is 6,050mm × 2,430mm	New	One located at the water supply intake of Fengxin County; the other at the boundary between Liao River and Anyi County.	One for detecting the upstream water of Liao River; the other for detecting the water at the point 200m

					upwards from the Xiangjiao dam at downstream Liao River.
Project investment	Total investment is estimated to be 197.0771 million yuan. We intend to apply for a loan of $20 million (about 130 million yuan); the amount of counterpart funds is 67.0771 million yuan, which is raised by support of higher authorities together with self-funding by the local government				

2.1.2 Project Scale

2.1.2.1 Sewage Prediction

The prediction is based on the project feasibility study, the amount of sewage combined with per capita comprehensive index method, land area comprehensive index method, classification of water use and estimated amount of water use.

The population is calculated according to the predicted number, which is shown in Table 2-2; land use is calculated based on the scope of county sewage treatment plant plus the South District and the North District. The planned land use is 14.34km^2 calculated according to *Engineering Planning Specifications for Urban Water Supply Works* (GB50282-98); comprehensive water use index for unit construction land in small cities is 4,000 to 8,000 m^3/km^2·d, with reference to other types of water use standards for urban construction land; the standard for comprehensive water use of Fengxin urban unit area is 2,500m^3/km^2·d.

Table 2-2 Current Situation and Prediction of Fengxin County's Total Population (10,000)

Year		2015	2016	2023	2030
The registered population	North District	3.96	4.03	4.57	5.17
	South District	2.77	2.82	3.20	3.62
	Sum	6.73	6.85	7.77	8.79
Migrant population	North District	1.42	1.45	1.64	1.86
	South District	0.99	1.00	1.13	1.30
	Sum	2.41	2.45	2.77	3.16
Total	North District	5.38	5.48	6.21	7.03
	South District	3.76	3.83	4.34	4.92
	Sum	9.14	9.31	10.55	11.95

According to measured data (2011-2015) from Fengxin Water Supply Company, the average daily urban water consumption in 2015 was 13,300 t/d; and according to *Code for Design of Outdoor Water Supply (GB50013-2006)*, the diurnal variation coefficient was 1.1 - 1.5 and the maximum daily water consumption 20,000t/d.

Table 2-3 Urban Water Consumption over the Past Five Years

Year	Urban Water Consumption in Real Term (10,000t)	Daily Water Consumption (t/d)	Annual Growth Rate (%)
2011	387.00	1.06	/

2012	399.00	1.09	3.1
2013	421.00	1.15	5.5
2014	466.00	1.28	10.7
2015	486.00	1.33	4.3
Average	/	/	5.9

According to the above table, the average growth rate of water consumption from 2011 to 2015 was 0.059. The designed growth rate of water consumption is 3.6% in this project, since the city witnessed a rapid population growth in recent years so the subsequent population growth would slow down, and the city adopted water conservation and environmental protection measures which helped to reduce per capita water consumption at an average growth rate of 0.03 to 0.05. Therefore, the predicted average daily water consumption in 2030 will be 22,600t/d; and the designed diurnal variation coefficient is 1.5, then the maximum daily water consumption in 2030 will be 33,900 t/d.

In combination with above three methods and some uncertainties, the maximum total daily water consumption of the South District and the North District in 2030 is predicted to be 3.5 t/d. The predicted amount of sewage is shown in the table below.

Table 2-4 The Predicted Amount of Sewage in 2030

Total water demand (10,000m^3/d)	3.50
Production-sewage coefficient (%)	85.00
Maximum daily sewage (10,000m^3/d)	2.98
Average daily sewage (10,000m^3/d)	1.98
Sewage collection coefficient (%)	95.00
Sewage collected by sewage pipes (10,000m^3/d)	1.88
Groundwater infiltration (10,000m^3/d)	0.19
Average total daily sewage (10,000m^3/d)	2.07
Sewage treatment scale (10,000m^3/d)	2.00

According to prediction, the project sewage collection and treatment scale of the South District and the North District will be 1.57m^3/d in 2023, and 20,000m^3/d in 2030.

2.1.2.2 Project Content

(1) The construction scale of sewage pipe network is shown in Table 2-5.

Table 2-5 Content of Sewage Pipe Network Construction

Serial No.	Road	Sewage Pipe Diameter	Discharging Direction	Starting Point	Ending Point	Pipe Length
1	Yingxing Avenue	DN400	North to south	Shishan North Road	Fengchuan Road	155.1
2	Dazhai Ditch trunk sewage interception pipe	DN500	West to east	Tonghua Avenue	Yingxing Avenue	1613
3	Jiutiange Road	DN400-DN1000	Converging into Dazhai Ditch in the middle	Chongxian Avenue	Binghe East Road	2780.9

4	Xisha Road	DN400	Converging into Zongqi Road in the middle	Jiutiange Road	Binghe East Road	451.2
5	East Lake Avenue	DN400	Converging into Zongqi Road in the middle	Yingxing Avenue	Binghe East Road	907.7
6	Zongqi Road	DN400-DN500	South to north, converging into Dazhai Ditch	Binghe East Road	Shishan North Road	999.1
7	Tonghua Avenue	DN400-DN500	West to east, converging into Tiangong Avenue	Yingxing Avenue	Tiangong Avenue	898.2
8	Yanshan Road	DN400	Connected with drainage pipes in Longshan Avenue	Shishan North Road	Longshan Avenue	180.9
9	Wazijiao Road	DN400	Connected with drainage pipes in Longshan Avenue	Jiaoyu Road	Longshan Avenue	245.5
10	Guangshi Road	DN400	Connected with drainage pipes in Yingbin Road	Shishan North Road	Yingbin Road	205.8
11	Jiefang Road	DN400	Connected with drainage pipes in Jianshe South Road	Ximen Road	Jianshe South Road	339.8
12	Zhongrao Road	DN400-DN500	West to east, connected with pipes in Jianshe North Road	Zong'er Road	Jianshe North Road	788.6
13	North Longshan Avenue	DN400	North to south, connected with pipes in Zhongrao Road	Hengsan Road	Zhongrao Road	634.6
14	Huanhai Road	DN400	West to east, converging into Dazhai Ditch	Jianshe North Road	Fengxin Avenue	719.2
15	Jianshe North Road	DN500	South to north, converging into Dazhai Ditch	Shishan North Road	Tonghua Avenue	619.2
16	Tiangong Avenue	DN400-DN1000	North to south, converging into sewage treatment plant	Hujiaxin Village	Binghe East Road	3665.2
17	Section along the river of replacing trunk sewage interception pipes	DN1000	West to east	Zongqi Road	Zongba Road	520
18	Xinyang Road	DN600	North to south, connected with pipes in Shuyuan Road	Xinsan Road	Shuyuan Road	306.6
19	Shuyuan Road	DN600	West to east, connected	Xinyang	Jingyi Road	823.2

			with pipes in Jingyi Road	Road		
20	Chi'an Avenue	DN400–DN500	West to east, connected with pipes in Longshan Avenue	Hualin Avenue	Longshan Avenue	1188.1
21	Fuyun Road	DN400	West to east, connected with pipes in Chi'an Avenue	Xinwu Road	Xinliu Road	322
22	South Longshan Road	DN400–DN500	Converging into Shuyuan Road in the middle	Liaohe West Road	Chi'an Avenue	725.5
23	Jingyi Road	DN400–DN600	Converging into Jianshe Road in the middle	Shuyuan Road	Xiaoqian Avenue	579
24	Jing'er Road	DN400	Converging into Jianshe Road in the middle	Chi'an Avenue	Xiaoqian Avenue	357.2
25	Jianshe Road	DN400–DN500	Connected with sewage pipes in Xiaoqian Avenue	Longshan Avenue	Jingsan Road	787.5
26	Nongmin Street	DN400–DN500	Connected with sewage pipes in Liaohe East Road	Chi'an Avenue	Liaohe East Road	1460.7

(2) The construction scale of rainwater pipe network is shown in Table 2-6.

Table 2-6 Content of Rainwater Pipe Network Construction

Serial No.	Road	Rainwater Pipe Diameter	Discharging Direction	Starting Point	Ending Point	Pipe Length
1	Jiutiange Road	d600–d1000	The north section connects with pipes in Tonghua Avenue, the south section in Xisha Road and the middle section converges into the Southern Ditch	Chongxian Avenue	Binghe East Road	1822.4
2	Xisha Road	d1500–d1800	Connected with drainage pipes in Binghe East Road	Jiutiange Road	Binghe East Road	538.6
3	East Lake Avenue	d800	Converging into Zongqi Road	Yingxing Avenue	Binghe East Road	878
4	Zongqi Road	d800–d1500	The north section converges into the Southern Ditch and the south section connects with pipes in Xisha Road	Binghe East Road	Shishan North Road	870.3
5	Tonghua Avenue	d800–d1000	West to east, converging into the Dazhai Ditch	Yingxing Avenue	Tiangong Avenue	830.1
6	Yanshan Road	d800	Connected with drainage pipes in Longshan Avenue	Shishan North Road	Longshan Avenue	178.9

Serial No.	Road	Rainwater Pipe Diameter	Discharging Direction	Starting Point	Ending Point	Pipe Length
7	Wazijiao Road	d800	Connected with drainage pipes in Longshan Avenue	Jiaoyu Road	Longshan Avenue	221.7
8	Guangshi Road	d800	Connected with drainage pipes in Yingbin Road	Shishan North Road	Yingbin Road	221.3
9	Jiefang Road	d800	Connected with drainage pipes in Jianshe South Road	Ximen Road	Jianshe South Road	341.9
10	Zhongrao Road	d800–d1500	West to east, connected with pipes in Jianshe North Road	Zong'er Road	Jianshe North Road	777.6
11	North Longshan Avenue	d800	North to south, connected with pipes in Zhongrao Road	Hengsan Road	Zhongrao Road	740.6
12	Huanhai Road	d800–d1000	West to east, connected with drainage box culverts in Fengxin Avenue	Jianshe North Road	Fengxin Avenue	622.9
13	Jianshe North Road	d800–d1800	South to north, converging into Dazhai Ditch	Shishan North Road	Tonghua Avenue	637.4
14	Fengchuan Road	d800	West to east, connected with pipes in Zongqi Road	Yingxing Avenue	Zongqi Road	603.8
15	Chi'an Avenue	d600–d1500	West to east, connected with pipes in Longshan Avenue	Hualin Avenue	Longshan Avenue	1075.5
16	Fuyun Road	d800	West to east, connected with pipes in Chi'an Avenue	Xinwu Road	Xinliu Road	317
17	South Longshan Road	d600–d800	Converging into Shuyuan Road in the middle	Liaohe West Road	Chi'an Avenue	698.1
18	Jingyi Road	d800–d1200	North to south, connected with pipes in Xiaoqian Avenue	Shuyuan Road	Xiaoqian Avenue	575.6
19	Jing'er Road	d800–d1200	North to south, connected with pipes in Xiaoqian Avenue	Chi'an Avenue	Xiaoqian Avenue	438.6
20	Jianshe Road	d800	Connected with pipes in Jingyi Road in the middle	Longshan Avenue	Jingsan Road	752.1

(3) The construction scale of pumping stations is shown in Table 2-7.

Table 2-7 Content of Pumping Stations Construction

Serial No.	Name	Designed Flow	Construction Content	Construction Type	Construction Location	Service Area
1	The sewage lifting pump station at the	3,000 m^3/d in the short term 6,000 m^3/d in	One integrated sewage	New	Southwestern district of the intersection of	South District

	west side of Jingyi Road in the South District	the long term	prefabricated pumping station		Jianshe Road and Jingyi Road	
2	Huangshagang flood drainage station	9,720m^3/h	One integrated prefabricated pumping station	New	The afforestation belt next to Huangshagang	South District
3	Jiutiange electric pumping station	1m^3/s	One integrated prefabricated pumping station	New	Near the Xiangjiao dam on Jiutiange Road	Guarantee water demand for irrigation of the downstream 4,500 acres of farmland

(4) Dredging and installing cover plates for channels

Table 2-8 Content of Major Channel Projects

System	Designed Content	Specification	Units	Quantity
Dazhai Ditch	Protection slope made of mortar flag stone	Length × height = 2 × 480 × 3m	m^2	2,880
	Slab culvert	Width × height = 5 × 3m	m	660
		Width × height = 5 × 3m	m	336
		Width × height = 3 × 2.5m	m	311
	Dredging sludge	Length × width × thickness = 1,200 × 5 × 0.4m	m^3	2,400
Beizhizhen Ditch	Dredging sludge	Length x width x thickness = 2,900 × 2 × 0.6m	m^3	3,480
Southern Ditch	Slab culvert	Width × height = 4 × 2.5m	m	634
	Dredging sludge	Length × width × thickness = 1,900 × 4 × 1m	m^3	7,600
Chongxian Avenue	Slab culvert	Width × height = 4 × 3m	m	517

2.1.3 Construction Method

(1) Pipeline Construction Method

The construction method should be determined on the basis of local soil property, pipe diameter, buried depth and other specific circumstances.

1) Excavation using steel plate stakes for supporting can be adopted in the case of poor soil conditions, difficulties in general excavation or construction beneath existing roads. Specific circumstances should be considered whether it is necessary to install top support to ensure safe construction. Meanwhile, the construction may be divided into different sections:

when a section is completed and accepted, the retained top soil should be immediately backfilled before the excavation and construction of the next section.

2) When the soil is soft, top unloading and steel plate stakes will be adopted in sections where the pipeline depth equals to or is larger than 4.0m. Specific circumstances should be considered whether it is necessary to install top support, and the construction may be divided into different sections to prevent collapse of foundation pit and other adverse consequences during raining days caused by general excavation.

3) Pipe jacking and other non-excavation methods are basically adopted for cross-river pipes or on roads which have good pavement quality, small excavation space, close distance to buildings, heavy traffic, or are difficult to be intercepted.

(2) Management and Maintenance for Drainage Pipes and Channels

Technical Specification for Safety of Urban Sewer Maintenance (CJJ6-2009) should be applied to management and maintenance of drainage pipes and channels.

1) Management and Maintenance Tasks for Drainage Pipes and Channels

①Accepting drainage pipes and channels;

②Supervising the implementation of drainage pipes and channels usage rules;

③Regularly checking, washing and clearing drainage pipes and channels to maintain their discharging capacity;

④Maintaining the inner side and constituent structures of drainage pipes and channels, and handling accidents.

Common problems inside drainage pipes and channels are: blockage by dirt; heavy external loads; and damage, cracks, corrosion caused by sewage erosion or ground subsidence due to uneven foundation.

2) Methods for Clearing Drainage Pipes and Channels

Sedimentation and siltation in drainage pipes and channels are easily caused by lack of water, small slope gradient, exceeded solid impurities, poor construction quality and other reasons. In these cases, over siltation may weaken the discharging capability or even lead to blockage. Therefore, regular clearing should be conducted, which mainly include hydraulic and mechanical methods.

①Hydraulic Method

Hydraulic method means flushing the pipeline with water, which comes from the pipe itself or from the river or water supply system. When sewage from the pipe is used, the pipe itself must have a certain flow rate without too much sludge inside (about 20%). When water from the supply system is used, it can be taken from fire hydrants, street water supply hydrants, or from the water wagon. Generally speaking, 2,000–3,000kg of water will be used each time for clearing branch sewage pipes in the streets.

With simple operation and high efficiency, it is easy for staff to conduct the hydraulic method. According to the experience of some cities, the hydraulic method can not only clear sludge within 250m of the downstream pipes, but also have a good dredging effect within about 150m of the upstream pipes.

②Mechanical Method

Mechanical method, which can be both manually or mechanically powered, should be conducted when the pipes and channels are severely blocked by dense sludge, since the hydraulic method in this case is not effective. But manual dredging, with a rather low

efficiency, requires workers to work in high intensity and poor environmental conditions without good hygiene. Pipeline dredging vehicles and robots are advanced cleaning machines with good cleaning effect, meeting the requirements of municipal works.

(3) Dredging Methods

Since the channel width varies, mechanical together with manual methods will be adopted in dry season in this project. There is no water coming from the upstream of the dredging river in dry season, thus enclosure is not necessary. When dredging channels are narrow, manual method is mainly adopted; when dredging channels are wide, workers will be equipped with small digging machines.

2.1.4 Implementation Schedule

The project is planned to be started in January, 2018, completed and accepted by the end of December, 2022. The construction lasts 5 years.

2.1.5 Project Investment

(1) Total Investment

The total investment amount is estimated to be 197.0771 million yuan, of which 18.8984 million yuan goes to strengthening management of Poyang Lake Basin, 155.0057 million yuan goes to restoring lake and river environment and improving sewage management system requires, and 3.85 million yuan goes to supporting activities.

(2) Financing

We intend to apply for a loan of $20 million (about 130 million yuan), and the amount of counterpart fund is 54.9032 million yuan which is raised by support of higher authorities together with self-funding by the local government.

2.2 Project Analysis

2.2.1 Analysis of Pollution Sources During the Construction Period

(1) Waste Water During the Construction Period

Waste water during the construction period mainly includes construction waste water, domestic sewage from construction personnel and residual water from sludge dehydration.

1) Domestic Sewage during construction

The construction personnel amounts to 100 on average during peak construction period, working at different pipeline sections. The water consumption of construction personnel is calculated as 50L/d·person with discharging coefficient being 0.8, then the amount of domestic sewage generated by construction personnel is 4m^3/d, whose COD contained is calculated as 250mg/L, BOD_5 150mg/L, SS 200mg/L and NH_3-N 35mg/L, then the generated pollutants are COD 1kg/d, BOD_5 0.6kg/d, SS 0.8 kg/d and NH_3-N 0.14kg/d.

Domestic sewage generated during the construction period should be collected and disposed by existing local collection and treatment facilities, and cannot be discharged arbitrarily.

2) Construction Waste Water

Waste water discharged during construction mainly includes two types: one is muddy water (small amount in general) generated by washing machinery and vehicles during pipeline excavation; the other is waste water generated at the construction site by washing sand and stones, mixing and pouring concrete and other works. Main pollutants in

construction waste water are SS, petroleum and the like. After precipitation, the construction waste water can be used for dust reduction.

3) residual water from sludge dehydration

A certain amount of waste water will be produced during sludge dehydration. Such waste water, after eliminating the SS through dosing, will be discharged into water bodies.

(2) Waste Gas during Construction Period

1) Construction Dust

The main waste gas pollution source during construction is dust, including dust produced by transportation vehicles and dust at the construction site (e.g. excavation of pipes and channels, earthwork stacking and loading and unloading of building materials, etc.).

According to relevant documents, during the construction, the dust generated by vehicles accounts for more than 60% of total dust, and is related to the road surface condition and vehicle speed. Under normal circumstances, the dust on construction roads blown away by the natural wind is limited within 100m. Spraying water on roads 4 to 5 times per day helps to reduce about 70% of dusts in the air and limit the TSP pollution within the range of 20–50m, indeed a good way to reduce dust. Test results of spraying water are shown in Table 2-9.

Table 2-9 Test Results of Spraying Water for Dust Reduction During Construction

Distance to roadside (m)		5	20	50	100
TSP concentration (mg/m^3)	Do not spray water	10.14	2.810	1.15	0.86
	Spray water	2.01	1.40	0.68	0.60

Another major dust source during construction is wind dust in open stacking area and bare area. Such dust will be affected by humidity and wind speed during construction. Therefore, water should be timely sprayed on roads and in the stacking area, construction during windy days are prohibited, and open-air stacking should be limited in order to reduce the dust.

2) Waste Gas of Construction Machinery

Waste gas can also be exhausted by vehicles or generated from fuel combustion during the construction. The waste gas contains HC, CO, NOx, and other pollutants. Such waste gas is small in amount.

3) Odor Generated by Dredging

The proposed project involves dredging for the Southern Ditch, Dazhai Ditch and Beizhizhen Ditch. The dredging volume totals 13,480m^3. A small amount of odor will be generated in the sludge stacking area.

(3) Noise during Construction Period

Noise during the construction period mainly comes from material transportation, pipe and channel excavating, pipe loading and unloading, and soil backfilling during the operation of machinery like loaders, bulldozers, excavators, heavy-duty trucks and the like. The noise is intermittent and machinery sound value can reach about 75-90dB(A). Therefore, construction without control will influence the ambient environment.

Table 2-10 Noise Intensity of Major Construction Machinery (dB(A))

Serial No.	Type of Machine	Distance to the Machinery from the Monitoring Point (m)	Maximum Sound Level

1	Loader	5	90
2	Road roller	5	81
3	Bulldozer	5	86
4	Excavator	5	84
5	Large heavy-duty truck	—	86
6	Light truck	—	75

(4) Solid Waste

Solid waste generated during the construction period mainly includes construction personnel's domestic wastes, spoil and sludge generated during construction, as well as garbage in the water bodies to be dredged.

1) Domestic Waste

Provided the amount of construction personnel is 100 with 0.5kg/p/d production of wastes, then the total domestic waste production volume is about 50kg/d. Environmental assessment recommends that garbage collection bins and environmental protection billboards be set up at the construction site, and the Sanitation Department be commissioned to transport the collected domestic waste.

2) Construction Spoil

The earthworks and stones mainly come from pipeline construction. The total amount of excavation is 28,547m^3, the total volume of fillings is 11,966m^3, and the rest 16,581m^3 is abandoned. At the same time, a certain amount of construction waste will be generated during construction, including concrete, broken bricks, gravels and other materials, altogether about 2,120m^3.

3) Ditch and Channel Sludge

13,480m^3 of sludge will be dredged in Beizhizhen Ditch, Southern Ditch and Dazhai Ditch, which is shown in the table below.

Table 2-10 List of Dredging Conditions

Water Body	Dredging Location	Dredging Length (m)	Dredging Width (m)	Dredging Depth (m)	Total Dredging Volume (m^3)	Dredging Method	Drying Method	Orientation
Beizhizhen Ditch	Whole line	2,900	2	0.6	3,480	Mechanical plus manual methods during dry season	Centrifugal dewatering and drying	Woodland of Yuantou Group in Huangxi Village, Ganzhou Town
Southern Ditch	Whole line	1,900	4	1	7,600			
Dazhai Ditch	Whole line	1,200	5	0.4	2,400			

4) Garbage in the Water Bodies to be Dredged

Existing garbage, creature remains and other solid pollutants in the Southern Ditch, Dazhai Ditch and Beizhizhen Ditch will be cleaned up during dredging. The amount of such waste is small, and is estimated to be 0.25t.

(5) Ecological Impact and Soil Erosion

The drainage network reconstruction does not involve residential resettlement or demolition, but it involves temporary land acquisition.

Vegetation damage may be caused during construction, leading to negative impacts on the ecological environment. Therefore, necessary afforestation such as engineering measures and phtyto measures should be adopted for the exposed ground and slope surface to reduce environmental impact and prevent soil erosion.

2.2.2 Analysis of Pollution Sources in the Operation Period

The construction of enclosed sewage pipeline system itself does not produce any waste water. Sewage collected by the pipes, via lifting pump station, will be discharged immediately into the sewage treatment plant, thus no odor will be produced; bar screen will be set up in the pump station to crush the wastes before they enter the collection tank, which will neither influence the station's work nor produce any solid waste; but wastewater (experiment waste) will be generated in the water environment monitoring and control central laboratory.

(1) Noise

Major environmental noise sources during the operation period include noise generated by submersible pump, crushing bar screen and other machinery. The noise intensity is shown in Table 2-11.

Table 2-11 Sound Value of Noise Sources

Source	Noise level (dB(A))	Noise Reduction Measure
Submersible pump	60–70	Using low-noise equipment, adopting vibration & noise reduction measures, and conducting regular maintenance
Crushing bar screen	70–85	

(2) Waste Water

Wastes will be generated in the water environment monitoring and control central laboratory during its operation, such as acid (HW34), alkali (HW35), and organic solvents (HW42), which belong to hazardous waste. Based on data from labs of similar scale, about 300kg of said liquid waste will be produced. After collection, the wastes will be sent to qualified hazardous waste treatment units for disposal, and arbitrary discharging is not allowed.

2.3 Production and Predicted Emission of Major Pollutants

Table 2-12 Production and Predicted Emission of Major Pollutants

Item \ Content		Emission Source (No.)	Pollutants	Production Concentration and Volume	Emission Concentration and Volume
Water pollutant	Construction period	Domestic sewage	Volume of Waste water COD BOD_5 SS NH_3-N	$4m^3/d$ 1kg/d, 250mg/L 0.6kg/d, 150mg/L 0.8kg/d, 200mg/L 0.14kg/d, 35mg/L	Disposed by local domestic sewage treatment facilities, without arbitrary discharging
		Construction waste water	SS	Little	Little
		residual water from	SS	Little	Little

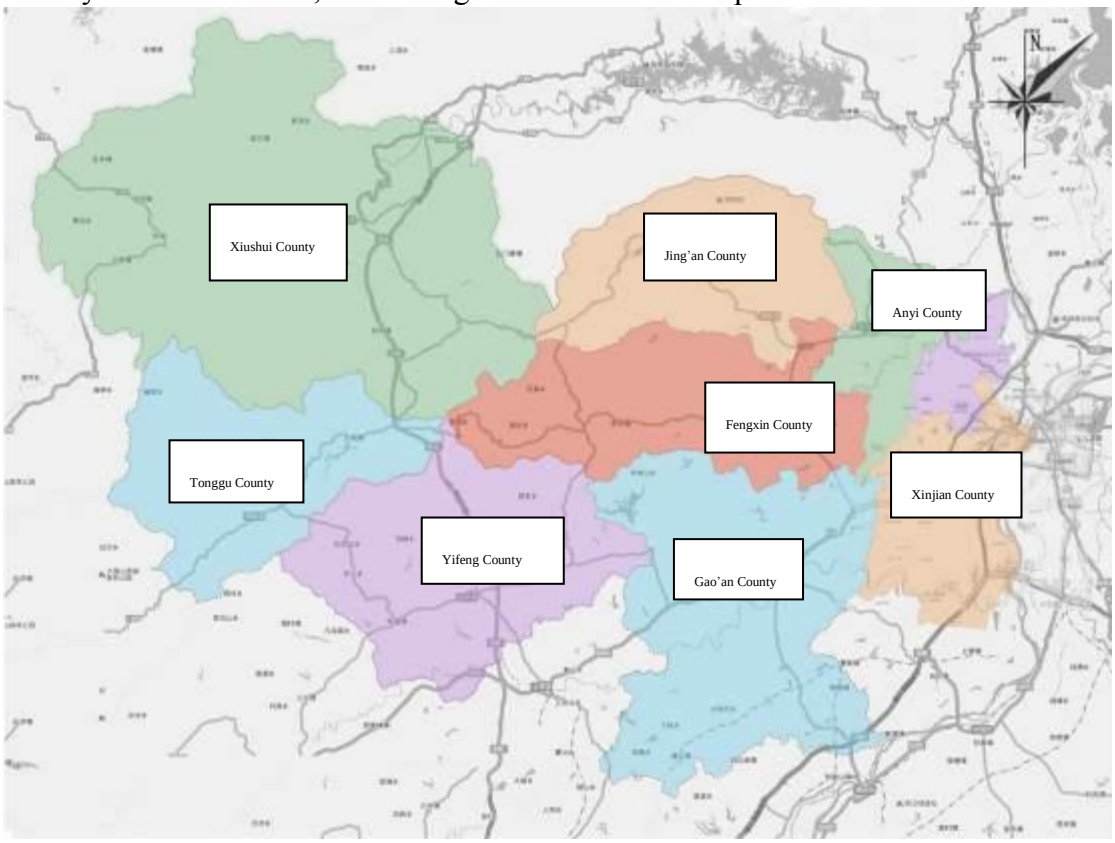
Item \ Content		Emission Source (No.)	Pollutants	Production Concentration and Volume	Emission Concentration and Volume
		sludge dehydration			
	Operation period	Lab liquid waste	Waste acid (HW34), waste alkali ((HW35), and waste organic solvents (HW42)	300kg/a	Disposed by qualified units
Atmospheric pollutants	Construction period	Construction dust	TSP	Little, fugitive emission	Little, fugitive emission
		Waste gas from fuel combustion	HC, CO, NOx	Little, fugitive emission	Little, fugitive emission
		Odor in the sludge stacking area	NH_3, H_2S	Little, fugitive emission	Little, fugitive emission
Noise	Construction period	Construction machinery	Construction noise	Around 80dB(A)–85dB(A)	
	Operation period	Equipment operation	Equipment noise	Around 60–85dB(A)	Around 65.3dB(A)
Solid waste	Construction period	Construction	Spoil	28,547m^3	16,581m^3
			Construction waste	2,120	2,120
			Ditch and channel sludge	13,480m^3	13,480 m^3
			Garbage in the dredging area	0.25t	0.25t

3 Environmental Status Quo

3.1 Natural Environment

3.1.1 Geographical Location

Fengxin County, located in northwestern Jiangxi Province and at the upstream of Nanliao River which is the tributary of Gan River's Xiu River, is adjacent to Anyi in the east, Gao'an in the south, Yifeng in the southwest, Xiu River in the northwest, and Jing'an in the north. It ranges from east longitude 114°45' to 115°33' and north latitude 28°34' to 28°52', belonging to the eighth time zone. 1,642 square kilometers of land is under the County's administration, accounting for about 1% of the province's land area.



Map 3-1 Geographic Location of Fengxin County in Yichun City (1:2,500,000)

3.1.2 Landform

Surrounded by mountains on three sides, Fengxin County tilts from west to east, and gradually lowers in the center and the eastern part. Basically the topography of Fengxin can be concluded as "seventy percent of mountains, twenty percent of farmlands, five percent of waters and five percent of roads and manors." The mountains, all belonging to tributaries of Jiuling Mountain, mainly lie in the western, northwestern and southwestern parts of the county. In Fengxin, the landform is complicated, with low hills standing alone everywhere. In the eastern part, the topography, being a hilly plain, is gentle, with slope gradient lower than 15 degrees in general. Rivers abound in this whole region.

Fengxin's main urban area is in the Fengchuan Town, and its new urban area in the Hexing Village of eastern part of Chi'an Town. The region contains mainly low hills caused by erosion and denudation, and some parts of the region belong to denuded and depositional

landforms, with ground elevation ranging from 37 to 70m. The terrain is rather plain without too much mountains, on which deposits are thin and vegetation is sparse.

The Nanliao River flows from west to east through Fengxin's urban area, both sides of which mainly are river alluvial terraces landforms. Level one and two terraces are well developed, with the terrace surface elevation being less than 50m. The regional stratum is simple, mainly formed by the fourth alluvial and diluvial layer, tertiary red rocks and granodiorite. The region belongs to cathaysian or neo-cathaysian structural system with simple geological structure. According to the regional geological map (1:200,000), no fault structure has been found. The seismic intensity is under six in the region.

3.1.3 Climate and Meteorology

Located in the mid-subtropical humid climate zone, Fengxin features distinct four seasons, abundant rainfall, sufficient sunshine and a long frost-free period. As the terrain changes, the temperature decreases from east to west while rainfall increases from east to west. There is clear humidity difference between the east and the west, and vague temperature difference between the north and the south. Influenced by complicated topography, the region encounters frequent natural disasters and drought and hail from time to time. Fengxin's average annual temperature is 17.3°C. January is the coldest time, with an average temperature of 4.7°C (the extremely low temperature was –15.1°C in history); July is the hottest time, with an average temperature of 29°C (the extremely high temperature was 40.4°C in an August). The average annual rainfall is 1,612mm, with the highest up to 2,264mm and the lowest down to 1,237mm a year. The rainfall is concentrated from April to June, accounting for 54% of the year's total; from July to September, rainfall decreases, accounting for less than 28% of the year's total. The average annual relative humidity is 79%; the annual average frost-free period lasts 260 days; and the annual sunshine reaches 1,803 hours.

3.1.4 Hydrology and Water System

Surface water: Fengxin rivers, most of which are mountain streams, covering an area of about 70,000 acres. The Nanliao River, which belongs to Xiu River Tributary and originated in Zhaoqiao of Yifeng County, is the major river in Fengxing with a total length of 98.3km in the region. Its width generally ranges from 60m to 250m, and from around 250m to 300m in the urban area. Nanliao River has more than 60 tributaries within Fengxin, among which about 29 flow into Nanliao River from north to south and 31 from south to north. Zhongbaogang and Huangshagang tributaries are the major Nanliao River tributaries flowing across the Fengxin County.

The Huangshagang River, belonging to Nanliao River tributary, lies in the southwestern part of the county's urban area. It originated in the Hualin Mountain and flows from west to northeast, with a total length of 36.5km. Its riverbed width is 20km in general and the maximum width is 60m. The Huangshagang River bears serious soil erosion with large amount of sand and silt at its bottom. Its controlled basin area is 135km^2 with an average gradient ratio being 3.5 ‰.

The Zhongbaogang River, belonging to Nanliao River tributaries, lies in the southwestern part of the county's urban area. It originated in Dahuo Mountain of Chi'an, with the main stem length being 14km and controlled basin area being 41.6km^2. Its average gradient ratio is 7.5 ‰.

First built in the 1950s, the Nanliao Irrigation Channel shoulders the irrigation task in Chi'an, Fengchuan, Songbu and other townships and towns of Fengxin County. Located on the stem of Niaoliao River in Guxian Village of Huibu Township is the Nanliao Dam, whose main channel winds across Fengxin's urban area from west to east in the South District. With the designed flow capacity being 11m^3/s, the channel's gradient ratio is 1/2,000, and 7km of the channel passes across the urban area. Due to self-contained irrigation and drainage system, it has little adverse impact on urban flood control.

Hydrogeological condition: Fengxin's groundwater mainly consists of phreatic water, with the burial depth being about 2m in general. The regional hydrogeological condition is relatively simple. Its groundwater, based on the burial conditions, can be divided into two types: loose stratum pore phreatic water and bedrock crack water.

The loose stratum pore phreatic water is mainly distributed in the quaternary diluvial layer and eluvial layer. Most of the involved diluvial layers have a dual structure: the upper loam soil layer has little water and is less permeable; the lower layer with stones, powder and sand of different sizes is relatively permeable, being the major aquifer layer of the region, whose permeation efficiency ranges from 11 to 200m/round-the-clock. Bedrock crack water is mainly distributed in the weathering bedrocks, tectonic cracks and crack belts. Supplementation, runoff and discharging of groundwater are significantly affected by the precipitations. During normal and dry seasons, the groundwater level is slightly higher than that of the river water, thus the groundwater will be discharged into surface depressions and rivers; During flood season, river water level rises and exceeds that of the groundwater, the river water will infiltrate into and supplement the groundwater. When the groundwater level is higher than the loam floor, the crack phreatic water is capable of resisting slight pressure.

3.1.5 Natural Resource

Fengxin's covers 1,642 square kilometers in total. It has 1,603 square kilometers of terrestrial land, accounting for 97.7% of the total area, and 39 square kilometers of water area, accounting for 2.3% of the total area. Fengxin has: 1,533,000 mu of woodland, accounting for 62.2% of the total land, used for growing abundant moso bamboos and a variety of economic timbers; 78,6000 mu of agricultural land, accounting for 31.9% of the total land, used for planting grains, oilseeds and other crops; and 145,000 mu for other use, accounting for 5.9% of the total land.

3.2 Social Environment

(1) Administrative Boundary

The administrative area under Fengxin County is 1,642 square kilometers, covering 10 towns, 3 townships, 3 farms, 1 office and 1 management zone.

(2) Socio-demographic Condition

According to statistics at the end of 2014, the county's total population was 334,179, an increasing of 7,148 compared with the previous year. The birth rate was 11.85%, the mortality rate was 5.71%, and the natural growth rate was 6.14%, a year-on-year decrease of 1.16‰.

(3) Overall Economic Status

Fengxin's economy achieved a stabilized and accelerated development in the year of 2014. The county's GRP (Gross Regional Product) reached 10.56841 billion yuan, increased

by 10.5% over the previous year when calculated by the comparable price. Among them, value-added of the primary industry totaled 1.61723 billion yuan, increased by 4.6%; value-added of the secondary industry totaled 5.97458 billion yuan, increased by 12.6%; value-added of the industrial enterprises totaled 5.49654 billion yuan, increased by 12.5%; and value-added of the third industry totaled 2.9766 billion yuan, increased by 8.6%. Per capita GRP was 33,286 yuan (calculated according to resident population). The structure ratio of the three industries was 15.3:56.5:28.2.

In 2014, stable fiscal revenue growth was achieved in Fengxin. The year's total fiscal revenue reached 1.81936 billion yuan, up by 17.6% over the previous year. Of it, public budget revenue reached 1.3246 billion yuan, increased by 15.7%. Total fiscal revenue accounted for 17.2% of GRP, up by 1.12 percentage points over the previous year; tax revenue reached 1.62998 billion yuan, an increase of 23.3%, accounting for 89.6% of total revenue which achieved a year-on-year increase of 4.2 percentage points.

In 2014, steady employment growth was achieved in Fengxin. The year-end employment population of the whole county was 152,943, a year-on-year growth of 1.5%. 2,296 new urban jobs were created in the year.

(4) Transportation

Fengxin County altogether has 4 provincial highways, respectively Dacheng-Ganzhou Expressway (S226), Wanbu-Huangshagang Expressway (S313), Fengxin-Daixi Expressway (S314) and Sixia-Tangpu Expressway (S232), which are key roads for the county's economic and social development; Changfeng-Jingtong Expressway has been opened to traffic, thus the drive from Fengxin to Nanchang has been shortened to within 1 hour. Indeed, Fengxin has entered Nanchang's "1-hour economic circle."

3.3 Ecological Environment

Plants in Fengxin mainly include moso bamboo, kiwifruit, boxwood, camphor tree and cypress. Precious wild plants were not found in the project area after consultation with the forestry department and field investigation.

The Dazhai Ditch, Beizhizhen Ditch and Southern Ditch, located in the urban area of frequent human activities, are mainly used for water drainage and irrigation. Due to heavy domestic sewage pollution, these ditches are seriously silted with low quality water where green alga is the major aquatic plant and fishes and benthos are of common species. No fish spawning site, feeding ground, wintering ground or precious aquatic life is found in involved sections and these ditches are not an important natural habitats.

Because of frequent human activities, few trace of precious and rare animals was found within the area. At present, no animal species under special state protection but only commonly seen species like birds, rats, rabbits, snakes have been found within the area.

3.4 Current Situation of Land Use

Table 3-1 Current Situation of Land Use of the Project Area

Serial No.	Project Type	Location	Land Use Type
1	Pipe network construction	The North District and the South District	Construction land

2	Automatic monitoring station on water quality of river and lake	Intake of Fengxin water supply	Heath land
		Boundary between Fengxin's Liao River and Anyi County	Heath land

3.5 Current Situation of Drainage and Overview of Sewage Treatment Plant

3.5.1 Current Situation of Drainage in Urban Area

According to *Fengxin County Urban Master Plan* (2010-2030), four functional zones will be formed, including North District, East New District, South District and Fengxin Industrial District, as shown below. The North District is mainly for business, commercial, educational and residential use; the East New District is mainly for business office, cultural, sport, business, commercial, residential and other use; the South District is mainly for administrative, commercial, residential and other use; and Fengxin Industrial zone is divided into Fengtian Base and Huangxi Base. Fengtian Base, mainly for industrial use, is the major textile base in Fengxin with a large forestry park; Huangxi Base is a new urban group, mainly for industrial use with a small number of residents, and is designed to be an aggregation zone for high-tech industry and up-to-date manufacturing industry.

The existing two sewage plants are Fengtian industrial district sewage treatment plant and Fengxin urban sewage treatment plant located at the east side of Zhengjiazhou Village in the northern part of Fengxin County. Fengxin urban sewage treatment plant serves the South District and the North District, whose phase one (10,000m^3/d) and two (10,000m^3/d) have already been put into operation, and the long-term treatment scale can reach 30,000 m^3/d; an industrial park sewage treatment plant has been completed in the Fengtian Industrial District, with the treatment capacity being 60,000m^3/d.

The East New District and the Industrial Park (West District) are newly built districts, with perfect pipe network which achieves diversion of rainwater and sewage. But the drainage network construction in the South District and the North District lags so far behind that most sewage, after collection and without effective treatment, is directly discharged into the nearest water, flowing into the Liao River. The urban water system has not been effectively protected, leading to not only pollution of the receptor's water quality but also deterioration of water quality with unbearable odor which threatens the ambient ecological environment and influences public health and urban economic growth. Therefore, this project involves the North District and the South District.

Within the scope of the project: the North District (old urban area) adopts drainage system combined with interception facilities, and the South District (newly constructed) adopts rainwater and sewage diversion drainage system. See the figures below.

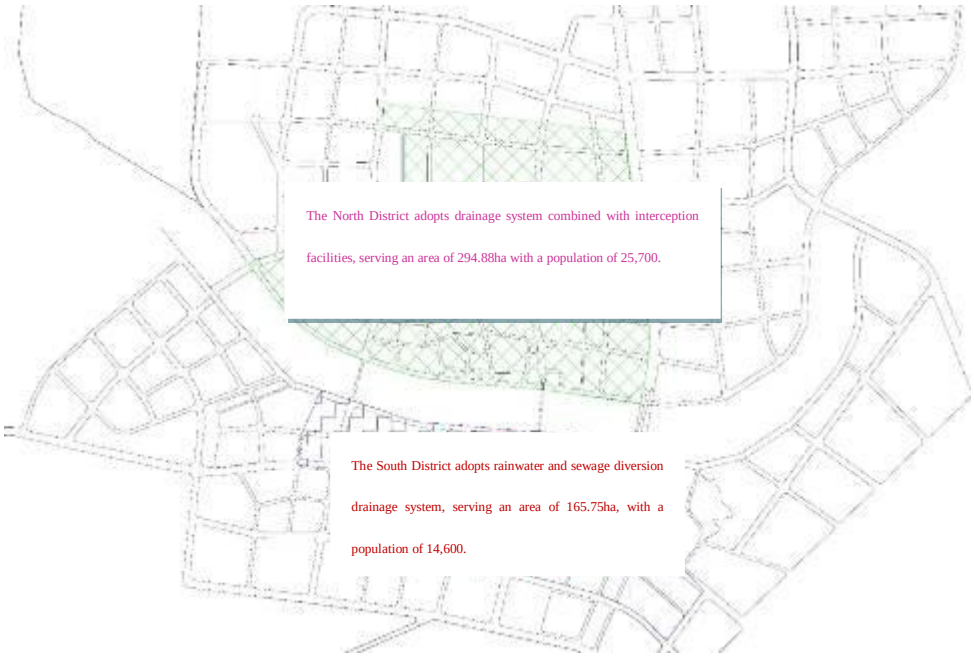


Figure 3-2 Current Situation of Drainage System of Fengxin Urban Area

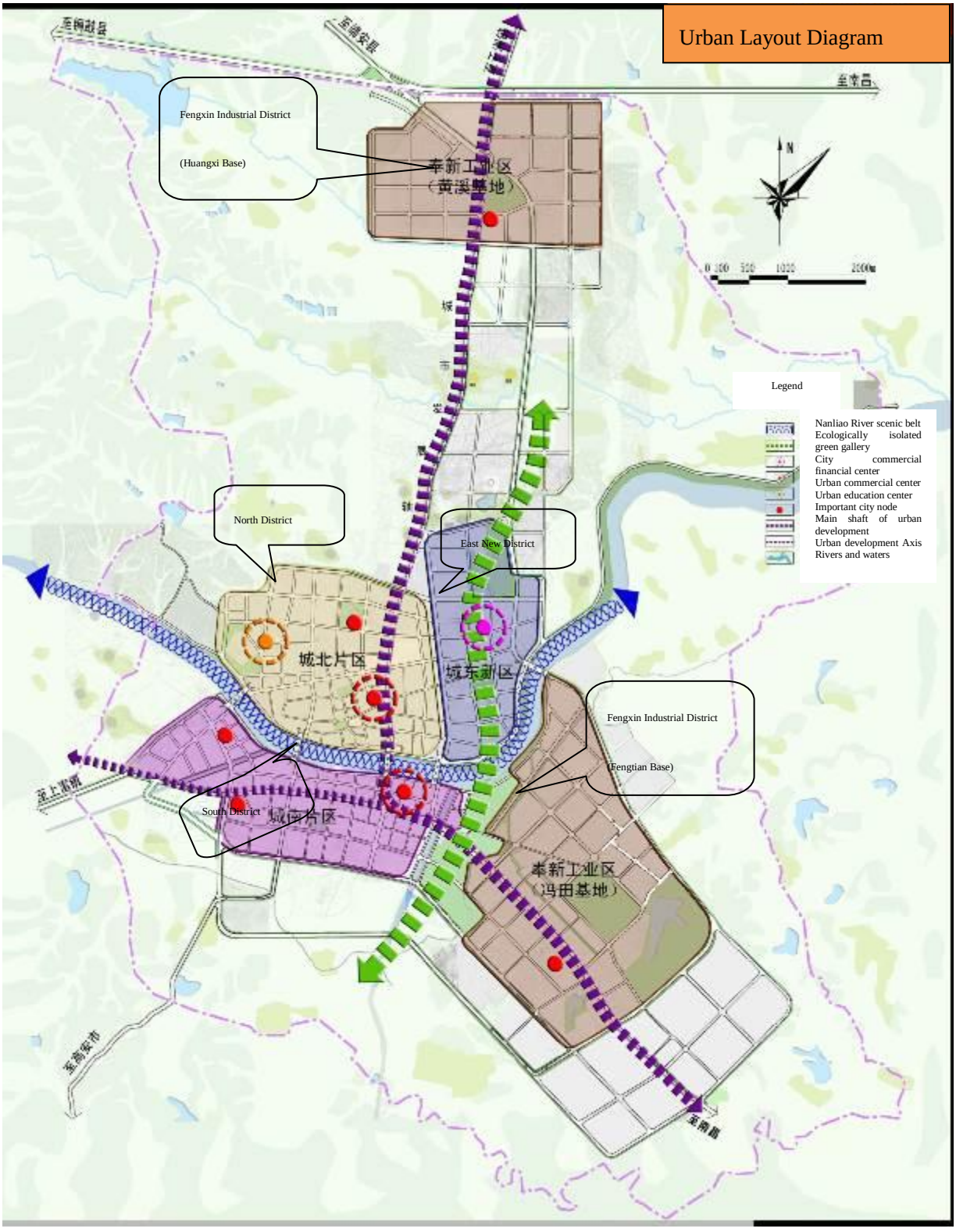


Figure 3-3 Planning Figure of Fengxin Urban Development

3.5.2 Current Situation of Drainage in the North District

The North District is located beyond the the north side of the Fengxin's Liao River, with a total planning area being 844.2ha, of which the area beyond the east side of Yingxing Avenue belongs to the East New District. The current situation of drainage system in the area beyond the west side of Yingxing Avenue is convergence intercepting, while rainwater

and sewage diversion system is adopted in the East New District. Among the entire North District, most sewage will be discharged into the nearest water bodies. But in some newly built communities, the sewage will be discharged into the sewage treatment plant via pipelines. Currently, the entire pipe network system in the North District is a mess without a uniformed planning. The sewage will be discharged (via branch pipelines) into the three existing drainage channels and the trunk sewage pipeline in the Binhe Road. According to the discharging direction, there are altogether 4 drainage systems, namely Beizhizhen Ditch System, Southern Ditch System, Dazhai Ditch System and Trunk Interceptor System.

(1) Beizhizhen Ditch Collection System

Beizhizhen Ditch begins at the northern end of the Fengxinshang Bridge, where a lifting irrigation pump station was built. During the end of June to the end of September, the station lifts water to the Beizhizhen Ditch to irrigate urban farmlands and vegetable plots beyond the east side of the Yingxing Avenue. Beizhizhen Ditch was built in the 1960s, flowing from south to north at the beginning then east to west, finally converging into the Liao River at Tiangong Bridge. Passing through the urban area, the channel is mainly used for irrigation. With the continuous development of the urban area, the channel irrigation capacity at the urban section is gradually reducing, but about 3,000 acres beyond the east side of Yingxing Avenue still need irrigation water. Currently the excavated channel section is 2.0m × 2.0m, and in some sections, the channel width is less than 1.5m. On both sides of the channel there are dense houses, many of which are built above the channel. Since heavy siltation and serious infiltration occur in the channel, only little water lifted by the lifting irrigation pump station can be used for downstream irrigation, as most of the water infiltrates into the urban soil. With a total length being about 3.0km, the channel is enclosed in most sections, with only 50m opened in the eastern side of Longshan Avenue, 100m in the eastern side of Zongwu Road. Most sections are built of mortar flag stone or brick except for about 1.0km of opened earthen section beyond the east side of Yingxing Avenue. Rainwater and sewage at both sides will converge into the channel.

The functional roads along the line include: Shishan Avenue, Yingbin Road West, North Jiangshe Road, Heng'er Road, Fengxin Avenue Mid and Huilan Road Mid. At the boundary between the Channel and Yingxing Avenue there is an overflow well to intercept and transport the sewage into the interception pipelines in the Yingxing Avenue, and finally into the sewage treatment plant.

Figure 3-4 Current Situation Along the Beizhizhen Ditch Collection System

(2) Southern Ditch Collection System

Started in the eastern area that is 50m southward the intersection of Mid Jianshe Road and Yingbin Road, the Southern Ditch is enclosed by slabs in the first half section, and is opened at the section beyond the east side of Yingxing Avenue. The overall trend of the channel goes from southwest to northeast and ends up around the Tiangong Avenue. Among the first half enclosed section (from the start point to Yingxing Avenue), residential houses occupy both sides of the channel. Due to the small bottom gradient, heavy siltation and serious infiltration occur inside the channel, thus water lingers inside during dry season and gives out odor. A major role of the channel in rainy season is flood discharging. The channel cross section is 4.0m × 3.0m, with a total length being about 2.2km. Heavy siltation and serious infiltration occur in the channel. Rainwater and sewage at both sides will converge into the channel. The current functional range includes a population of about 8,000. The functional area is 57.86ha, with sewage treatment capacity being 1,543m^3/d. The functional roads along the line include: Mid Jianshe Road, Yingbin Road (Mid Jianshe Road–Fengxin Avenue), Fengxin Avenue (Shishan Avenue–Fengchuan Road), Zongliu Road, Huilan Road and Fengchuan Road (Fengxin Avenue–Yingxing Avenue). At the intersection of the channel and intersection pipeline of Yingxing Avenue there is an overflow well to intercept and transport the channel sewage into interception pipelines in the Yingxing Avenue, and finally into the sewage treatment plant.

Table 3-2 Condition of Southern Ditch Collection System in North District

System Name	Road/Channel	Starting and Ending Points	Pipe Diameter (mm)	Pipeline Length (m)	Remark
Southern Ditch	Mid Jianshe Road	Yingbin Road–Fengchuan Road	DN600	332	Rainwater and sewage converge into the Southern Ditch
	Yingbin Road	Mid Jianshe Road–Fengxin Avenue	DN600	458	Rainwater and sewage converge into the Southern Ditch
	Fengxin Avenue	Shishan Avenue–Fengchuan Road	DN800	599	Rainwater and sewage converge into the Southern Ditch
	Zongliu Road	North Jianshe Road–Fengxin Avenue	DN800	549	Rainwater and sewage converge into the Southern Ditch
	Huilan Road	Heng'er Road–Shishan Avenue	DN800	281	Rainwater and sewage converge into the Southern Ditch
	Fengchuan Road	Fengxin Avenue–Yingxing Avenue	DN800	1,426	Rainwater and sewage converge into the Southern Ditch
	Yingxing Avenue	Shishan Avenue–Fengchuan Road	DN600	46	An overflow well will be set up in the Yingxing Avenue to intercept and transport the sewage into the sewage treatment plant

Figure 3-5 Current Situation Along the Southern Ditch Collection System

(3) Dazhai Ditch Collection System

The Dazhai Ditch starts in Zaoxia Road and ends up in Hejiazha, whose cross section is 6.0m × 5.0m, with a total length being about 4.7km. Mainly used for irrigation, the channel contains mountain spring water in the upstream, and is basically opened along all sections; at the urban section, domestic sewage on both sides will be discharged into the channel. The current functional range includes a population of about 3,000. The functional area is 22.46ha, with sewage treatment capacity being 599m^3/d. The functional roads along the line include: Heng'er Road, sections of Shishan Avenue and the northern side of Yingxing Avenue. At the intersection of the Channel and intersection pipelines of Yingxing Avenue there is an overflow well to intercept and transport the channel sewage into interception pipelines of Yingxing Avenue, and finally into the sewage treatment plant.

Table 3-3 Condition of Dazhai Ditch Collection System in North District

System Name	Road/Channel	Starting and Ending Points	Pipe Diameter (mm)	Pipeline Length (m)	Remark
Dazhai Ditch	Heng'er Road	Zongsan Road–Fengxin Avenue	DN600–DN800 2500×1500	1,527	Rainwater and sewage converge into the Dazhai Ditch

System Name	Road/Channel	Starting and Ending Points	Pipe Diameter (mm)	Pipeline Length (m)	Remark
	Shishan Avenue	Zongliu Road–Yingxing Avenue	DN800	1,103	Rainwater and sewage converge into the Dazhai Ditch
	Yingxing Avenue	Longshan Avenue–Fengxin Avenue	DN800–DN1000	1,316	An overflow well will be set up in the Yingxing Avenue to intercept and transport the sewage into the sewage treatment plant

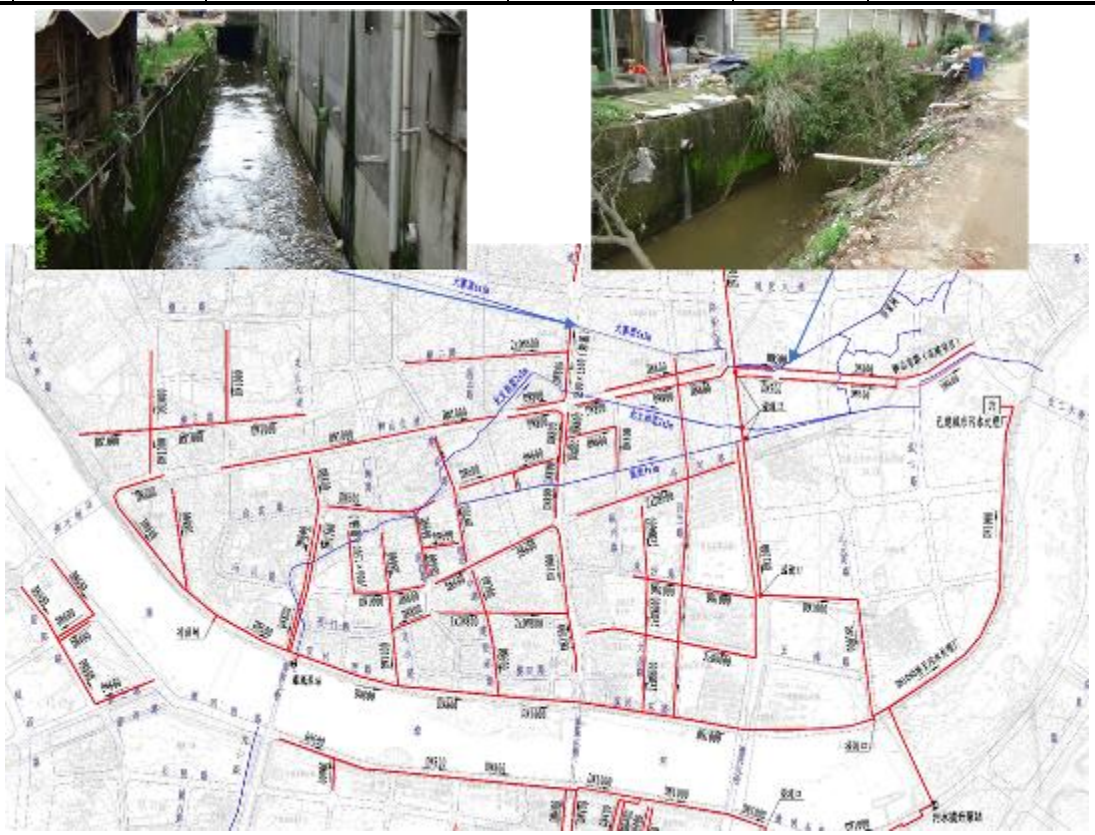


Figure 3-6 Current Situation Along the Dazhai Ditch Collection System

(4) Trunk Interceptor Collection System

The system includes trunk sewage interception pipes along the river and those in the Yingxing Avenue. The trunk sewage interception pipes, starting from the west in the eastern side of Hualin Bridge and ending up to the East in the sewage treatment plant near the Tiangong Bridge, contain those along the West Liaohe Road and those along the East Liaohe Road. The pipeline, with pipe diameter ranging from DN600 to DN1000, collects sewage generated in the North District which is discharged from north to south. Multiple overflow outlets (whose locations are shown in the attached map), have been set up to intercept the sewage. In the eastern area of the intersection of Jiutiange Road and East Liaohe Road, pressurized sewage which flows across the Liao River from the South District will converge into the channel. The current functional range includes a population of about 12,000. The

functional area is 87.13ha, with sewage treatment capacity being 2,324m^3/d. The functional roads and areas along the line include: Shishan Avenue, Longshan Avenue, Guangshi Road, South Jianshe Road, Huilan Road, Jiutiange Road and the South District. Trunk sewage interception pipes in the Yingxing Avenue section should be installed in the eastern side of Yingxing Avenue, with the pipe diameter being DN1000. The pipeline starts from Chongxian Avenue, goes along Yingxing Avenue from north to south and connects with the riverside trunk pipeline in the East Liaohe Road. The current functional range includes a population of about 10,783. The functional area is 77.63ha, with sewage treatment capacity being 2,070m^3/d. At the convergence of the three channels (Beizhizhen Ditch, Southern Ditch and Dazhai Ditch) in the North District and Yingxing Avenue there should be an overflow well to intercept and transport sewage into the trunk sewage interception pipeline in the Yingxing Avenue.

3.5.3 Current Situation of Drainage in South District

The South District is located beyond the south side of Fengxin's Liao River, with a total planning area of 590.1ha. As less area has been used in the South District, there are relatively few pipes already installed within the district. Most of the pipes are installed in areas beyond the north side of Xinwu Road and beyond the east side of Longshan Avenue. Rainwater and sewage diversion system is adopted in the constructed area, with rainwater pipes and sewage pipes being installed beneath all main roads. According to the discharging direction, there are altogether 3 drainage systems, namely Zhongbaogang System, Longshan Channel System, and Huangshagang System.

3.5.4 Overview of Sewage Treatment Plant

The designed drainage network serves the South District and the North District. The collected sewage will be eventually discharged into Fengxin sewage treatment plant. Details are shown in sections of due diligence

3.5.5 Major Problems of Drainage System

(1) A large amount of mountain spring water and irrigation water flows into the drainage pipe network

The Beizhizhen Ditch in the North District also shoulders irrigation task, and the irrigation water will converge into the trunk interception pipes at the interception well in Yingxing Avenue during the lifting; mountain spring water from the upstream, via Dazhai Ditch in the North District, will converge into the interception pipeline in the Yingxing Avenue. A large amount of mountain spring water and irrigation water has not been effectively divided, thus the sewage concentration is rather low when entering the sewage treatment plant. Moreover, this is a waste of water resources.

Figure 3-7 Current Situation of Drainage in Zhongbaogang Channel (Ending Section), Longshan Channel (Upstream Section) and Huangshagang (Upstream Section)

(2) Convergence method is adopted for most urban pipes and channels

Convergence method of rainwater and sewage is adopted for most of the existing sewage pipes in the North District, and unpleasant odor pervades the surroundings of rainwater grates with poor sanitary conditions; at the same time, during the construction of drainage pipes and channels, a large amount of mountain water and irrigation water converges into them, resulting in low sewage concentration; in addition, rainfall is frequent in Fengxin and a lot of rainwater enters the pipe network during rainy days, causing frequent concentration and volume changes of the influent into the sewage treatment plant .

(3) In some areas, sewage collection and treatment is not conducted

Sewage from Zhongbaogang drainage system and Longshan Channel drainage system in the South District is discharged directly into the Liao River, polluting its water quality.

Figure 3-8 Current Situation of Water Quality of Liao River

(4) There are a lot of open drainage ditches in the old urban area, whose trunk drainage lines are enclosed ditches in general

There are a lot of open drainage ditches in the old urban area, which are suffered from heavy siltation and blockage, greatly influencing the life of urban residents. And because most of the trunk drainage lines are enclosed channels, so they have the following problems: sewage infiltrates into the ground and pollutes the groundwater sources; terrestrial sludge tends to flow into open ditches, leading to siltation and blockage of such ditches, and the dredging work of the ditches are large in amount.

Figure 3-9 Beizhizhen Ditch in the North District Around the North Jianshe Road, Zongwu Road and Fengxin Avenue

3.6 Current Situation of Ambient Quality

3.6.1 Assessment of Current Situation of Atmospheric Environment

According to *2015 Fengxin County Environmental Quality Report* provided by Fengxin County environmental monitoring station, the ambient air quality monitoring and the results are as follows.

(1) Ambient Air Monitoring and Sampling Points

Table 3-4 Condition of Ambient Air Monitoring Points

Monitoring Item		Monitoring Point	Monitoring Cycle and Frequency
Urban area	SO_2	Fengxin No.1 Secondary School and Hualin Square of Fengxin County	One time every two months and 5 days in a row each time; 10-hour automatic sampling and monitoring should be conducted per day each time
	NO_2		
	Total suspended particles		Five times every year and 5 days in a row each time; 10-hour automatic sampling and monitoring should be conducted per day each time
	Inhalable particulate matter		
Townships and towns	SO_2	Township (Town) governments	One time every year and five consecutive days each time; four samplings (each 45 minutes every after 75 minutes) should be conducted in a day each time,
	NO_2		
	Inhalable particulate matter		

(2) Ambient Air Monitoring Program and Method

Table 3-5 List of Ambient Air Monitoring Program, Sampling and Analysis Method

Monitoring Item	Sampling Method	Analysis Method
SO_2	Sampling by comprehensive sampler	Formaldehyde solution sampling-pararosaniline hydrochloride spectrophotometric method HJ482-2009
NO_2	Sampling by comprehensive sampler	Saltzman HJ479-2009
Total suspended particles	Sampling by comprehensive sampler	Gravimetric method HJ/T 93-2003
Inhalable particulate matter	Sampling by comprehensive sampler	Gravimetric method HJ/T 93-2003

(3) Current Situation Assessment

1) Assessment Method

The single factor index method is adopted for the assessment, with the expression being:

$$Pi = \frac{Ci}{Coi}$$

In which,

Pi——The single factor index for Type i pollutant;

Ci——Actually measured concentration of Type i pollutants;

Co——Standard assessment value of Type i pollutants.

Current ambient air quality is analyzed based on the calculation results of the single factor index of pollutants, so as to verify whether it meets requirements in functional planning and thus pave the way for ambient air pollutants control.

Current situation of ambient air monitoring statistics and assessment results are shown in Table 3-6.

Table 3-6 List of Current Situation of Ambient Air Quality Assessment Results (Excerpt) (mg/m^3)

Monitoring Point	Item	Daily Average Concentration	Standard Concentration	Amount of Single Factor
Urban area	SO_2	0.046	0.15	0.31
	NO_2	0.0097	0.08	0.12
	PM_{10}	0.039	0.15	0.26
	TSP	0.070	0.30	0.23
Fengchuan Town	SO_2	0.043	0.15	0.29
	NO_2	0.0095	0.08	0.12
	PM_{10}	0.034	0.15	0.23
Chi'an Town	SO_2	0.046	0.15	0.31
	NO_2	0.0081	0.08	0.10
	PM_{10}	0.032	0.15	0.21

Table 3-7 shows that all the single factor of SO_2, NO_2, TSP, PM_{10} within the assessment area was less than 1, thus the pollutant did not exceed the standard, and the daily average monitoring value met the category II standard in *Ambient Air Quality Standards* (GB3095-2012). In summary, the ambient air quality is good around the project area.

3.6.2 Current Situation Assessment of Surface Water Environment

(1) Pollution Source Survey

According to information provided by Jiangxi Provincial Department of Environmental Protection, Fengxin County's condition of waste water pollutants from 2011 to 2015 is shown below.

Table 3-7 COD Emission of Fengxin's Waste Water from 2011 to 2015 (t)

Year	Industrial Source	Agricultural Source	Urban Domestic Waste	Others	Sum
2011	1254.868	994.995	1922	177.9	4349.763
2012	1064.224	922.4295	2031.04	177.9	4195.5935
2013	1308.0577	944.8787	2870	177.9	5300.8364
2014	1035.4785	1052.29	3020.247	177.9	5285.9155
2015	1125.42	717.19	2845.315	177.9	4865.825

Table 3-8 NH_3-N Emission of Fengxin's Waste Water from 2011 to 2015 (t)

Year	Industrial Source	Agricultural Source	Urban Domestic Waste	Others	Sum
2011	92.09	203.048	252	13.69	560.828
2012	82.521	169.461	271.9	13.69	537.572
2013	126.6507	174.1236	370	13.69	684.4643

2014	85.9365	180.44	392.994	13.69	673.0605
2015	127.9274	128.73	400.251	13.69	670.5984

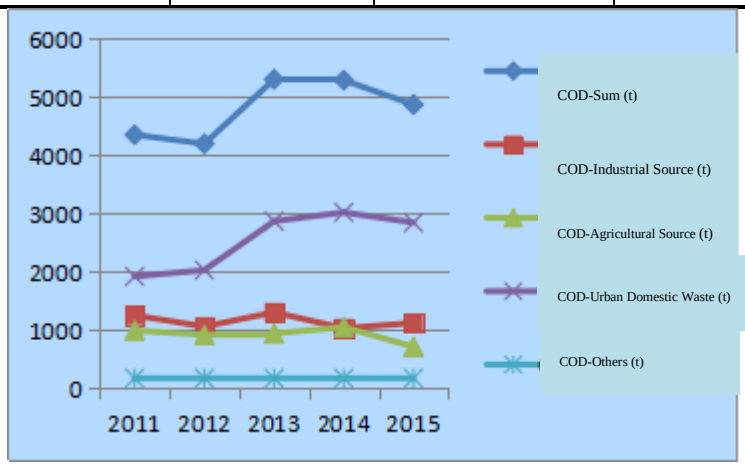


Figure 3-10 COD Emission Trend of Fengxin's Waste Water from 2011 to 2015

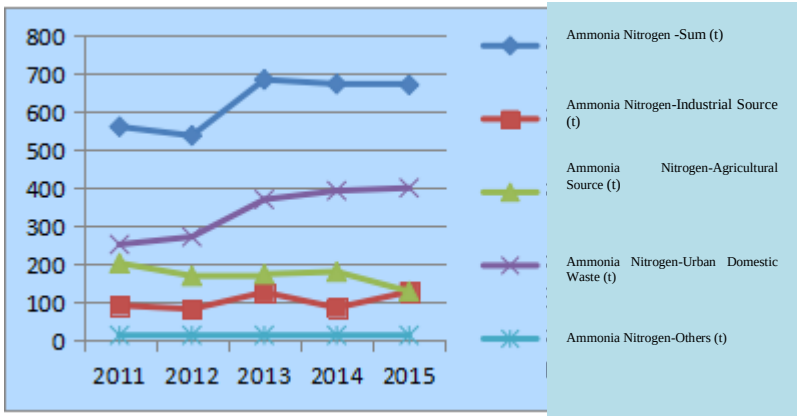


Figure 3-11 NH_3-N Emission Trend of Fengxin's Waste Water from 2011 to 2015

The above data show that the urban domestic waste is the major pollution source of Fengxin County's waste water, and the domestic sewage, followed by agricultural waste and industrial waste, is the major pollution source of Nanliao River. Agriculture pollution control is not considered in this project as agricultural pollutant emission spreads in the region and there are extremely small number of agricultural activities in the urban area. Besides, soil testing and formulated fertilization is adopted and organic fertilizers are used within the entire county. Fengxin's industries are mainly located in the Fengxin Industrial Park in southeastern part of Fengxin's urban area. A sewage treatment plant has already been established in the Industrial Park. The East District is a newly built district with perfect pipe network which achieves diversion of rainwater and sewage. But the drainage network construction in the South District and the North District lags so far behind that most sewage, after collection and without effective treatment, is directly discharged into the nearest water, flowing into the Liao River. Therefore, this project is mainly for resolving drainage issues in the North District and the South District.

(2) Current Condition of Water Quality

Fengxin Department of Environmental Protection provided sampling data (February 25, 2016) of 8 water quality monitoring points, including: ①upstream section of the Liao River; ② downstream section of the Liao River; ③ downstream Liao River (Xiangjiao Dam upwards 200m); ④reservoir of the flood drainage station in the South District; ⑤outlet of

Zhongbaogang; ⑥outlet of the Southern Ditch in the northern side of Tiangong Bridge; ⑦ convergence of the Southern Ditch and Yingxing Avenue; ⑧ intersection of the Dazhai Ditch and Yingxing Avenue. Wherein, the monitoring points in the Liao River from upstream to downstream are respectively ①, ⑤, ②, ③, ⑥, while monitoring points ④, ⑦, ⑧ are located in Liao River's tributaries.

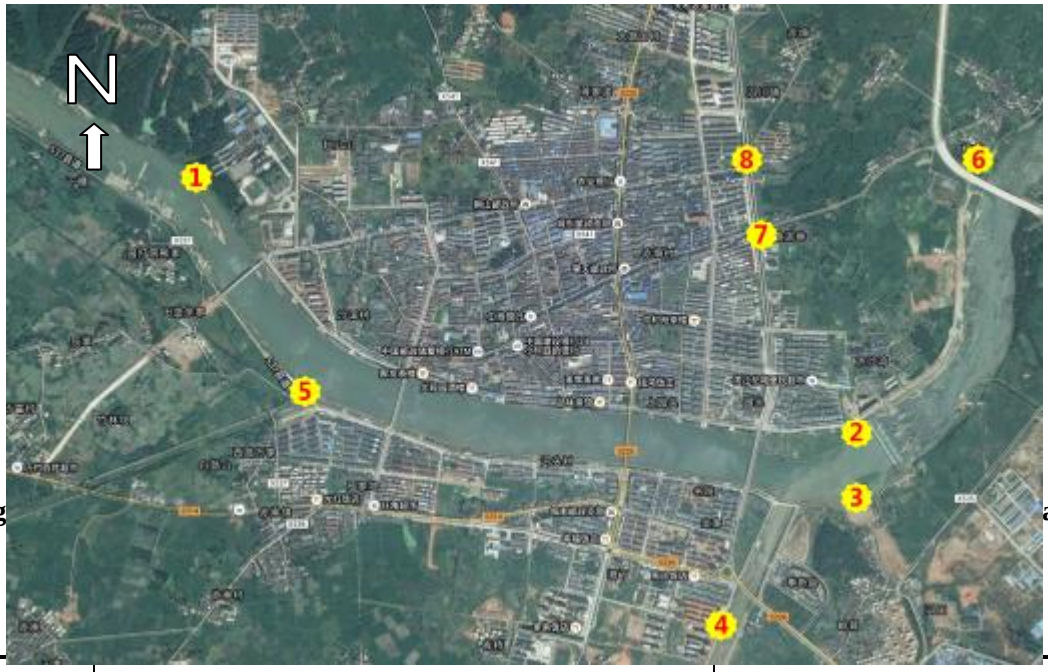


Fig and the

Serial No.	Sampling Location	Monitoring Item		
		COD_{Cr}	NH_3-N	TP
①	Upstream section of Liao River	10.5	0.043	0.025
②	The Xiangjiao Dam in the northern side of downstream Liao River	15.1	0.357	0.036
③	Downstream Liao River (Xiangjiao dam upwards 200m)	17.6	0.312	0.051
④	Reservoir of flood drainage station in the South District	22.7	0.950	0.069
⑤	Outlet of Zhongbaogang	13.6	0.667	0.039
⑥	Outlet of the Southern Ditch in the northern side of Tiangong Bridge	46.7	9.71	0.350
⑦	Convergence of the Southern Ditch and Yingxing Avenue	123	14.4	1.560
⑧	Convergence of the Dazhai Ditch and Yingxing Avenue	30.7	0.712	0.077

Table 3-10 Limits in *Surface Water Environment Quality Standards* (mg/L)

Standard Name and No.		Quality Factor Concentration Limit		
		COD	NH_3-N	TP
Surface Water Environment	Class I water	15	0.15	0.01

Standard Name and No.		Quality Factor Concentration Limit		
		COD	NH_3-N	TP
Quality Standards (GB 3838-2002)	Class II water	15	0.5	0.025
	Class III water	20	1.0	0.05
	Class IV water	30	1.5	0.1

Comparison between the water quality monitoring results of 8 monitoring points with class II and III water quality standards in *Environmental Quality Standard for Surface Water* (GB3838-2002) is shown below.

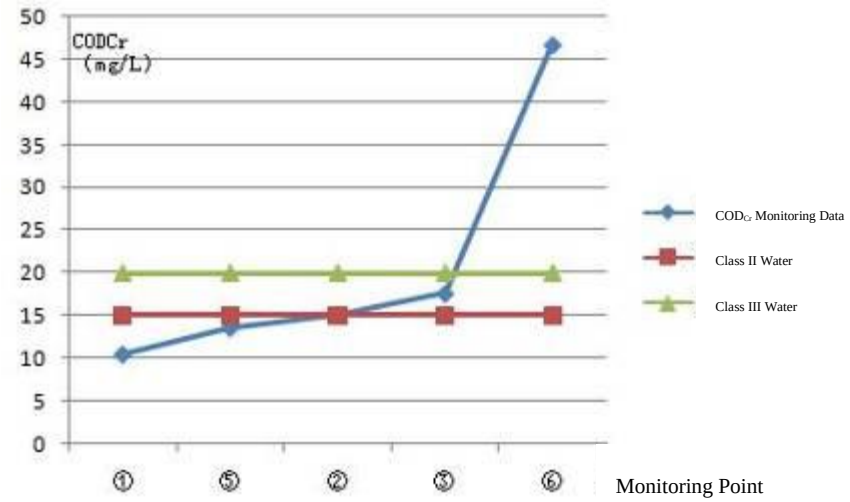


Figure 3-14 Comparison of COD_{Cr} Concentration Between the Quality of Current Water and Class Ⅱ and Ⅲ Water

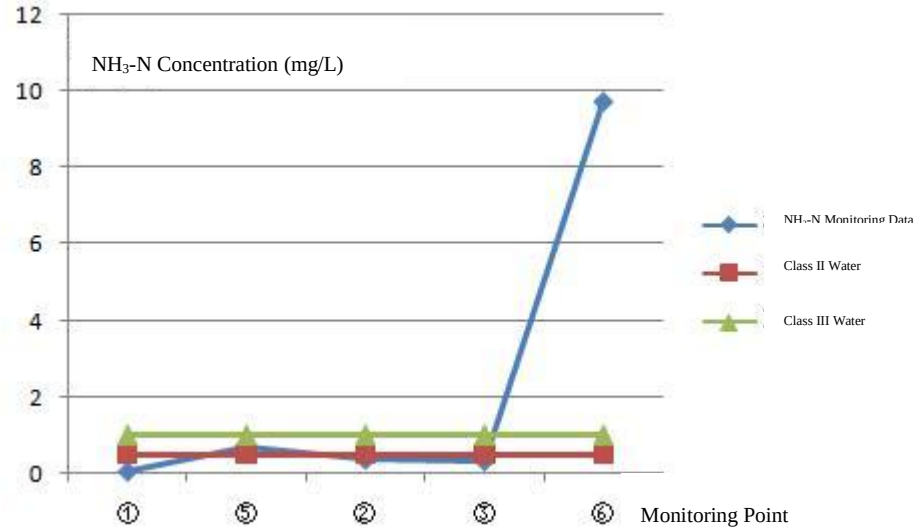


Figure 3-15 Comparison of NH_3-N Concentration Between the Quality of Current Water and Class Ⅱ and Ⅲ Water

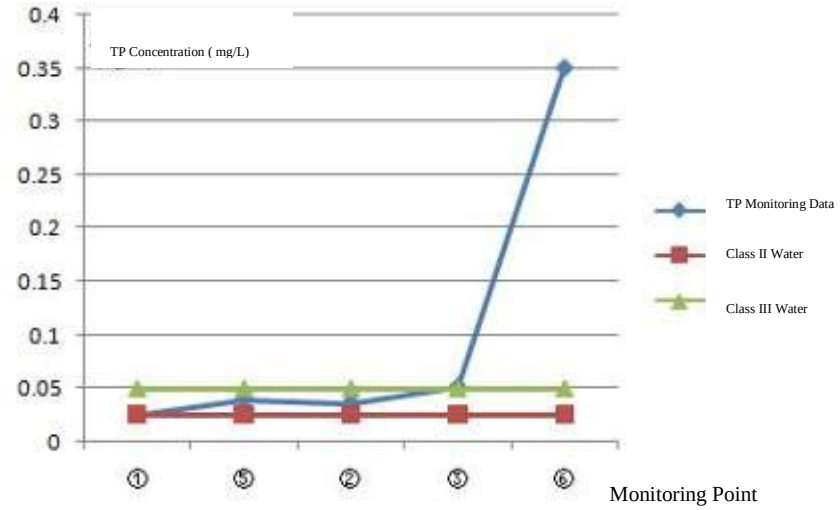


Figure 3-16 Comparison of TP Concentration Between the Quality of Current Water and Class Ⅱ and ⅢWater

As can be seen from the above data, the water quality of upstream Liao River is good. The water quality in monitoring point ① can basically meet the Class II water quality standard in *Environmental Quality Standard for Surface Water* (GB3838-2002). But after water flows through the urban area, the water quality worsens, and even a higher degree of pollution occurs in the urban tributaries. The tributaries directly flow into the Liao River and the water quality is class IV or worse. It is reasonable to conclude that direct discharging of urban sewage and sewage overflow due to convergence of rainwater and sewage are major causes of Liao River's pollution.

3.6.3 Assessment of Acoustic Environment Current Situation

The assessment involves monitoring of pump stations and related acoustic environment sensitive points to investigate the current situation of acoustic environment quality in places where pump stations are located, since acoustic environment impacts during operation mainly include those on nearby noise sensitive points caused by equipment operational noise in pump stations. 200m within the sewage lifting pump station which is located in the western side of Jingyi Road has no resident, so only acoustic environment monitoring has been conducted there.

Model: HS6288E multifunction noise analyzer;

Monitoring time/duration: June 15, 2016

Locations and results of monitoring points are shown in Table 3-11.

Table 3-11 Monitoring Results of Environmental Noise in Fengxin Urban Area

Serial No.	Monitoring Point	Monitoring Result		Standard Limit		Whether the Noise Meets the Standard	
		Day	Night	Day	Night	Day	Night
1	The sewage lifting pump station at the west side of Jingyi Road	50.3	45.4	70	55	Yes	Yes
2	Hengchang Huayuan Community	53.2	47.3	60	50	Yes	Yes
3	Huangshagang flood drainage	54.7	46.5	60	50	Yes	Yes

	station						
4	Weixing Binjianghuacheng Community	52.8	46.9	60	50	Yes	Yes
5	Jiutiange electric pumping station	53.8	46.3	70	55	Yes	Yes

According to on-site monitoring results, the noise of Huangshagang flood drainage station and Jiutiange electric pumping station meets category 4a standard in *Acoustic Environment Quality Standards* (GB3096-2008); the noise of sewage lifting pump station located at the west side of Jingyi Road in the South District meets the Category II standard; the noise of pump station noise sensitive points (Hengchang Huayuan Community and Weixing Binjianghuacheng Community) meets the category II standard.

3.6.3 Current Situation Assessment of Channel Siltation

To investigate the siltation conditions of the Beizhizhen Ditch, Southern Ditch and Dazhai Ditch, School of Environmental Resources and Chemical Engineering of Nanchang University was commissioned to detect the sediment of the channels. The sampling was conducted on June 6, 2016.

(1) Agency and plan of setting monitoring points

Table 3-12 Bottom Silt Monitoring Point Setting

Dredging Plan	Agency and Plan of Setting Monitoring Points	Monitoring Index
1) Beizhizhen Ditch: dredging volume totals 3,480m^3, with the depth being 0.5m and length being about 2,900m; 2) Southern Ditch: dredging volume totals 7,600m^3, with the depth being 0.5m and length being about 1,200m; 3) Dazhai Ditch: dredging volume totals 2,400m^3, with the depth being 0.3m and length being about 1,200m;	Currently no dredging section involves industrial pollution sources; one monitoring point (3 in total) will be set up in each channel	PH, Cu, Zn, Pb, Cd, Cr, Ni and moisture content

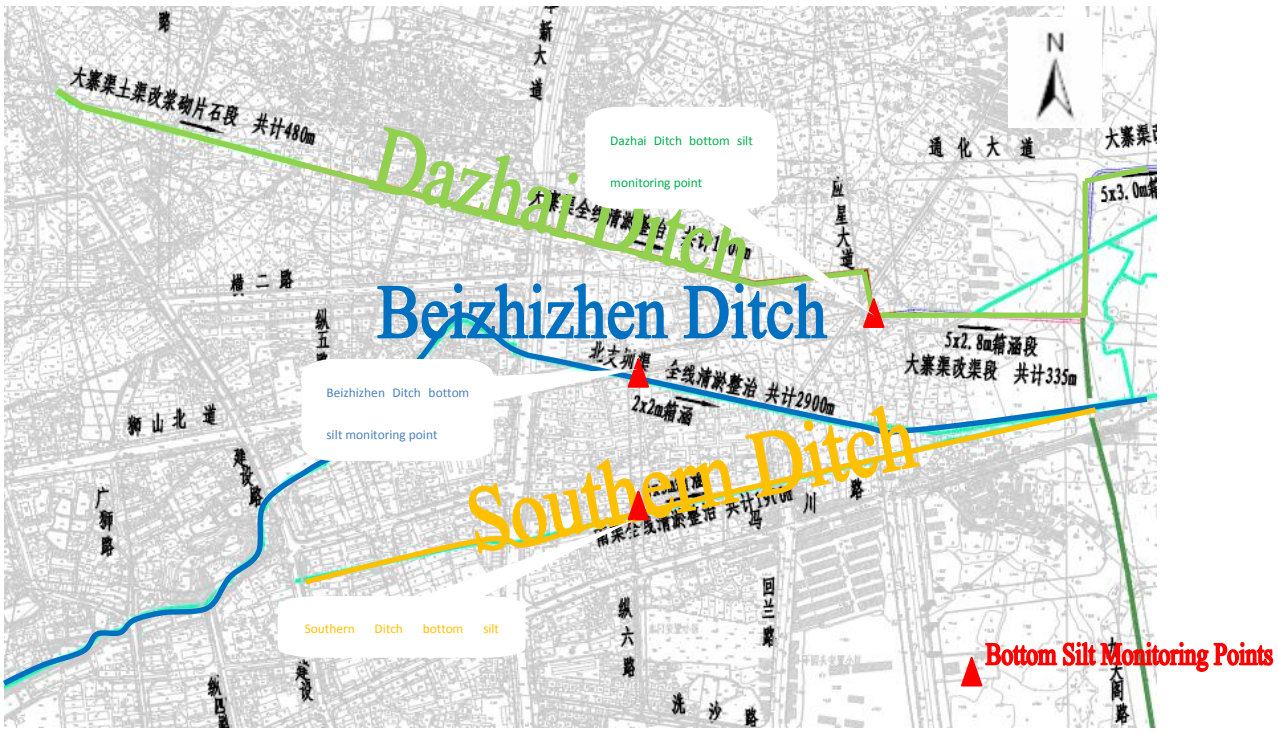


Figure 3-17 Location of Bottom Silt Monitoring Points of Southern Ditch, Dazhai Ditch and Beizhizhen Ditch in Fengxin County

(2) Sample Collecting and Monitoring Method

Samples are collected following aquatic sediments requirements in *Specifications for Water Environment Monitoring* (SL219-2013), and processed and monitored following requirements in *Technical Specifications for Soil Environment Monitoring* (HJ/T166-2004).

1) Sampling

Using tubular sediment sampler to collect and then conserve the sample in a sealed and light-proof glass container below 4℃; labeling outside the container the sample name and number.

2) Sample Pre-treatment

Open-air drying is conducted. Taking out sludge samples (generally no less than 500g) and quartering and reducing into 100g; putting the sample on a plate for open-air drying; shaping the dried sample into a thin layer of 2-3cm; timely crushing and turning over the thin layer to remove stones and animal and plant remains.

Screening: crushing the sample with a wood stick in order to let it go through 2mm nylon mesh; grinding it with an agate mortar in order to let it go through 0.49mm nylon mesh for later use.

3) Monitoring Analysis Method

Method for analyzing monitoring factors of bottom silt is shown in below table.

Table 3-13 Analysis Method for Bottom Silt Monitoring Factor

Monitoring Factor	Monitoring Instrument	Monitoring Method	Origin of Method
Cu	Monitoring instrument	Flame atomic absorption spectrophotometry	GB/T17138-1997
Zn	Atomic absorption spectrophotometer	Flame atomic absorption spectrophotometry	GB/T17138-1997
Pb	Atomic absorption spectrophotometer	Graphite furnace atomic absorption spectrophotometry	GB/T17141-1997
Cd	Graphite furnace atomic absorption spectrophotometer	Graphite furnace atomic absorption spectrophotometry	GB/T17141-1997
Cr	Graphite furnace atomic absorption spectrophotometer	Flame atomic absorption spectrophotometry	GB/T17137-1997
Ni	Atomic absorption spectrophotometer	Flame atomic absorption spectrophotometry	GB/T17139-1997

(3) Test Result

Table 3-14 Test Results of Fengxin Channels Bottom Silt (mg/kg Dry Sludge)

Item	pH	Cu	Zn	Pb	Cd	Cr	Ni	Moisture Content
Southern Ditch	6.45	39.1	2118.4	No	No	245.1	26.4	90%
Dazhai Ditch	6.82	3.75	1163.5	1.5	No	129.6	No	90%
Beizhizhen Ditch	6.99	64.25	2774.6	3.0	No	209.1	23.4	90%

Category II standard in *Soil Environment Quality Standards* (GB15618-1995)	＜6.5	50	200	250	0.3	150	40	-
	6.5–7.5	100	250	300	0.3	200	50	-
Standards for Control of Pollutants in Sludge for Agricultural Use (GB4284-84)	＜6.5	250	500	300	5	600	200	-
	≥6.5	500	1,000	1,000	20	1,000	200	-
Category B standard in *Soil Environment Quality Standards for Exhibition Sites (Provisional)* (HJ350-2007)	/	600	1,500	600	22	610	2,400	
Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant (CJ/T362-2011)	5.5–8.5	1,500	3,000	1,000	20	1,000	200	<60%
Standards for Sludge Disposal and Utilization (40 CFR Part 503) (United States)	-	4,300	7,500	840	85	-	420	-
Guidelines for Sludge Utilization in Agriculture (Directive 86/278/EEC) (European Union)	-	1000–1750	2500–4000	750–1200	20–40	-	300–400	-

The test results show that:

According to the monitoring result:

(1) Zn content of bottom silt of Dazhai Ditch is 1163.5mg/kg (pH 6.82). It exceeds category II standard (250mg/kg) in *Soil Environment Quality Standards* (GB/15618-1995) and standard (pH≥6.5, 1,000mg/kg) in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84), but meets the following standards: category B standard (1,500mg/kg) in *Soil Environment Quality Standards for Exhibition Sites (provisional)* (HJ350-2007), *Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant* (CJ/T362-2011) (3,000mg/kg), EU's *Guidelines for Sludge Utilization in Agriculture* (Directive 86/278/EEC) (2,500mg/kg-4,000mg/kg) and the US's *Standards for Sludge Disposal and Utilization* (40CFR Part 503) (7,500mg/kg). Other monitoring factors of Dazhai Ditch meet category II standard in *Soil Environment Quality Standards* (GB15618-1995).

(2) Zn and Cr content of bottom silt of Southern Ditch are 2118.4mg/kg and 245.1 mg/kg (pH 6.45) respectively. They exceed category II standard (200mg/kg, 150 mg/kg) in *Soil Environment Quality Standards* (GB/15618-1995). Zn content exceeds the standard (pH ＜6.5, 500mg/kg) in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84) and Cr content meets the standard (600mg/kg) in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84). But Zn content meets the following standards: category B

standard (1,500mg/kg) in *Soil Environment Quality Standards for Exhibition Sites (provisional)* (HJ350-2007), *Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant* (CJ/T362-2011) (3,000mg/kg), EU's *Guidelines for Sludge Utilization in Agriculture* (Directive 86/278/EEC) (2,500mg/kg-4,000mg/kg) and the US's *Standards for Sludge Disposal and Utilization* (40CFR Part 503) (7,500mg/kg). Other monitoring factors of Southern Ditch meet category II standard in *Soil Environment Quality Standards* (GB15618-1995).

(3) Zn and Cr content of bottom silt of Beizhizhen Ditch are 2774.6mg/kg and 209.1 mg/kg (pH 6.99) respectively. They exceed category II standard (250 mg/kg, 200 mg/kg) in *Soil Environment Quality Standards* (GB/15618-1995). Zn content exceeds the standard (pH $\geqslant$ 6.5, 1,000mg/kg) in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84) and Cr content meets the standard (1,000 mg/kg) in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84). But Zn content meets the following standards: category B standard (1,500mg/kg) in *Soil Environment Quality Standards for Exhibition Sites (provisional)* (HJ350-2007), *Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant* (CJ/T362-2011) (3,000mg/kg), EU's *Guidelines for Sludge Utilization in Agriculture* (Directive 86/278/EEC) (2,500mg/kg-4,000mg/kg) and the US's *Standards for Sludge Disposal and Utilization* (40CFR Part 503) (7,500mg/kg). Other monitoring factors of Beizhizhen Ditch meet category II standard in *Soil Environment Quality Standards* (GB15618-1995).

(4) That the bottom silt doesn't meet category II standard (pH 6.5-7.5) in *Soil Environment Quality Standards* (GB15618-1995) is mainly caused by wastes generated by urban small-scale electroplating factories built in the 1980s and 1990s. Those factories have disappeared in the urban area now.

(5) According to above comparison and analysis, the bottom silt of Southern Ditch, Dazhai Ditch and Beizhizhen Ditch does not belong to hazardous waste but belongs to general solid waste which will be used for woodland.

4 Alternatives Analysis

Comparison and analysis of alternatives of the project mainly involve two aspects: first, the analysis of zero-plan; second, the comparison of dredging method.

General principles are as follows:

1) Quantification: trying to quantify the project environmental impacts of each alternative.

2) Comprehensive comparison: comprehensive comparison and analysis are conducted based on environment, technique, economy, society and other aspects.

3) Suitability: the selected plan should comply with the relevant development planning requirements and standards, and be adapted to local conditions.

4.1 Comparison and Selection of Zero-plan

Comparison and analysis, from the aspects of environmental and socio-economic gains and loses, on "having a plan" and "no plan" were conducted in the project EIA. The results are shown in Table 4-1.

Table 4-1 Comparison and Selection of Zero-plan

Category	Adopt the plan	No plan
Major advantages:	(1) Complying with technical policies of national urban domestic sewage treatment and pollution control; (2) Complying with Poyang Lake Ecological Economic Zone Planning; (3) Helping to protect water quality of Poyang Lake Basin. By 2023, the estimated annual reduction of pollutant into Poyang Lake Basin water bodies include 15 tons of TN, 2.4 tons of TP and 215.5 tons of COD. (4) Improving people's living quality and environment; (5) Speeding up infrastructure construction, leveling up urbanization, and achieving sustainable urban development.	(1) Maintaining current conditions, e.g. vegetation will not be destroyed and so on; (2) Do not change the land use value (no land occupation); (3) No damage to vegetation, no dust or other environmental impacts during the construction.
Major disadvantages:	(1) Land acquisition; (2) Damage to vegetation; construction dust.	(1) Untreated sewage directly flows into surface water, which will severely pollute the surface water; (2) The backward condition of existing drainage system cannot be fundamentally resolved.
Comprehensive analysis	From the social and environmental perspectives, it is better to implement this plan than without one	

As can be seen in Table 4-1, although no environmental impacts exist if there were no plan, the direct discharging of sewage into the nearby water bodies will undoubtedly cause severe environmental pollution; and although certain impacts will be caused were this plan

implemented, adverse impacts can be avoided and mitigated by adopting related environmental protection measures. Moreover, the environmental impact during construction lasts only a short time, but there are long-term benefits brought by project construction and operation. In particular, the project can help protect and improve water quality of Poyang Lake Basin and level up urban infrastructures. Therefore, from the perspective of promoting socio-economic development and environmental protection, it is better to implement this plan than without one. In other words, the project is necessary.

4.2 Comparison and Selection of Technical Alternatives

The following two dredging methods are compared: one, mechanical together with manual methods will be adopted in dry season; two, environment-friendly cutter suction dredger will be used for dredging. Comparison results are shown below.

Table 4-2 Comparison of Dredging Method

Item	Plan One	Plan Two
Introduction	As for the Southern Ditch, Beizhizhen Ditch and Dazhai Ditch, there is no water coming from upstream in dry season, thus enclosure is not necessarily to be set. When dredging channels are narrow, manual method is mainly adopted; when dredging channels are wide, workers will be equipped with small digging machines.	The environment-friendly cutter suction dredger is equipped with a specialized environment-friendly cutter head. During dredging, the dredger uses the cutter head to dredge under a low vibration in an enclosed environment. The excavated silt will be discharged, via a high-power dredge pump on the dredger, into the enclosed silt pipeline and finally to the designated dumping area.
Application condition	Small rivers, ditches and channels that have no shipping traffic	Large and medium-sized lakes and reservoirs; generally used for environment-friendly dredging in rivers, lakes and reservoirs.
Construction land	Temporary land occupation of 600m^2 is needed	Temporary land occupation of 1,500m^2 is needed
Construction and progress	Implemented in season, with simple construction and strong operability	Construction in the wet period and high requirements of construction management are needed
Environmental impacts	Construction in dry season, with less impact on water quality or aquatic ecological environment	Less impact on water quality
Cost	Less cost	Higher cost
Advantage	High dredging quality; low requirement on equipment and technique; low moisture content of sludge generated; easy for follow-up treatment; lower construction cost	① The dredging equipment should have a high positioning accuracy and precision of excavation to avoid over-dredging or the opposite, and to avoid damaging the original soil. During dredging, impact on the aquatic environment should be prevented; ②It should be ensured that the dredging will not reduce turbidity of the water body.

Disadvantages	Carried out in the dry season and time is limited and the construction is vulnerable to weather	The environment-friendly cutter suction dredger is pretty large, which cannot easily enter the project site, demanding construction management, and large temporary land occupation is needed. Therefore, the cost is high.

The dredging channel that varies in width is small and without water during dry season in general. Therefore, it is difficult for large-scale ships to enter the channel. Based on said reasons, plan one is more suitable than plan two. Besides, plan one requires less land occupation and has fewer impacts on the water quality and aquatic ecological environment. Therefore, plan one is recommend and manual together with mechanical dredging methods will be adopted during dry season.

5 Environmental Impact Analysis and Mitigation Measures

5.1 Environmental Impact Analysis and Mitigation Measures during Construction Period

5.1.1 Aquatic Environmental Impact Analysis During the Construction Period and Mitigation Measures

5.1.1.1 Aquatic Environmental Impact Analysis during Construction Period

(1) Impact of Dredging on Water Quality

The proposed project involves dredging for the Dazhai Ditch, Beizhizhen Ditch and Southern Ditch. The dredging volume totals 134,800m3. Mechanical together with manual dredging methods will be adopted in dry season. There is no water coming from the uptream of the dredging river in dry season, thus cofferdam is not necessarily to be set up. When dredging channels are narrow, manual method is mainly adopted; when dredging channels are wide, workers will be equipped with small digging machines. The project's impact on water quality is minor.

Based on the above analysis, bottom sludge is not hazardous waste but common solid waste. Sludge will be dried in the storage yard, using the centrifugal dewatering system which is a complete, effective, automatic dewatering treatment technology composed of driers, screw pumps, conveyors, etc., that can achieve continuous production. Purified and concentrated mud will be sent through screw pumps to separating element where mud is gradually separated from water. The residual water will be discharged after flocculant agent-feeding treatment, having few impacts on water quality.

Dewatered sludge should be cleared timely and should be covered with tarpaulin in temporary storage to prevent rainwater backflow from polluting the water.

(2) Construction Waste Water and Domestic Sewage

Waste water generated during the construction period mainly includes domestic sewage of construction personnel and construction waste water. Major pollutants of domestic sewage include COD, BOD_5, SS, NH_3-N, altogether 4.8m^3/d; construction waste water mainly includes muddy water (small amount in general) and waste water generated at the construction site. The former is generated by washing machinery and vehicles during pipeline excavation; the latter, including SS, petroleum and the like, is generated by washing sand and stones, mixing and pouring concrete and other works. Channel dredging is conducted in dry season and generally has no impact on the water environment.

Construction waste water and domestic sewage will pollute the ambient water if arbitrary discharging occurred. Domestic sewage from construction personnel should be disposed by surrounding existing residential sewage treatment system, and cannot be discharged arbitrarily. After precipitation, the construction waste water can be used for dust reduction. After adopting above measures, the waste water generated during construction will have no adverse impact on the ambient water environment.

5.1.1.2 Mitigation Measures

(1) Dredging

Mechanical together with manual dredging methods will be adopted in dry season. Construction duration should be minimized to avoid disturbing the water bodies. The residual water generated by sludge dehydration can be discharged into the nearest water bodies after treatment of dosing and flocculation.

For arranging the sludge stacking area, the nearest wasteland should be used. Sloping reclamation dam should be set up surrounding the stacking area. The dam can be shaped like a woven bag or be formed by compacted earthwork. At the inner side of the stacking area and the reclamation dam, impermeable materials should be laid.

Water outlets should be set up in the stacking area. Water outlets should be as far away from mud outlets as possible. For the sake of taking full advantage of the sludge storage space, water outlets should be set in the corner of the storage yard. Sludge volume, area and geometrical shape of the storage yard and drainage outlets outside the storage yard, etc. should be taken into overall consideration. The project should meet the need of residual water monitoring and the need of emergency processing to residual water which does not meet the requirement of emissions.

Emergency processing facilities of residual water should be set up, including the accident pools, the emergency chemical addition equipment and so on. With the permission of the construction site, emergency accident reservoir should be set up around the stacking area. In accordance with the specific condition of the construction site, the designed reservoir should store residual water for 2-4 hours. Certain anti-seepage measures also should be taken for the reservoir. In circumstances of accident or emergency, if there is residual water that does not meet the standard, the pool can be used as the site for emergency storage and treatment.

The dewatered bottom sludge should be timely removed. If temporary stacking is needed, the sludge must be covered by tarpaulin to prevent the sludge from backflow during rainy days, causing water pollution.

(2) Construction Waste Water and Domestic Sewage

Waste water generated by processing sand and gravel, after being disposed by settling pond, can be used for mixing concrete and watering to reduce dust, and cannot be discharged into nearby water bodies; slurry generated during construction should be disposed in the settling pond via mud pump and be solidified through drainage and evaporation, and the slurry cannot be discharged into nearby water bodies; waste water generated from washing machinery and equipment, after being disposed by oil-separating sedimentation tank, can be used for watering the construction site to reduce dust, and cannot be discharged into nearby water bodies.

Drainage should be taken into full account for the layout of the construction site which should also be away as far as possible from the river. It should be ensured that the construction site, warehouses, storage areas of diesel oil and bitumen, and facilities for manufacturing bitumen are more than 500m away from the river. Pollutants should be prevented from entering the river when the facilities are in operation. In particular, leakage via land or surface water should be avoided during rainy season.

During construction, the on-site ground should be kept clean. Waste water or pollutants should be prevented from entering the ditches. Otherwise, infiltration of waste water may occur.

If on-site oil storage is needed, then anti-seepage treatment must be conducted in the warehouse. Measures should be carried out for storage and use in order to avoid phenomena of evaporating, emitting, dripping leaking, or polluting water bodies.

The infrastructure construction should be conducted in non-flood season to reduce influence of shallow groundwater level on the construction.

Channel dredging should be carried out in dry season and the construction time should be shortened as much as possible to reduce disturbance to water bodies.

Domestic sewage from construction personnel should be disposed by surrounding existing residential sewage treatment system, and cannot be discharged arbitrarily. Anti-seepage and anti-loss measures should be conducted in accordance with relevant requirements for temporary garbage storage room.

5.1.2 Ambient Air Impact Analysis during Construction Period and Mitigation Measures

5.1.2.1 Ambient Air Impact Analysis during Construction Period

(1) Dusts Produced by Transportation Vehicles

According to relevant documents, during construction, the dust generated by vehicles accounts for more than 60% of the total dust. Dust generated by vehicles, after completely drying, can be calculated according to the following empirical formula:

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

In which:

Q —— dust generated by vehicles, kg/km·vehicle;

V —— vehicle speed, km/h;

W —— vehicle load, t;

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

Table 5-1 shows the dust amount generated by a truck of 10t when passing a 1km road under different pavement cleanliness and different driving speed. It is thus clear that under the same conditions of road surface cleanliness, the faster the speed, the greater the amount of dust; while under the same vehicle speed, the dirtier the road surface, the greater the amount of dust. Therefore, limiting driving speed and keeping the road surface clean are the most effective ways to reduce dust generated by vehicles.

Table 5-1 Dust Generated Under Different Vehicle Speed and Different Road Surface Cleanliness

Amount of Dust / Vehicle Speed	0.1 kg/m^2	0.2 kg/m^2	0.3 kg/m^2	0.4 kg/m^2	0.5 kg/m^2	1.0 kg/m^2
5 (km/m^2)	0.0511	0.0859	0.1164	0.1444	0.1707	0.2871
10 (km/m^2)	0.1021	0.1717	0.2328	0.2888	0.3414	0.5742
15 (km/m^2)	0.1532	0.2576	0.3491	0.4332	0.5121	0.8613
25 (km/m^2)	0.2553	0.4293	0.5819	0.7220	0.8536	1.4355

Meanwhile, spraying water on roads 4 to 5 times per day helps reduce by about 70% of dusts in the air, indeed a good way to reduce dust.

(2) Dust at the Construction Site

Another major source of the dust during construction is wind dust in open stacking area and bare area. Due to construction needs, open stacking is adopted for construction

materials. At some construction sections, the topsoil needs manual excavation and temporary stacking, hence generating dusts when the weather is dry and windy. The amount of dust may be calculated according to empirical formula in the stacking area:

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

In which: Q —— the amount of dust, kg/t·y;

V_{50} —— wind speed at the space 50m above the ground, m/s;

V_0 —— wind speed for blowing away dust, m/s;

W —— moisture content of the dust, %.

The wind speed for blowing away dust can be affected by dust particle size and moisture content. Therefore, reducing open stacking, ensuring a certain dust moisture content and minimizing bare ground are effective means to reduce wind dust. Diffusion and dilution of dust in the air is affected by wind speed and other weather conditions as well as dust settling velocity. Dust settling velocities under different dust particle diameters are shown in Table 5-2. According to the table, dust settling velocity rises rapidly as particle diameter increases. The settling rate is 1.005m/s when particle diameter is 250μm, thus it is reasonable to consider that when dust particles are larger than 250μm, the main influence sphere is the downwind area, and the real impact source of the external environment is tiny dust particles.

Table 5-2 Dust Settling Velocity of Different Particle Diameter

Particle Diameter (μm)	10	20	30	40	50	60	70
Settling Velocity (m/s)	0.003	0.012	0.027	0.048	0.075	0.108	0.147
Particle Diameter (μm)	80	90	100	150	200	250	350
Settling Velocity (m/s)	0.158	0.170	0.182	0.239	0.840	1.005	1.829
Particle Diameter (μm)	450	550	650	750	850	950	1,050
Settling Velocity (m/s)	2.211	2.614	3.016	3.418	3.820	4.222	4.624

(3) Exhaust Gas of Construction Machinery and Transportation Vehicles

Bulldozers, excavators, trucks and other construction machinery will produce a certain amount of exhaust gas during operation, which includes HC, CO, NOx and other pollutants which cause a certain degree of impact on the ambient air. Small amount of exhaust and low concentration of pollutant will be discharged by vehicles as long as they decelerates. Transportation vehicles, bulldozers, excavators and other vehicles should slow down the speed when passing by villages or entering the construction site, in order to reduce the impact of vehicle exhaust. Furthermore, regular repair and maintenance should be conducted to ensure vehicles' normal function and to reduce exhaust emission.

(4) Odor Generated by Dredging

The proposed project involves dredging for the Southern Ditch, Dazhai Ditch and Beizhizhen Ditch, with the total dredging amount being about 13,480m^3. Mechanical

together with manual dredging methods will be adopted in dry season in this project. Temporary stacking area will be set up for silt dehydrating and drying. A small amount of odor will be produced in the sludge stacking area.

5.1.2.2 Mitigation Measures

Waste gas generated during construction mainly includes dust at the construction site, odor in the sludge stacking area and exhaust produced by construction machinery and transportation vehicles. The following measures will be adopted to protect the ambient air during the construction period:

(1) Adopting advanced construction techniques; using wet process for crushing gravels and concrete; equipping the construction site with dust collection device; controlling vehicle speed and exhaust emission from cars and coals; spraying water at the construction area when needed (4 to 5 times a day is preferred); using liquefied petroleum gas, electricity and other clean energy; enhancing afforestation of the construction site and strengthening labor protection for construction personnel. All these will reduce adverse impact on the ambient air.

(2) At the inner side of entrance and exit for vehicles transporting materials and spoil, a car washing platform should be established, surrounded by barriers to prevent leakage of waste water from washing cars. Before leaving the site, the tires and body of vehicles must be washed in the washing platform. Any sludge is not allowed to be attached to vehicles' surface. Materials and spoil should not exceed the upper edge of the vehicle ledge during transportation, and the vehicle hopper should be sealed or be covered with a tarpaulin.

(3) Concrete mixing station and asphalt mixing station cannot be set inside the construction site; commodity concrete and asphalt should be used.

(4) Transportation vehicles, bulldozers, excavators and other vehicles should slow down the speed when passing by villages or entering the construction site. Furthermore, regular repair and maintenance should be conducted to ensure vehicles' normal function and to reduce exhaust emission.

(5) Setting up dust-proof barriers around the work area, especially at places close to residential areas, hospitals and schools.

(6) Minimizing the generation of dust and particulate matter in order to avoid impact on surrounding residential and business practices; focusing on protecting vulnerable populations (such as children, the elderly, etc.).

(7) Regularly spraying deodorant in the sludge stacking area to reduce impact on the ambient air.

(8) Removing all the dewatered sludge.

5.1.3 Analysis of Acoustic Environment Impacts during Construction Period and Mitigation Measures

5.1.3.1 Analysis of Acoustic Environment Impacts during Construction Period

Construction noise disappears with the completion of construction; but the noise is strong, and it will have a serious impact on the ambient acoustic environment such as important sensitive points like hospitals, schools and the like. As a result, it is necessary to control the construction noise. Since the pipeline construction equipment is movable and the number of equipment operated differs at different time points in the same construction phase, it is difficult to accurately predict the noise value at each site boundary. According to the

attenuation model of point acoustic sources, noise values of machinery at different distances from the noise sources can be calculated. The point sound source attenuation model is as follows:

$L_P = L_{PO} - 20Lg(r/ro) - \Delta L$

In which:

L_P—The sound pressure level at r(m) from the sound source, dB(A);

L_{PO}—The sound pressure level at ro(m) from the sound source, dB(A);

ΔL—Various attenuation volumes (except divergence attenuation), dB(A). Outdoor noise source $\triangle L$ is taken as zero.

When the noise attenuation of trees and buildings is not considered, the predicted noise values (not adding the current noise value) of all kinds of construction machinery at different distances are shown in the table below.

Table 5-2 The Predicted Noise Values of All Kinds of Construction Machinery at Different Distances (Unit: dB(A))

Serial No.	Type of Machine	Predicted Noise Value								
		5m	10m	20m	40m	50m	80m	100m	150m	200m
1	Loader	90	84.0	78.0	72.0	70.0	66.0	64.0	60.5	58.0
2	Road roller	81	75.0	69.0	63.0	61.0	57.0	55.0	51.5	49.0
3	Bulldozer	86	80.0	74.0	68.0	66.0	62.0	60	56.5	54.0
4	Excavator	84	78.0	72.0	66.0	64.0	60.0	58.0	54.5	52.0
5	Large heavy-duty truck	86	80.0	74.0	68.0	66.0	62.0	60	56.5	54.0
6	Light truck	75	69.0	63.0	57.0	55.0	51.0	49.0	45.5	43.0

According to above table, the daytime noise over 50m from the construction machinery meets standard specified by *Standards for Ambient Noise Emission at Construction Site Boundary* (GB12523-2011) (70dB(A) in the daytime and 55dB(A) in the nighttime). Generally the nighttime noise at places less than 200m away from the construction machinery does not meet the standard. Therefore, the daytime construction noise has great impacts on the acoustic environment at places less than 50m away from the construction site, and the nighttime construction noise, compared with the former condition, has greater impact at places less than 200m away from the site. But this is a short-term and temporary noise which will disappear upon the completion of the construction. There are no hospitals, schools, kindergartens, nursing homes or other important sensitive points in the affected area. There are mainly general sensitive points in the affected area. But certain measures should be adopted to reduce the impact of construction noise on environment sensitive spots.

5.1.3.2 Mitigation Measures

Noise during the construction period mainly comes from material transportation, pipe and channel excavating, pipe loading and unloading, and soil backfilling during the operation of machinery, such as bulldozers, excavators, gravel mixing station, heavy-duty trucks and the like. The following measures will be adopted to protect the acoustic environment during the construction period:

(1) Setting up warning signs and using low-noise equipment at sensitive sections of the acoustic environment; controlling noise source, media of noise transmission and traffic noise; offering construction personnel anti-noise earplugs; reasonably arranging the construction time, etc.

(2) Reasonably arranging for the construction time based on *Standards for Ambient Noise Emission at Construction Site Boundary* (GB12523-2011). Simultaneous operation of a large number of high-noise equipment and construction at sensitive time should be avoided whenever possible. Operation of high-noise equipment should be arranged in the daytime, and nighttime transportation should be reduced. Construction at night (22:00-6:00) is prohibited. Construction activities that must be carried out at night should be approved by relevant local environmental protection departments, and negotiation in advance with local residents should be conducted. In addition, noise reduction measures should be implemented (such as installing sound barriers) to minimize the impact of construction noise on local residents.

(3) The speed of all construction vehicles outside the work site must not exceed 25 km/h.

(4) The speed of vehicles within the construction site must not exceed 15 km/h.

(5) The noise of the machinery and equipment should be lower than 90dB(A).

(6) More stringent measures should be carried out in sensitive areas (including residential areas, hospitals, nursing homes, etc.) to prevent harsh noises.

(7) Appropriate measures should be adopted to reduce the impact of on ambient environment caused.

(8) The project owner should actively negotiate with nearby schools and units; adjust the construction time or taking other measures to minimize the influence of construction noise on teaching and working.

(9) The construction unit must select the construction machinery, tools and transportation vehicles that meet relevant national standards.

(10) The project owner should require the construction unit to indicate at the construction site construction notices and complaints telephone. Upon receiving complaints, the project owner should timely get in touch with the local Department of Environmental Protection for timely handling environmental disputes and thus ensuring smooth construction.

5.1.4 Solid Waste Impact Analysis during Construction Period and Mitigation Measures

5.1.4.1 Solid Waste Impact Analysis during Construction Period

Solid waste generated during the construction period mainly includes construction personnel’s domestic waste, spoil, construction waste, sludge and garbage in the dredging area.

(1) The Impact of Construction Personnel Domestic Waste

During the construction period, the domestic waste production volume is about 60kg/d. The waste mainly includes organic waste, which is prone to rot and fermentation. Arbitrary discarding of such waste may pollute the water environment. At the same time, mosquitoes tend to propagate due to fermentation, hence producing smelly odor and polluting the environment. Therefore, EIA institutes recommend that garbage collection bins be set up

within the construction site during the construction period, and the Sanitation Department be commissioned to transport the collected domestic waste.

(2) The Impact of Construction Solid Waste

Earthwork and stones of this project mainly come from pipeline construction. The total amount of excavation is 28,547m^3, the total volume of fillings is 11,966m^3, and the rest 16,581m^3 is abandoned. At the same time, a certain amount of construction waste will be generated during construction, including concrete, broken bricks, gravels and other materials, altogether about 2,120m^3. Some of these wastes can be recycled, and the rest should be transported to the local landfill.

If the arrangement for spoil area is not reasonable, or the construction unit arbitrarily stacks the spoils, then waste earthwork or spoil will be randomly distributed along both sides of the construction area, occupying a considerable amount of urban land and making it difficult to control soil erosion in the affected area. Besides, this will have a severe adverse impact on the surrounding ecological environment, making it difficult to restore and re-use the occupied land. Moreover, this will have adverse impact on surrounding landscape. The construction unit should timely transport the spoil to the designated location for unified distribution by the County Department of Environment Protection to other project sites which need earthwork; construction waste should be timely transported to the Yichun City construction waste landfill for disposal.

(3) Channel Dredging

In this channel regulation project, the estimated amount of sludge needed to be dredged and disposed totals 13,480m^3. According to the monitoring data and above analysis, the bottom silt of Southern Ditch, Dazhai Ditch and Beizhizhen Ditch does not belong to hazardous waste but to general solid waste which can be used for woodland. In this project, mechanical together with manual dredging methods will be adopted in dry season. Temporary stacking area will be set up for silt dehydrating and drying. The locations of temporary stacking area are shown below. The temporary land occupation is about 600m^2.

Table 5-4 Temporary Sludge Stacking Area in Fengxin

Subproject	Dredging Water Body	Location of Temporary Stacking Area	Area (m^2)	Land Use Type
Fengxin	Beizhizhen Ditch	Area 200m eastward from the Huilan Road	160	Heath
	Southern Ditch	Area 50m eastward from the Zongliu Road	300	Heath
	Dazhai Ditch	Area 300m westward from the Yingxing Avenue	140	Heath

The dredged sludge will be dried in the dehydration area. Centrifugal dewatering system is adopted, which is an effective, non-stop and highly automatic dewatering and drying system. The system consists of drying machines, screw pumps, conveyors and other equipment. After impurities were extracted, the concentrated slurry will be discharged into the separation unit, and slurry particles will be gradually separated from the water. The dried soil will be transported via conveyor to the temporary stacking area, and the residual water will be discharged after dosing and flocculation. The dehydration rate can reach 50%.

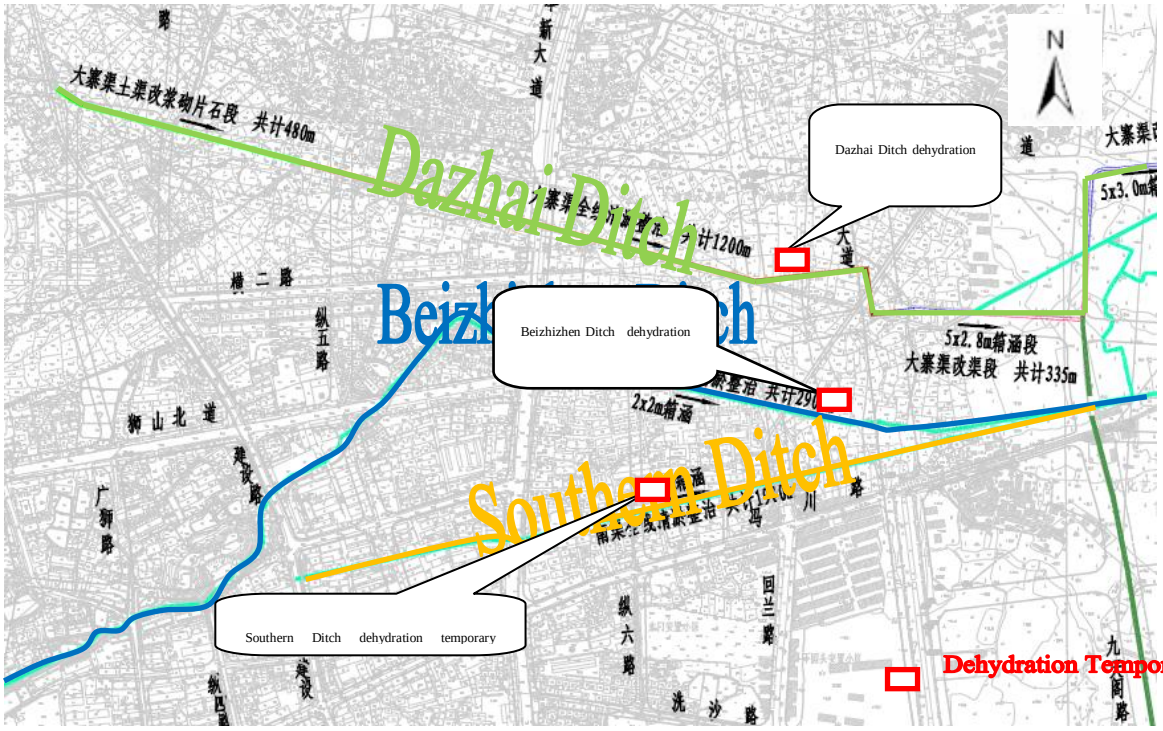


Figure 5-16 Fengxin Dehydration Temporary Stacking Area

It is estimated that the dredging volume totals 13,480m^3, the moisture content of which is 90%. If the density is 1.0kg/L, the dried sludge weighs 1,348t. The remaining bottom silt after dehydration will be transported to the Yuantou Group of Huangxi Village, Ganzhou Town and Fengxin County and be used as topsoil in the woodland. The transportation distance is about 7km. Pursuant to *Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant* (CJ/T 362-2011), the amount of sludge being used as topsoil in the woodland should not exceed 30t/hm^2. The woodland area of Yuantou Group is Ganzhou Town's collective land, covering about 200ha. The amount of used sludge may reach 3,000t. Therefore, it is feasible to transport the sludge to Yuantou Group and be used as topsoil in the woodland. See the sludge letter of acceptance in Annex I.

According to the design manual of USA Environmental Protection Agency (land application of municipal sludge), the use of forest land is divided into surface application and injection application. Such silt is applied to the surface. For the sake of preventing the public from entering into the forest land, fences and warning signs should be set up after silt is mixed with soil. As the project applied area is small, the stir is not suggested, while earthing and virescence should be taken to prevent soil form erosion.

(4) Impact of Garbage in the Dredging Area

Existing garbage, creature remains and other solid pollutants in the Southern Ditch, Dazhai Ditch and Beizhizhen Ditch will be cleaned up during dredging. The amount of such waste is small, and is estimated to be 0.25t. Environmental assessment recommends that garbage collection bins be set up at the construction site, and the sanitation department be commissioned to transport such waste to the county landfill for disposal.

5.1.4.2 Mitigation Measures

(1) Construction Solid Waste

The construction unit should timely transport the spoil to the designated location for unified distribution by the county sanitation department to other project sites which need earthworks. The following measures should be taken in stacking areas of the project and the county sanitation department:

1) Temporary stacking areas of earthwork and stones should be reasonably arranged. Each stacking area should be away from water bodies and environment sensitive spots like residential spots and schools, etc. Each stacking area should be set in the urban area or residential area, and places at the downwind or crosswind direction of summer dominant winds are preferred;

2) Land occupation should be minimized; temporarily occupied area will be restored according to its original land use type after construction is completed;

3) Temporary stacked earthwork should be compacted and rolled, then covered by felt cloth. Water proofing, wind proofing and other measures should be conducted;

4) It is necessary to set up earthen drainage ditch around the temporary stacking area; it is necessary to set up an earthen grit chamber at the outlet of the ditch to slow down water and settle sand;

5) Sealed transportation should be ensured and scattering be avoided;

6) During stacking work, staff should be assigned to each section to command the operation and non-operating personnel not to enter the work area. All staff, vehicles and machinery within the stacking area should be under the command of the persons in charge. Transportation vehicles must unload in accordance with the assigned route, area and order. Arbitrary unloading inside or outside the temporary stacking area influencing normal unloading is not allowed.

7) Water proofing and drainage should be well conducted around the spoil site and on the work area surface to ensure smooth drainage and avoid soil erosion and environmental pollution;

8) Protection and construction safety of temporary stacking area must be handled in accordance with relevant construction specifications and requirements;

9) After work, staff should be designated for inspection; were there any safety threat, timely handling and reporting to higher level should be conducted and obvious warning signs should be set; stacking work should be finished within one day;

10) After completion of the project, timely removing all temporary facilities in the construction site, clearing spoils, leveling the ground and restoring the ambient environment; during construction and downtime, maintaining environmental health both inside and around the construction site;

11) During stacking work, the order of paving and rolling should be strictly followed. Directly paving new soil without rolling first is strictly prohibited. During soil paving, forming the higher slope from the middle in pace with the progress of the construction; it is necessary to set up a certain number of collection tanks on ditches and channels to settle down sludge in the water; it is necessary to timely grasp changes of the weather and local flood condition, in order to dredge the drainage ditch and collection tanks in advance; improving drainage ditch and other facilities.

12) After the completion of earthwork engineering, equipment, surplus materials, wastes and temporary facilities in the temporary stacking area should be promptly removed.

(2) Construction Waste

Comprehensive classification and recycling of recyclable waste (scrap iron, scrap steel and material packing bags should be sold to scrap yards, and waste bricks be used as materials for road base) should be conducted. Waste that can not be recycled should be timely transported to the construction waste landfill. During the process, sealed transportation should be ensured, and scattering be avoided. When temporary stacking is needed, water proofing, wind proofing and other measures should be conducted.

(3) Domestic Waste

Inside the construction area, domestic waste garbage bins which carry out daily clearing, collection and classification should be set, and the transportation of waste be commissioned to the Sanitation Department.

(4) Dredging Ditches and Channels

Mechanical together with manual dredging methods should be adopted in dry season.

Centrifugal dewatering and drying treatment system will be adopted for the sludge. When moisture content is below 60%, the dried sludge can be used for woodland in Yuantou Group of Huangxi Village, Ganzhou Town and Fengxin County. The woodland to which sludge is applied cannot be used for growing vegetables, grains or other crops.

The sludge stacking area should be set in waste land. Sloping reclamation dam should be set around the area. The reclamation dam can be shaped like a woven bag or be formed by compacted earthwork. At the inner side of the dam, impermeable materials should be laid.

Outlet, impermeable residual water treatment tank and emergency tank should be set in the stacking area. The residual water generated by sludge dehydration can be discharged into nearby water bodies after it meets standards by treatment of dosing and flocculation.

The stacking area should be covered by tarpaulin in rainy season, to prevent the sludge from being washed away by rainfall.

Deodorant should regularly be sprayed to reduce impact on the ambient air.

Temporary land occupation should be minimized and the sludge should timely be removed.

According to the plan, the dried sludge will be transported to the woodland of Yuangtou Group in Huangxi Village, Ganzhou Town. The sludge will be laid on the ground of the woodland, then be covered by the original soil for planting trees. Enclosure should be set surrounding the woodland to reduce soil erosion. The detail is shown in sections of soil conservation measures.

Fences and warning signs should be set up to prevent the public from entering the stacking area.

Temporary land occupation should be minimized, the sludge should be timely removed, and the temporarily occupied land should be rehabilitated to cropland after the construction is completed.

(5) Garbage in the Dredging Area

Garbage collection bins should be set up at the construction site, collecting garbage in the dredging area. The collected garbage should be transported by the sanitation department to the county waste treatment plant for disposal.

5.1.5 Ecological Impact Analysis during Construction Period and Mitigation Measures

5.1.5.1 Ecological Impact Analysis during Construction Period

The ecological impact during construction mainly includes following three aspects:

(1) Impact on Vegetation and Animals inside the Construction Area

Poultry, commonly seen animals and plants are major creatures in the construction area, and no wildlife under key protection nor their concentrated habitats were found. No rare plant was found in the construction area. Drainage pipe network of this project will be set mainly along urban roads. No ancient or precious trees are found among the construction area, and temporarily occupied area will be restored according to its original land use type after construction is completed. Therefore, it causes little impact on the regional vegetation.

The construction's impact on animals is temporary. As the construction area and duration are limited, the construction's impact will not last long. With the completion of the construction and restoration of local vegetation, the animals can still return to their original homeland. Therefore, the impact on animals is minor.

(2) Impact on Aquatic Life Caused by Dredging

This project will dredge sludge of about 134,800m^3 in Dazhai Ditch, Beizhi Channel and Southern Ditch. These channels, located in the urban area of frequent human activities, are mainly used for water drainage and irrigation. Due to heavy domestic sewage pollution, these channels are seriously silted with low quality water where green alga is the major aquatic plant and fishes and benthos are of common species. No fish spawning site, feeding ground, wintering ground or precious aquatic life is found in involved sections and these channels are not an important natural habitats.

This project will dredge sludge of about 134,800m^3. Due to different width of channels, machines and manual work will be combined to dredge sludge during dry season. As there is little water from the upper stream at that time, there will be no cofferdam. Without water, most benthos will disappear. Thus, this project has few impacts on the aquatic ecosystem, and will not cause serious ecological deterioration or changes of Pipa Lake.

(3) Exacerbating Soil Erosion

During construction, the building of construction site will destroy surface vegetation, increasing soil erosion modulus. Temporary stacking will bury the surface vegetation, and the stacked spoil and woodland where sludge is used will form a new soil erosion area, causing soil erosion in rainy season.

Only limited and temporary damage will be caused by the construction to the ecology and landscape. Therefore, as long as construction personnel are under good management, and restoration work is well conducted after the construction is completed, the impact on the ecology and landscape caused by the construction is acceptable.

5.1.5.2 Mitigation Measures

(1) Scientifically arranging the construction site and minimizing land occupation. Temporarily occupied area will be restored according to its original land use type after construction is completed.

(2) Enhancing publicity and education. During construction, if any rare and endangered wild plant, tree and endemic plant were found, measures like reporting to relevant departments or on-site protection should be conducted. Construction noise should be controlled to minimize its impact on animals.

(3) Topsoil should be excavated and stacked layer by layer. After the construction is completed, such activities should timely be conducted as removing temporary facilities,

loosening the compacted soil, backfilingl the topsoil layer by layer and restoring vegetation. It is necessary to select suitable vegetation for restoration based on local climate features, side slope gradient and geological conditions.

(4) Soil Erosion Prevention and Control Measures

1) Rationally choosing the construction period and trying to avoid construction in rainy season or raining days; setting up construction enclosure surrounding the work site to prevent construction materials and waste from leaking into the surface water.

2) Setting up earthen drainage ditch around the construction site on the basis of its terrain conditions; setting up an earthen grit chamber at the outlet of the ditch to slow down the water and settle sand.

3) Combining key control with surface protection, and engineering measures with phtyto measures. Using engineering measures to realize their quick effect and guaranteeing function. Phtyto measures are auxiliary ones for soil and water conservation, conserving soil and water in a stable manner over a long term and afforesting and beatifying the ambient environment.

4) Protecting the land surface's leaf layer and organic matters and backfilling them to the damaged areas to promote the growth of native plants.

5) Covering the eroded barren areas with native grasses and trees, or hardening the soil surface of such areas.

6) Conducting proper erosion control measures before rainy season, in order to better carry out works; preparing corresponding erosion measures at each construction point upon the completion of their subprojects.

7) Establishing sedimentation control facilities in all construction sites to slow down water, change the flow direction and settle silts before vegetation is restored. Such facilities include material piles, stone pathways, settling pits, straw bales, hedgerows and sludge piles, etc.

8) Using ditches, berms, grass fences, stone piles and other measures to prevent water from rushing into the construction site or interfering on-site work.

9) Maintaining and continuing to adopt erosion control measures till vegetation is fully restored.

10) Spraying water on earthen roads, excavation areas, filling areas and earthwork areas if they are necessary to reduce wind erosion.

5.1.6 Social Environmental Impact Analysis and Mitigation Measures during Construction Period

5.1.6.1 Analysis of Acoustic Environment Impact during Construction Period

(1) Impact of Land Occupation

Currently the temporary land occupation mainly involves urban roads. All the occupied land will be restored to the original land use type after the construction is completed, hence causing little impact on regional land use.

(2) Impact on Municipal Facilities and Services

The pipeline project mainly involves curb sides, sidewalks, non-motorized vehicle lanes and existing cover plate channels. During construction, drainage, electric power, fuel gas and bus lines may be interrupted, which will influence residents' life.

(3) Impact on Commercial Streets

During pipeline construction, the traffic obstruction caused by road excavation will have some impact on normal operation of street shops, such as hindering customer's access and inconvenience to commodity loading and unloading.

(4) Impact on Traffic and Safety

The pipe network construction has a great impact on the traffic. Although sections can be divided during construction, temporary stacking of certain amount of earthwork will inevitably influence nearby traffic. If slotting were adopted when the pipeline needs to pass across the road, vehicles may easily be blocked on the road, greatly influencing the traffic. Therefore, when geological and soil conditions are permitted, adopting pipe jacking method will reduce the impact of road excavation. But in this case, the road's bearing pressure (bearing weight) decreases and heavy-duty trucks are not accessible in a short period of time, which will influence the downtown traffic. It is estimated that 20 days is needed for each cross-road pipe construction, so the impact will last about 20 days. Besides, construction on the trunk roads will have particular impact on the traffic. Involved trunk roads and sensitive points on both sides thereof are shown in Table 5-5.

Table 5-5 List of Involved Trunk Roads

Serial No.	Road Name	Road Grade	Redline Width	Project Content	Pipeline Location	Condition of Significant Sensitive Points
1	Longshan Avenue	Trunk road	40m	Rainwater trunk pipe (culvert) and sewage trunk pipe	Single side pipeline	Fengxin No.3 Secondary School
2	Fengchuan Road	Secondary trunk road	20m	Rainwater pipe (culvert) and sewage trunk pipe	Single side pipeline	Fengchuan No.2 Primary School

Therefore, the civil works contractor should carefully plan and speed up the construction. Pipe jacking should be adopted whenever possible. Meanwhile, the contractor should negotiate with local department of traffic control and formulate traffic management plan, and inform the affected residents in advance. At the construction site, signs should be set up and staff be designated to ensure smooth traffic. Besides, further strengthening construction management, shortening the construction time and other measures should be adopted to prevent traffic congestion.

5.1.6.2 Mitigation Measures

(1) Mitigation Measures for Land Occupation

It is necessary to scientifically arrange for the construction site and minimize land occupation. The temporarily occupied area will be restored according to its original land use type after construction is completed.

Temporary stacking areas of earthwork and stones should be reasonably arranged. Each stacking area should be away from environment sensitive spots like residential spots and schools, etc.

(2) Mitigation Measures for Pipeline Construction Impact on Municipal Services

1) Informing the public of service interruption (including water, electricity, fuel gas, and public traffic lines) at least five days ahead by putting up a notification at the project site, public traffic stops, as well as in affected residential areas and enterprises;

2) Guaranteeing construction safety and ensuring the schedule to shorten construction duration under good construction organization. The construction should be finished as quickly as possible for restoring municipal services.

(3) Mitigation Measures for Impact on the Business down the Street

Enclosure should be set up at the side facing commercial shops. A pedestrian aisle should be reserved to guarantee normal operation of shops down the street.

(4) Mitigation Measures for Impact on Traffic and Safety

1) Before construction, the civil works contractor should negotiate with local department of traffic control and formulate traffic management plan. On construction nameplate, the construction unit should provide information of demolition, construction and engineering schedule, traffic detours and interim public traffic lines, etc.;

2) A warning board should be set up at each construction section entrance, in front of each intersection, bend, lane change and traffic aisle, etc., indicating information such as location of the construction area, speed limit, height limit and other limits.

3) In principle, construction at night (22:00–6:00) is prohibited. Construction activities that must be carried out at night should be approved by relevant local department of environmental protection and negotiation in advance with local residents should be conducted. In addition, noise reduction measures should be implemented (such as installing sound barriers) to minimize the impact of construction noise on local residents.

4) In order to reduce traffic pressure on surrounding roads, except in special circumstances, vehicles that transport earthwork should try to avoid urban traffic peak and nighttime transportation is preferred. Other construction vehicles' entering and leaving the construction site should be adjusted accordingly depending on traffic influencing factors such as season, weather, holiday or emergency, etc.

5) For works with construction period being more than 30 days, the construction site boundary should be enclosed according to local conditions; the enclosure should be at equal to or more than 2.5m/ 3m at construction site of common areas/ key areas respectively;

6) The enclosure set up should be straight, orderly, clean, beautiful and damage-free, and its appearance should be harmonious with the surrounding environment;

7) The enclosure constructed on road should be within 5m range of visibility at crossroads. Straight and rigid enclosure of metal mesh panel should be set up without blocking the visual line of drivers and pedestrian, and in the precondition of guaranteeing traffic safety. Within 5m range of visibility, it's forbidden to stack any article.

8) In case the enclosure is equal to or less than 5m from residence, or the construction point is equal to or less than 15m from sensitive buildings like residence, hospital and school, etc., proper measures should be taken to lower the noise, such as raising the enclosure, etc. The enclosure in sensitive areas should be up to 3m high; and the scope of 5m outside the enclosure should be kept clean.

9) All staff should never stack materials, tools, and earthwork, etc. within 1m range from the enclosure.

10) All staff should never use the enclosure as retaining wall or the support of other facilities and equipment;

11) It is necessary to minimize the impact on nearby residents and vehicles when the construction involves entrance of a community. In this case, construction on one side should be adopted and be completed as quick as possible. Topsoil should be timely backfilled when the construction is completed. When the construction cannot be completed within one day, steel plate should be laid above the ditches and channels to ensure normal passage and safety.

12) It is necessary to set up a full-time "Traffic Picket Post," namely a full-time traffic safety and safe construction team, responsible for: ensuring the implementation of traffic safety measures and management and maintenance thereof during construction; maintaining traffic order around construction roads; and assisting in resolving traffic problems during the construction period.

13) During the construction period, working vehicles and personnel should strictly comply with traffic laws and regulations, and be subject to traffic management departments. All construction activities should be under the supervision and inspection of the traffic management department and the project owner. If any problem were found that would influence the traffic, rectification should be conducted immediately.

14) It should be ensured that safe construction and anti-disturbing measures are well adopted, in particular the adoption of measures like dust control, noise control, sludge and earthwork management; contacting with affected units and communities to get their understanding and support, in order to ensure smooth construction.

15) The project owner should list coordinated traffic measures as content in the formulation of construction organization design. Before construction, actively contacting with the Transportation Department and introducing and reporting the project overview, construction plan, general layout as well as transportation plan of construction materials and earthwork. Asking for the Department's support and guidance to improve the transportation plan and formulate detailed rules for implementation.

16) In case hidden well cover is opened or raised for construction on urban roads maintained open to traffic, folding construction curb fender should be adopted at the boundary of construction area;

17) All staff should never use red and white flag, safety isolation rope, or other materials to replace the construction curb fender.

18) In the setting of construction curb fender, the long-side section of channel steel on the foundation should face towards the construction area; in case construction passageway is set up between construction curb fender and construction area, the passageway should be equal to or more than 0.6m wide;

19) In case the external surface of buildings (structures) is painted, refurbished, or cleaned, construction curb fender should be used as fully-closed enclosure at the boundary of construction area, and various mechanical equipment, tools, and materials should be placed within the scope of enclosure;

20) All staff should never remove construction curb fender before the road construction takes interim passing measures or the engineering is completed;

21) In key areas, road pipeline should be constructed by means of "excavating a section, paving a section, and renovating a section", and the whole pipeline should never be excavated simultaneously.

22) For construction occupying urban roads, the construction unit should observe relevant regulations of public security, traffic department, and road administration department, handle relevant examination and approval formalities, and set up interim road according to specifications;

23) The construction unit should strictly observe the license regulations on construction period, and should never execute construction by occupying road or exceeding the licensed construction period;

24) In the case of construction under occupation of urban roads and will influence the travel of vehicles and pedestrian, interim roads should be set up according to regulations. In particular, interim roads should be set up near hospitals for safe access of ambulances. After the interim roads have been set up for kindergartens and schools, the nearby construction site should strictly be closed to prevent the children's entering;

25) In case hidden well cover is opened or raised for construction on urban road maintained open to traffic, folding construction curb fender should be adopted at the boundary of construction area;

26) The construction unit should adopt sheet flattening method for construction in case the ditch or pipeline slot is excavated on urban roads which are used as traffic roads, and the work cannot be completed on the very day;

27) The supporting and consolidation scheme should pass safety argumentation, and be reported to construction unit for approval; the steel plate covering road should be at least equal to or more than 0.03m thick. The edge of the steel plate and metal slope rack adopted should be burnished to remove sharp edges and burrs, in order to ensure the safety of personnel and vehicles;

28) Metal shape should be adopted for supporting and consolidating the lower end of covering steel plate in case the excavation width of ditch (pit) is equal to or more than 0.8m;

5.1.7 Construction Health and Safety

This is a small project without much construction personnel, but the on-site living conditions and sanitary conditions are relatively poor, and workers should work in high intensity. All these may easily lead to epidemics. To ensure construction safety, comprehensive physical examination should be conducted to all construction personnel and persons suffering from infectious diseases cannot enter the construction site; regular physical examination should be conducted to canteen staff, who have to get timely treatment and be removed from the cafeteria if suffering from any epidemic disease, in order to prevent the spread of epidemics. In the construction site, centralized water supply facilities should be established, otherwise, municipal water supply should be adopted. Besides, the construction site should provide sanitation facilities and medical staff. Labor protection for construction personnel should be strengthened to maintain their health and safety and to ensure smooth construction.

5.2 Environmental Impact Analysis and Mitigation Measures during Operation Period

This is a water environment management project, involving pipeline construction and non-engineering measures. This analysis mainly includes the project operation's positive and other environmental impact.

5.2.1 Positive Impact

Through the drainage pipe network construction, the completion year (2023) will see a domestic sewage collection capacity growth in the North District and the South District serving about 49,400 residents, with a collection rate being 80% and 8,200m^3/d of increased sewage collection volume. It is estimated that the total sewage collection volume will reach 20,000m^3/d in the long term, and the annual reduction of pollutants discharging into water bodies will be 15 tons of TN, 2.4 tons of TP and 215.5 tons of COD.

The project also involves strengthening the environmental management of Fengxin's river and lake basins, establishing effective water quality monitoring system and formulating public water quality reports. The project will affect the sustainable economic and social development of Fengxin County. The direct beneficial population totals 120,000, including 60,000 female population. The "source reduction, control en route, terminal treatment and water purification" mode will be adopted in this project, thus controlling and preventing Nanliao River's water environmental pollution from the source.

5.2.3 Impact on Atmospheric Environment during the Operation Period

During the operation period, the pipe network will not produce any waste gas, hence no impact on the ambient atmosphere.

5.2.4 Aquatic Environmental Impact Analysis and Mitigation Measures during Operation Period

5.2.4.1 Aquatic Environmental Impacts during the Operation Period

5.2.4.1.1 Drainage Pipe Network Reconstruction Project

(1) Normal Working Condition

After the drainage pipe network reconstruction is completed, sewage will be collected through pipes. Thus the sewage can no longer pollute water bodies through overflow and infiltration. Urban sewage will be collected and discharged into the sewage treatment plant, greatly reducing the infiltration of sewage into the groundwater and basically eliminating the former sewage infiltration issue. As a result, the groundwater and surface water environment will be gradually improved.

Through drainage pipe network construction, the completion year (2023) will see a sewage collection rate of 80% in the North District and the South District collecting about 15,700m^3/d sewage and discharging them into the urban sewage treatment plant for effective treatment. It is estimated that the annual reduction of pollutants discharged into water bodies will be 15 tons of TN, 2.4 tons of TP and 215.5 tons of COD.

(2) Abnormal Working Conditions

As the pipe network is buried underground, during sewage transportation, if anti-seepage measures of pipe joints were poor or sewage pipeline were ruptured, leakage may occur and impose great adverse impacts on groundwater environment and sanitation on

the ground. Therefore, appropriate engineering and management measures must be adopted to mitigate the impact if accidents occurred and to avoid accidents caused by broken pipes.

5.2.4.1.2 Water Environment Monitoring System

The Water Environment Monitoring System is established in the County Department of Environmental Protection. Neither new staff will be recruited nor new domestic sewage will be generated in this project; waste acid (HW34), alkali waste (HW35), and waste organic solvents (HW42) generated in the laboratory belong to hazardous waste, with the generation volume being 300kg/a. Such waste will be collected and discharged to certified units for disposal, and will not be discharged arbitrarily.

Generally speaking, the project will contribute to eliminating causes of water environment pollution and improving the management capacity among the Poyang Lake Basin, hence protecting the water environment.

5.2.4.2 Mitigation Measures

(1) Drainage Network Reconstruction Project

1) It is necessary to timely clear the pipe network and replace the damaged pipes to avoid evaporating, emitting or leaking sewage that will pollute the groundwater and nearby water bodies.

2) Attention should be paid to the following points during maintenance and dredging:

① Before cleaning inspection wells, it is necessary to set up warning signs and eliminate barriers from the surface of pool to ensure the smoothness of traffic; it is necessary to evacuate non-operating personnel before lifting the pool cover;

② All staff should never use drilling steel and anus anvil, etc. to pry the cover on inspection wells in order to avoid sparkle, combustion and explosion;

③ Staff should use electric machine to pump and drain sewerage; it is necessary to check whether electric machine, power supply, line and knife switch have leakage or not to avoid electric shock;

④ Before dredging, operating personnel should use natural ventilation to remove harmful gas such as CO, CO_2, H_2S, methane, and use instrument to detect them. Well operation should be conducted after confirming the well is harmless and safe;

⑤The operating personnel who enter the well should wear anti-static clothes. Entering the well with keys and hard metals is not allowed;

⑥The operating personnel above the well should hold safety belts in hands and keep contact with the operating personnel who enter the well;

⑦After completion of dredging, the well cover should be restored, in case the works cannot be completed on the same day, operating personnel should set up warning signs or protective enclosure here.

3) Attention should be paid to the following points during maintenance and management:

①Inspection wells should be cleared periodically, inspected frequently, and repaired in time, in order to ensure the smoothness and soundness of sewage interception pipelines and inspection wells;

②All staff should never pour garbage, pollutants, and impurities into inspection wells, stack impurities or buildings houses above inspection wells, or reconstruct pollution discharging pipeline arbitrarily;

③Inspection wells should be covered tightly in order to prevent stink and accidents;

④All staff should never use open fire near inspection wells;

⑤Mud residue cleared off from inspection wells should be transported to specialized treatment plant specified by the county environmental health authorities. Relevant records should be made in order to avoid cross contamination.

(2) Experimental Liquid Waste

During operation, the water quality testing laboratory will produce waste acid (HW34), waste alkali (HW35) and waste organic solvents (HW42) which belong to hazardous waste. The produced volume is about 300kg, and prevention and control measures are as follows:

1) Classifying and collecting hazardous waste; putting the waste into impermeable and leak-proof sealed containers, each of which should be labeled a clear color mark;

2) Setting up an anti-seepage and leak-proof temporary storage room for hazardous waste, open-air storage of which is prohibited;

3) The hazardous waste should be collected, transported and disposed by certified units, and disposal fee should be paid;

4) Implementing hazardous waste transfer licensing system and transfer duplicate forms system;

5) Discarding or discharging of hazardous wastes during transportation are prohibited; dumping and stacking at non-storage locations or mixing the hazardous wastes with domestic sewage or garbage are prohibited; collecting, storing, transporting and disposing hazardous wastes without operation license or not in accordance with rules of the operation license are prohibited.

4.1.1.2 Analysis of Acoustic Environment Impacts during the Operation Period and Mitigation Measures

4.1.1.3 Analysis of Acoustic Environment Impacts during the Operation Period

5.2.5.1.1 Noise Characteristics

The noise comes mainly from machinery like lifting pump and crushing bar screen, etc., manifested as aerodynamic noise and mechanical noise. All the noise sources are located underground in the integrated prefabricated pumping station, Therefore the acoustic waves spread only outside the building.

Assessment criteria: Category 4a standard in *Acoustic Environment Quality Standards* (GB3096-2008) was implemented for the acoustic environment of Jiutiange electric pumping station and Huangshagang flood drainage station, and category II standard implemented for the sewage lifting pump station located at the west side of Jingyi Road in the South District; category IV standard in *Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008) was implemented for the noise emission of Jiutiange electric pumping station and Huangshagang flood drainage station, and category II standard implemented for the sewage lifting pump station located at the west side of Jingyi Road in the South District; category II standard was implemented in pump station noise sensitive points such as Hengchang Huayuan Community and Weixing Binjianghuacheng Community.

Mechanical equipment are set in pumping stations, all of which are integrated prefabricated pumping stations. Therefore, their noise intensities are similar to each other, and are calculated as the max noise intensity, i.e. 70dB(A) for submersible pump and

85dB(A) for crushing bar screen; general noise reduction measures can reduce noise by 15-25dB(A), and 20dB(A) is taken for calculation; 5m is taken as the depth of integrated prefabricated pumping stations. The major noise sources are shown in Table 5-6.

Table 5-6 Major Noise Sources and Reduction Measures

Source	Intensity (dB(A))	Number of One-seat Pumping Stations	Synthetic Sound Pressure Level (dB(A))	Sound Pressure Level at the Plant Boundary (dB(A))	Noise Reduction Measures
Submersible pump	60–70	2	65.3	51.3	Using low-noise equipment and setting a rubber shock pad at the bottom and adopting flexible connections; adopting vibration&noise reduction measures and conducting regular maintenance
Crushing bar screen	75–85	1			

5.2.5.1.2 Impacts Prediction of Noise on Environment

(1) Prediction Model

Total noise attenuation from noise sources to receivers is calculated according to distance from the noise source to the receiver, sound insulation of the wall, air absorption and attenuation of building barrier. This prediction only considers attenuation of the distance and sound insulation of the building wall. The air absorption can be neglected considering that the noise source is near the predicted position. Considering the distance of each noise source, the noise source is to be processed by simplifying the source into two point sound sources.

1) Prediction of Sound Pressure Level of Simple Sound Source

a) The formula for contribution value of equivalent sound level (L_{eqg}) generated by sound source during construction at the predicted position:

$$L_{eqg} = 10\lg(\frac{1}{T}\sum_i t_1 10^{0.1L_{Ai}})$$

In which,

the contribution value of equivalent sound level generated by sound source during construction at the predicted position, dB(A);

L_{Ai}—Sound level A generated by the sound source i at the predicted site, dB(A);

T—Time period calculated by the predication, s;

t_i —Running time of sound source i in time period T, s;

b) The formula for the equivalent sound level (L_{eq}) predicted at the predicted position:

$$L_{eq} = 10\lg(10^{0.1L_{eqg}} + 10^{0.1L_{eqb}})$$

Wherein:

L_{eqg}—the contribution value of equivalent sound level generated by sound source during construction at the predicted position, dB(A);

L_{eqb}—Background value at the predicted site, dB(A).

2) Geometric Divergence Attenuation of Point Sound Source

The fundamental formula for non-directional point sound source is:

$$L_p(\mathrm{r}) = L_p(r_0) - 20\lg(r / r_0)$$

3) Prediction for Sound Pressure Level of Multiple Sound Sources

The sound pressure level at the predicted position under multiple sources is the decibel sum of noise level of the noise for the receiver.

Formula:
$$L_{P_T} = 10L_g\left(\sum_{i=1}^{n} 10^{L_{P_i}/10}\right)$$

In which:

L_{P_T} —The total sound pressure level superposed at certain predicted position, dB(A);

L_{P_i} —The sound pressure level contributed by sound source i to certain predicted sites, dB(A).

(2) Prediction Contents

According to the distribution of the noise sources, prediction and calculation will be conducted on noise around the boundary of pumping stations and sensitive points. Then, comparison of the contribution values with implemented standards should be conducted.

(3) Prediction Results and Analysis

Prediction results of equipment noise impact on pumping station boundaries and sensitive points are shown in Table 5-7 and Table 5-8.

Table 5-7 Distribution and Noise Intensity of Construction Noise Resources

Source	Intensity After Treatment (dB(A))	Distance (m)	Predicted Value (dB(A))
The sewage lifting pump station at the west side of Jingyi Road	65.3	Station boundary (5m)	51.3
Huangshagang flood drainage station	65.3	70	28.3
		Station boundary (5m)	51.3
Jiutiange electric pumping station	65.3	80	27.2
		Station boundary (5m)	51.3

Table 5-8 Pumping Station Noise Prediction after Operation (Unit: dB(A))

Prediction Point and Time		Contribution Value	Background Value	Superimposed Value	Whether the Value Exceeds Standards	Standard
Boundary of the sewage lifting pump station at	Day	51.3	50.3	53.8	No	70
	Night	51.3	45.4	52.2	No	55

the west side of Jingyi Road						
Hengchang Huayuan Community	Day	28.3	53.2	53.2	No	60
	Night	28.3	47.3	47.3	No	50
Boundary of Huangshagang flood drainage station	Day	51.3	54.7	56.3	No	60
	Night	51.3	46.5	52.5	No	50
Weixing Binjianghuacheng Community	Day	27.2	52.8	52.8	No	60
	Night	27.2	46.9	46.9	No	50
Boundary of Jiutiange electric pumping station	Day	51.3	53.8	55.7	No	70
	Night	51.3	46.3	52.4	No	55

As is shown in Table 5-8, after operation, the acoustic environment of Jiutiange electric pumping station and Huangshagang flood drainage station met category 4a standard in *Acoustic Environment Quality Standards* (GB3096-2008), and the sewage lifting pump station located at the west side of Jingyi Road in the South District met category II standard; the noise emission of Jiutiange electric pumping station and Huangshagang flood drainage station met category IV standard in *Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008), and the sewage lifting pump station located at the west side of Jingyi Road in the South District met category II standard; pump station noise sensitive points such as Hengchang Huayuan Community and Weixing Binjianghuacheng Community met category II standard. All pumping stations have minor impact on the acoustic environmental.

5.2.5.2 Mitigation Measures

Using low-noise equipment and setting a rubber shock pad at the bottom and adopting flexible connections; adopting vibration & noise reduction measures and conducting regular maintenance

5.2.6 Solid Waste Impact Analysis during the Operation Period and Mitigation Measures

During normal operation, sewage pipes will be fully enclosed, thus generating no solid waste. Bar screens will be set up in pumping stations to crush wastes before they enter the collection tank. This will not influence the station's work and waste interception is not needed. So there is no impact on the ambient environment.

5.2.7 Social and Environmental Impacts during the Operation Period

When the urban drainage pipe network reconstruction is completed and put into operation, it will effectively solve the current problem of regional sewage being directly discharged into nearby water bodies without being collected and discharged into the sewage pipes. This can effectively solve such problems as water accumulation and water logging, providing Fengxin County and its people with picturesque landscape and a good living environment. The proposed project, with significant social and environmental benefits, is a livelihood project conducive to the public.

5.3 Due Diligence

The designed drainage pipe network serves the South District and the North District and the collected sewage will be eventually discharged into the Fengxin sewage treatment plant. Therefore due diligence of the Fengxin sewage treatment plant is conducted in this EIA.

(1) Location of the Sewage Treatment Plant

The sewage treatment plant is located in the east side of Zhengjiazhou Village in the northern part of Fengxin County.

(2) Construction Conditions and Scale of the Sewage Treatment Plant

First completed in 2009, the treatment scale of the plant was 10,000t/d (phase I occupied 27mu of land); expanded in 2014, it had a treatment capacity of 20,000t/d (phase II covered 9mu of land); the future capacity will reach 30,000t/d .

(3) EIA and Environmental Protection Acceptance Conditions

On September 15, 2008, the Jiangxi Provincial Department of Environmental Protection approved Fengxin urban sewage treatment plant's EIA (a treatment scale of 15,000m^3/d), and the approval document number was "Jiangxi Provincial Department of Environmental Protection [2008] No. 426 (Annex II)"; on November 24, 2010, the Jiangxi Provincial Department of Environmental Protection approved and accepted phase I construction (10,000t/d), and the approval document number was "Jiangxi EIA [2010] No. 642 (Annex III);" on December 30, 2014, Yichun Municipal Department of Environmental Protection approved phase II EIA (the increased sewage treatment capacity being 10,000m^3/d) of the Fengxin Urban Sewage Treatment Plant, and the approval document number was "Jiangxi Provincial Department of Environmental Protection [2014] No. 385 (Annex IV);" on May 26, 2016, Yichun Municipal Department of Environmental Protection approved and accepted phase II construction, and the approval document number was "Jiangxi EIA [2016] No. 35 (Annex V)."

(4) Service Area

The service area involves the South District and the North District.

(5) Treatment Techniques

In this plant, sewage treatment uses improved oxidation ditch treatment technique and effluent adopts ultraviolet for disinfection. After reaching the required standard, the effluent will be discharged into the Nanliao River. See Figure 2-7 for treatment technical process.

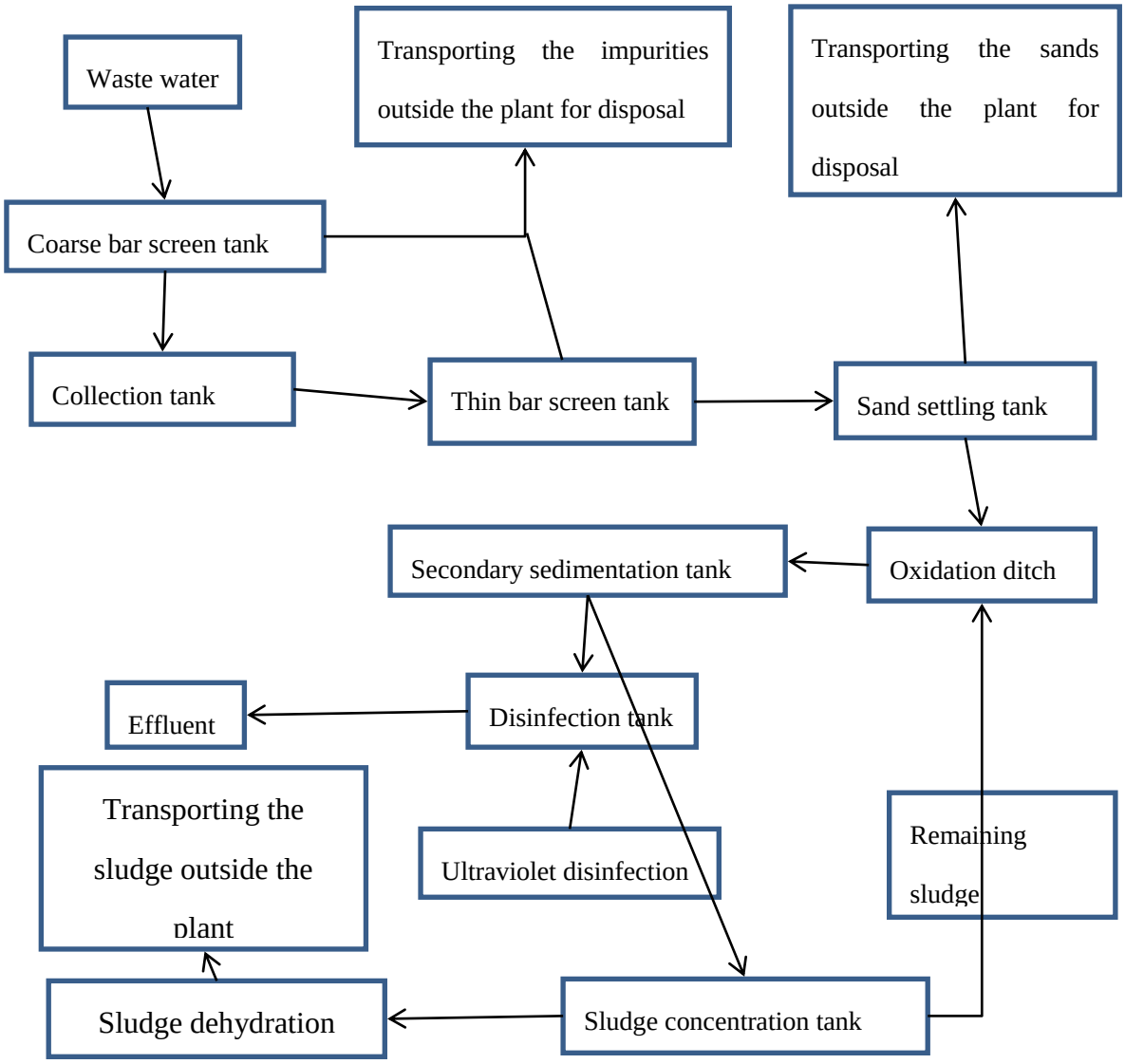


Figure 5-17 Technical Process of Waste Water Treatment

(6) Operation Conditions

According to the information provided by the plant, Fengxin urban sewage treatment plant now functions well, with an average treatment capacity of 7,500t/d. Sludge production volume is 8t/d, with a moisture content of 78.08%. The sludge is transported by sealed trucks to the Fengxin County Sanitation Department for landscape greening. Based on test annual report (January to December, 2015) of Jiangxi Hongcheng Water Environmental Protection Co., Ltd. (Fengxin County) (Annex VI), annual average values of real influent and effluent water quality of Fengxin urban sewage treatment plant are shown in table 5-9.

Table 5-9 List of Real Influent and Effluent Water Quality of Fengxin Urban Sewage Treatment Plant (Unit: mg/L)

Type	pH	COD	BOD_5	SS	TN	NH_3-N	TP
Real influent water quality	7.70	157.73	68.87	73.67	25.59	19.18	2.29
Real effluent	7.04	18.24	8.38	8.51	5.18	1.46	0.66

water quality							
Discharging standards	6–9	≤60	≤20	≤20	≤20	≤8(15)	≤1.0

Note: values outside the bracket are control index when the temperature is higher than 12℃, while values inside the bracket are control index when the temperature is not higher than 12℃.

The above table shows that the sewage treatment plant effluent meets category 1B standard in *Pollutant Discharge Standards for Urban Wastewater Treatment Plants* (GB18918-2002).

(7) Matching Analysis of Water Volume for Sewage Treatment

The designed drainage network serves the South District and the North District, the area of which is as large as the service range of the existing sewage treatment plant. By the completion year (2023), the total volume of sewage being transported to the sewage treatment plant will be 15,700m^3/d, accounting for 78.5% of the existing treatment capacity (20,000m^3/d); the designed future treatment capacity, accordant with the capacity of existing sewage treatment plant, is 20,000m^3/d. Therefore, the current sewage treatment plant capacity is sufficient for treating short-term and long-term sewage collected by the project. At the same time, it is recommended that the sewage treatment plant realize a long-term sewage treatment capacity of 30,000m^3/d.

In summary, based on due diligence of the Fengxin County sewage treatment plant, the treatment capacity, techniques and treatment amount of the plant meet the needs of this project. The plant's operation is now in good condition, thus sewage collected by the pipe network in proposed project will be effectively treated.

6 Environmental Risk Analysis and Mitigation Measures

6.1 Identification of Environmental Risks

According to pollution impact analysis, the results of main environmental risk identification are:

(1) As the pipe network is buried underground, during the sewage transportation, if anti-seepage measures of pipe joints were poor or sewage pipeline were ruptured, leakage may occur;

(2) Health and safety of workers when conducting pipeline maintenance or repair works.

6.2 Impact Analysis of Environmental Risks

(1) Pipeline Leakage

The sewage which infiltrates into the underground will not only pollute surrounding soil and sanitation, but also have adverse impact on the groundwater quality. According to the operation condition, the existing rainwater and sewage pipes are not likely to be broken, unless in such cases as long-time disrepair, aging, brutal construction or vandalism.

(2) Health and Safety of Maintenance Workers

Such problems as pipeline blockage and accidents that occur in any structure should be resolved immediately. In these cases, workers need to enter sewage pipes, collection wells or sewage tanks, which tend to produce and accumulate toxic gas of high concentration like H_2S, methane and CO_2, etc. During repair, if protective measures were not conducted well, the workers may, due to poor ventilation, inhale toxic gas and feel dizzy, hard to breathe. and even worse, die Explosion and other accidents may occur when methane meets any flame, threatening workers' safety.

6.3 Risks Mitigation Measures

(1) Pipeline Leakage Prevention Measures

1) In pipeline design, according to the specific circumstances and characteristics of the city, appropriate pipes should be used and the quality and duration of the pipes should be ensured. Foundation of drainage pipes must meet the requirements of the mechanical design, otherwise appropriate treatment must be conducted. Foundation construction should be strictly in accordance with the required width, thickness and strength in the design drawings, and quality must be ensured.

2) Before workers install pipes, appropriate checks should be finished. On the one hand, workers should carefully examine all pipes to avoid installing those with cracks or tiny holes into ditches; on the other hand, workers should carefully check whether the centerline and edges of the pipe foundation, and size and strength of the well foundation meet the requirements in the drawings; last, workers should check whether the location of wells, well spacing, strength grade of concrete and juncture anti-leakage mortar reach the national standards.

3) During pipe installation, cement mortar needed for junction plaster band should be produced in accordance with the required mixture ratio. Protrusion will often be caused by

extrusion at the joint of two pipes pipes. Timely treatment should be conducted for the protrusions in order to ensure smooth drainage; otherwise, the water flow cross-section will not be reduced and water flow speed will be influenced. Even worse. waste accumulation and blockage of pipelines may occur.

4) Ditch backfilling must be conducted after pipe socket concrete and junction plaster band mortar reach a certain strength. Impulsing the pipes directly with sands and gravels is prohibited. In the sands and gravels, there should not be chunks of broken stones, bricks and other hard objects. On both sides of the pipe, compaction should be ensured after backfilling. Above the pipe top, backfilling should be conducted layer by layer and compaction should be ensured to make the filling bear the pressure as a whole. Thus the vault filling helps to disperse pressure and protect the pipes.

5) During operation, the project owner should establish a fine system for pipeline supervision and management to timely clear the pipe network and replace damaged pipes to avoid the evaporating, emitting or leaking of sewage which will pollute the groundwater and nearby water bodies.

In summary, during the project construction, although such pollutants as waste water, noise, and solid waste may be generated, as long as appropriate measures have been adopted, the impact on ambient air quality, water bodies and acoustic environment will be minor. Therefore, the project is feasible.

(2) Measures for Protecting Health and Safety of Maintenance Workers

Safeguard measures taken to protect personal safety of the operating personnel are essential to prevent harms from toxic gas. Ventilation measures which eliminate toxic gases and filling the working space with fresh air are the most effective ways to avoid poisoning. If adequate ventilation were not available, entry into dangerous space should be avoided, otherwise the workers must wear protective equipment before necessary entry. Protective equipment includes gas masks, air masks and so on. Detection instruments include gas detector and paper test.

6.4 Emergency Institution and Plan

For this project, emergency response to unexpected environmental risk accidents is relevant to multiple units and departments, including the Department of Environmental Protection, the Department of Public Security, health administrations, fire departments and other authorities. Emergency plans should immediately be launched in accordance with *Jiangxi Provincial Contingency Plans for Environmental Emergencies* if any risk accident occurred.

The project’s emergency response agency consists mainly of PLG office and other emergency response teams, which include rescue team, liaison team, logistics team and vehicle team. Responsibilities of each team are shown below, and responsible agencies are shown in Figure 6-1.

(1) PLG is responsible for overall on-site command and coordination with external units, and organizes to formulate and ensure the implementation of emergency response plan according to the environmental risk conditions.

(2) PLG office is responsible for assisting the PLG with work distribution, supervision and inspection.

(3) Rescue team, under unified command of the PLG, is responsible for handling risk accidents and repairing relevant equipment, etc.

(4) Liaison team is responsible for coordinating work of rescue team, logistics team and vehicle team.

(5) Logistics team is responsible for assisting rescuing poisoned personnel, providing them with appropriate first aids and care and getting them admission to hospital for observation and treatment. Besides, the team is responsible for delivering rescue related items.

(6) Vehicle team is responsible for the deployment and use of vehicles, transporting poisoned persons to hospitals, and transporting rescue items, etc.

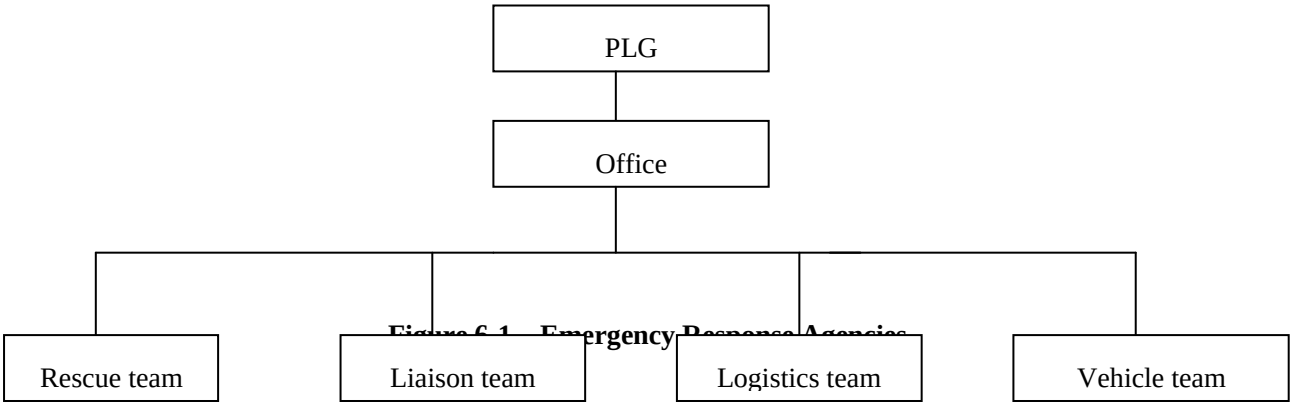


Figure 6-1 Emergency Response Agencies

7 Industrial Policy Analysis

7.1 Industry Policy Compliance Analysis

This project intends to build a pipeline engineering architecture (E4852), which belongs to the 22nd category of encouraged projects (XXII urban infrastructure: 9 Urban water supply and drainage project, water supply source and water purification plant project) in the *Catalogue for Guiding Industry Restructuring (2011 Version)* (Revised in 2013). It is in line with relevant national industrial policies.

7.2 Urban Planning Compliance Analysis

Involving reconstruction of the pipe network in the North District and the South District of Fengxin County, the project is in line with *Fengxin County Urban Master Plan (2010-2030)* and *Specific Plan for Fengxin County Urban Drainage Works (2010-2030)*, Fengxin County "Twelfth Five-year" Plan and Fengxin County "Thirteenth Five-year" Plan (Draft).

8 Public Consultation and Information Disclosure

8.1 Purposes and Approacheshods

The construction and operation of World Bank-financed Fengxin County Water Environment Management Project will impact the ambient environment, which is directly related to the vital interests of people close to the project site. Pursuant to the requirements in *Interim Procedures of Public Participation in Environmental Impact Assessment* (Huan Fa [2006 No. 28]), *Notice by Jiangxi Provincial Department of Environmental Protection on Further Strengthen Public Participation, Supervision and Management of EIA on Proposed Project* (Jiangxi EIA [2014] No. 145) and the World Bank's OP4.01, two rounds of public consultation and information disclosure were carried out. The first round was carried out before the formulation of EIA outline, mainly for introducing the project and its potential impact on the environment to affected residents and asking for public opinion. The second round was conducted when the draft EIA report was finished, mainly for full report disclosure and public consultation on main content and conclusions of the report, in order to obtain public's understanding of and support for the construction and related mitigation measures.

Public consultation and information disclosure are a type of two-way information sharing between the project implementing agency and the public, an important component of EIA. They play a critical role in improving decision-making. The purposes of public consultation and information disclosure are: to disclose relevant project information to the project areas and the public who are concerned about the project, keeping the public informed of the project's main content, its implementation and operation features and significant environmental issues or problems related to the project; to help assessment staff identify issues or problems and confirm that all significant environmental issues or problems triggered by the project have been analyzed and assessed in the EIA; to confirm the feasibility of environmental protection measures and implementation of optimal measures. Public consultation highlights the importance of linkages and communications between all stakeholders with the public. It can directly reflect views of the public and enable decision-makers to timely identify potential issues or problems and revise and improve design. In this way, concerns of the public can be adequately addressed, thereby contributing to further improvements and stronger rationality of the project's planning, design, environmental monitoring and management, as well as the most optimal coordination between the project's environmental, social and economic benefits.

8.2. Public Consultation

Two rounds of public consultation were carried out, which mainly were on-site visit, questionnaire survey and discussion meeting. See relevant documents in annex VII.

8.2.1 First Round of Public Consultation

8.2.1.1 First Round of Public Consultation

See conditions of the first round of public consultation in the table below.

Table 8-1 Dates, Participants and Approaches of First Round of Public Consultation

Period	Approach	Date/Duration	Location	Participants	Content

Period	Approach	Date/Duration	Location	Participants	Content
1	①On-site visit ② Questionnaire survey	December, 2015 and January, 2016	Urban area of Fengxin County	On-site visit and questionnaire survey: representatives from Fengchuan No.2 Primary School, Fengxin County No.3 Secondary School, residents of Zhonghe Community and other sensitive points, representatives from Fengxin County Government, County Water Bureau, County Urban Management Authority, County Department of Environmental Protection, County Department of Transportation, County Sewage Treatment Plant and other units.	Informing affected residents of a brief introduction to the project and its potential impact on the environment, and asking for public views and suggestions.

8.2.1.1 Feedback of Public Views

Public views in the first round of public consultation and feedback thereof are shown in the table below.

Table 8-2 Public Views and Feedback

Period	Approach	Public Concerns or Views	Feedback of Implementing Agency
1	①On-site visit; ② Questionnaire survey	(1) All expressed support to the project; (2) It is recommended that construction traffic organization be designed to ensure smooth traffic and safety.	Response of the project owner and EIA institutes: They appreciated public's understanding and support. The project would be further improved in its design and preparation work. The construction traffic organization design requirements would be listed in EIA and EMP to ensure smooth traffic and safety during the construction period.

8.2.2 Second Round of Public Consultation

8.2.2.1 Second Round of Public Consultation

See conditions of the second round of public consultation in the table below.

Table 8-3 Dates, Participants and Approaches of Second Round of Public Consultation

Period	Approach	Date/Duration	Location	Participants	Content
2	①On-site visit; ②Questionnaire;	May 2016	Urban area of Fengxin	① On-site visit and participants of	(1) Notifying the public that draft

Period	Approach	Date/Duration	Location	Participants	Content
	③ Discussion meeting		County	questionnaire survey: representatives from Fengchuan No.2 Primary School, Fengxin County No.3 Secondary School, residents of Zhonghe Community and other sensitive points, and representatives from Fengxin County Government, County Water Bureau, County Urban Management Authority, County Department of Environmental Protection, County Department of Transportation, County Sewage Treatment Plant and other units; ② Discussion meeting: 1 time. Attendees included representatives of affected residents and units.	EMP has been completed; (2) Keeping the public informed of potential environmental impact of the project; (3) Mitigation measures proposed in the EMP against adverse environmental impact; (4) Collecting public views and suggestions about environmental protection measures proposed in the EMP.

8.2.2.2 Feedback of Public Views

Public views in the second round of public consultation and feedback thereof are shown in the table below.

Table 8-4 Views and Feedback of the Second Round of Public Consultation

Period	Approach	Public Concerns or Views	Feedback of Implementing Agency
2	①On-site visit; ② Distributing questionnaire; ③ Discussion meeting	The public supported the project construction and accepted the proposed environmental protection measures.	Response of the construction unit and EIA institutes: They appreciated understanding and support of the public and would strictly implement all environmental protection measures in the EMP.

8.3 Information Disclosure

8.3.1 First Round of Information Disclosure

See dates, locations and methods of the first round of information disclosure in the table below.

Table 8-5 Dates, Locations and Methods of Information Disclosure

Period	Method	Date/Duration	Location	Contents

Period	Method	Date/Duration	Location	Contents
1	On-site notice	2016.1	Government bulletin board of Fengchuan Town	Mainly about content of the project and its potential environmental impact

Figure 8-1 On-site Picture of Disclosure

8.3.2 Second Round of Information Disclosure

See dates, locations and methods of the second round of information disclosure in the table below.

Table 8-6 Dates, Locations and Methods of the Second Round of Information Disclosure

Period	Method	Date/Duration	Location	Contents
2	Full report disclosure	May, 2016	1. Reading room of residential committee of Jiaoyuyuan Community in Fengchuan Town of Fengxin County; 2. Fengxin County Government	The full EIA report (draft)
	On-site notice	May, 2016	Bulletin board of Fengchuan No.2 Primary School, Fengxin County No.3 Secondary School, Zhonghe Community, etc.	(1) Project overview; (2) Environmental protection measures to be taken; (3) Conclusions of the EIA draft; (4) Location and method for accessing the full report

Figure 8-2 Disclosure of Fengxin Full Project Report

9 Resettlement and Social Assessment

The content below is a part of *Resettlement Plan for the World-Bank-Financed Jiangxi Poyang Lake Basin Water Environment Management Project* and *Social Assessment Report for World-Bank-Financed Jiangxi Poyang Lake Basin Water Environment Management Project* made by Hohai University.

9.1 Resettlement Plan

9.1.1 Impact of Land Occupation

Fengxin County in Yichun City is involved in land acquisition. This project involves permanent land acquisition and temporary land occupancy while no house demolition or minority communities are involved within the land to be acquired. The project impacts are illustrated in Table 9-1.

Table 9-1 Summary of the Project Impacts on Migrants

County	Project Name	Township and Town (in number)	Village (in number)	Acquired Collective Land (hectare)		Acquired State-owned Land (hectare)	Temporary Land Occupation (hectare)		Directly Affected Population		Indirectly Affected Farmer and Shop	
				Total	Paddy Field/ Arid Land Included		Collective Land	State-owned Land	Household (by household)	People (by number of person)	Number (by household)	People(by number of person)
Fengxin County	Pipeline network construction project in North District	1				0.114		145.49			35	140
	Pipeline network construction project in South District							96.54				

County	Project Name	Township and Town (in number)	Village (in number)	Acquired Collective Land (hectare)		Acquired State-owned Land (hectare)	Temporary Land Occupation (hectare)		Directly Affected Population		Indirectly Affected Farmer and Shop	
				Total	Paddy Field/ Arid Land Included		Collective Land	State-owned Land	Household (by household)	People (by number of person)	Number (by household)	People(by number of person)
	Water Environment Monitoring System					3						

9.1.2 Measures to Reduce Impacts

In the planning and design stage, in order to reduce the impact of project construction on the local socio-economic and people's life, the design agency and owner of the Project had adopted several effective measures:

(1) In the planning stage, when optimized selection for schemes was conducted, much consideration was put into the impact of project construction on the local socioeconomic , which was set as a key factor in the optimized selection for schemes;

(2) Design was optimized. To reduce the demolition immigrants, existing national and local roads were used to connect planned construction area.

(3) The design was optimized to occupy wasteland and state-owned land and reduce the occupancy of arable land.

In the Resettlement and the implementation stage, when the land acquisition and resettlement are unavoidable, in order to reduce the impact of construction projects, the following measures will be taken:

(1) The collection of basic material should be strengthened and thorough analysis should be conducted concerning the current situation of local socioeconomic and future development. Practical resettlement action plan should be established according to local situation. The people affected by the project should be prevented from suffering loss for project construction.

(2) The public participation should be actively encouraged and information disclosure should be strengthened and surveillance by the masses shall be accepted.

(3) Internal and external monitoring should be reinforced and effective and unblocked feedback mechanism and channels should be established. The information processing cycle should be minimized to ensure the various problems in project implementing process be settled in time.

(4) Project sites are arranged in a scientific way by occupying as less land as possible. When construction is completed, temporarily occupied area will be recovered as provided by its original land use type.

(5) Temporary storage area of earthwork is properly arranged so that it is far from environmentally sensitive points such as residential quarters, schools and the like.

9.2 Social Assessment

9.2.1 Social Assessment

Social assessment of this project consists of items below:

(1) Generally, the project is of high economic and social benefit, consistent with medium or long-term development plan for representative counties of each sub-project. Meanwhile, it will have positive impacts on improving regional environment and boosting regional economic and social development.

(2) Most farmers/residents of representative counties will benefit directly from the project, since the project has extensive covering rate and inclusive beneficiaries.

(3) Disadvantaged groups will be direct beneficiaries of the project. Generally, the project has little adverse impact on their livelihood, but create some jobs for them to live a better life.

(4) Because the project is in line with the region's customs, culture and religion, there is no relevant risks.

(5) Project management system of high enforcement capability provides institutional guarantee for the project's smooth operation and implementation.

The project will alleviate pollution in Poyang Lake Basin and improve living, ecological and social environment for residents in the project area. Purposes of the project are in line with China's plan of utilizing foreign investment and pollution control. Local governments of various levels and beneficiary groups are all supportive to the project.

Sewage treatment and ecological restoration projects have been spreading in China's provinces for years. The technology is relatively mature. Moreover, the project areas have conducted similar pollution control projects and formed full-time technological teams, boasting a good working foundation. And staffs of project offices of all levels are experienced in project management. All of these are favorable for successfully completing the project .

Implementation of the project will bring favorable social benefits, including: improving people's living environment and their livelihood; creating more jobs for vulnerable groups and farmers; decreasing incidence of disease and improving people's health conditions, promoting rural urbanization and transforming farmers into urban residents, and facilitating industrial restructuring and green economic development.

Any project may encounter risks in the implementation. This project will face risks in the construction, difficult land acquisition and subsequent maintenance. Therefor, the project has to pay attention to the development of beneficiary groups and also attend to social equity. Undoubtedly, a more integral project design and high-quality project management will reduce potential social risks and prevent adverse social impacts in the area.

9.2.2 Suggestions

Due to differences and complexity of project contents in various cities or towns and distinct economic and social development, we have to face potential risks brought by project construction. Those risks can be avoided through two methods. Firstly, engineering design should be optimized on the basis of no extra quantity. Secondly, owners should consult with

stakeholders before, during and after the project construction to know their needs and desires, and communicate with different departments. To this end, the social assessment group proposes the following suggestions:

1. General Advice

(1) Optimizing the Design

Project owners and feasibility study agencies should minimize the scale of land acquisition and demolition in design, and adopt advanced measures of environmental protection to avoid secondary pollution brought by environmental projects;

(2) Conducting Participatory Activities

Major stakeholders should be involved in the design, implementation, management and supervision of the project. Project owners, the PMO/PPMO and social assessment group formulate outline for beneficiary participation and initiate monitoring and evaluation to ensure that major stakeholders join in the whole process of the project, including the preparation, design, implementation, monitoring and supervision, and equip them with the awareness of environmental protection;

(3) Carrying out Training on Environmental Knowledge and Public Health Education

Relevant government departments should organize public training on national and regional laws and regulations on environmental protection as well as environment indicators under the assistance of the publicity department, Bureau of Education, Environmental Protection Bureau, Bureau of Radio and Television, newspaper offices, and sub-district/town/township/village level residents' committees; launch training on water conservation, treatment of sewage and waste, control of point pollution, prevention of water-mediated diseases and recycle of waste; and publicize life-styles that may affect surrounding environment and help residents in the project area to realize that their way of living may have impacts on surrounding environment;

(4) Formulating A Reasonable Resettlement Action Plan

On the basis of public consultation, the PMO/PPMO, resettlement plan group and project owners should ensure that migrants' livelihood will not deteriorate due to the project construction;

(5) Creating Jobs Opportunities

The PMO/PPMO, project owners, construction agency with the assistance of the Bureau of Civil Affairs and the Social Security Bureau will provide jobs opportunities for migrants, poverty-stricken families and women in cities and rural areas to involve them in the project construction;

(6) Formulating and Implementing Preferential Charging Policy for Impoverished Groups

The PMO/PPMO, project owners and the Price Bureau should establish local charging policy for impoverished groups on the basis of public hearing;

(7) Safety and Convenience Maintenance during Construction

The project owners and construction agencies should schedule the construction progress by taking residents' need and habits into consideration;

(8) Institutional Capacity Building

The project managers and constructors should launch training on World Bank social and safeguard policies to better implement the project;

(9) Mechanism of Follow-up Project Management

Residents should be involved in the follow-up management. It is proposed to establish a community team of follow-up project management based on the management group during the construction. Members of follow-up management team (women included) will be elected by villagers. Environmental institutions should strengthen the legislation and law enforcement on environmental protection and enhance environmental education for residents in the project area for sustainability of the project effects.

2. Suggestions on Sub-projects

1) Pipeline network construction will affect residents rest, shop business and industry operation on the two sides of roads. Therefore, pipe laying should shorten construction duration as much as possible to reduce unfavorable impacts. If possible, certain compensation should be offered to affected residents and shop owners;

2) It is necessary to connect sewage of households within the construction and residential area from the source;

3) Since the project area enjoys developed water system and abundant water, drainage project should be in line with local conditions to ensure construction quality and life time.

10 Environmental Management Plan

For details, see the stand-alone EMP of World Bank-financed Fengxin County Water Environment Management Project.

11 Analysis of Economic Cost-Benefit of Environmental Impact

11.1 Cost Estimate for Environmental Protection

The total investment is 197.0771 million yuan, and investment estimate for environmental protection is shown in Table 11-1, mainly including cost for environmental protection measures and cost for monitoring and training, with the total amount being 2.383 million yuan. Environmental protection investment accounts for 1.2% of the total investment.

Table 11-1 Cost Estimate for Environmental Protection

Cost for Environmental Management	Environmental Monitoring Cost		Training Cost	Total Cost for Implementing EMP
	Construction period	Operation period		
224	6.3	0	8	238.3

11.2 Analysis of Economic Cost-Benefit of Environmental Impact

11.2.1 Environmental Benefits

Involving reconstruction of the pipe network in the North District and the South District of Fengxin County, this project has significant benefits in the environment, including reduction of pollutant loads, improvement on water quality and environmental management capability, etc.

(1) Reduction of Pollutant Load

In the completion year 2023, the sewage collection capability will reach about 15,700m^3/d in the North District and the South District, with the collection rate being over 80%. It is estimated that the annual reduction of pollutants into water bodies of Poyang Lake Basin will be 15 tons of TN, 2.4 tons of TP and 215.5 tons of COD.

(2) Improvement of Water Quality

The implementation of this project will help control river pollution, purify and conserve the water, greatly reducing the pollutants discharged into the Liao River. Therefore, the impact of pollutants on local surface water bodies will be reduced and the regional water quality will be improved. As a result, the project will fundamentally protect the regional water bodies and significantly improve environmental conditions in Fengxin County.

(3) Improvement of Environmental Management Capacity

The implementation of environmental monitoring and management capacity building project provides local environmental protection with strong technical measures and supervision and management methods. The project promote healthy development of local environmental protection work and effectively prevent environmental pollution accidents and reduce environmental risks. Measures that improve management, technique and others can minimize pollution of regional surface water bodies, hence improving regional environmental conditions.

(4) Good Environmental Conditions can be Provided for Regional Social and Economic Development

The implementation of the project helps: to speed up the local municipal infrastructure construction; to establish and improve the environmental infrastructure network system; to further ease the contradiction between the Basin's regional urban development and environmental constraints; to improve environment quality of the basin in the project site; to enhance water environmental functions and urban functions. All these create fine environmental conditions for rapid and healthy economic and social development of the region and the whole province at large.

11.2.2 Social Benefits

11.2.2.1 Improve Residents' Health and Life Quality of the People Living in the River Basin

The project can effectively level up the backward environmental infrastructure in the project area, improve water quality of regional water bodies and protect and improve people's living environment. It can also reduce the morbidity, promote people's health and further improve people's life quality.

11.2.2.2 Increasing Job Opportunities for Residents

Jobs will be created in pace with the progress of the project. First, during the construction period, some short-term and odd jobs will be provided; second, during the operation period, some long-term and stable job opportunities will be provided, including technical and management posts of the project; third, due to the implementation of the project, the investment environment will be greatly improved and can attract more capital, the development of industry and agriculture will be accelerated, and the service sector will be boosted, thus more job opportunities will be provided.

11.2.2.3 Improving Residents' Awareness of Environmental Protection

The construction of the project is also a profound and vivid publicity of environmental protection. Through specific environmental protection activities, people can deeply realize the significance of the environmental protection and know the serious consequences due to environmental damages, including economic loss, health damage and resource loss, etc. Such action is, compared with pure propaganda, more effective and easier to be accepted by people. Meanwhile, the project can develop a demonstration base for environmental science popularization and education, which provides the public with a place for receiving environmental education and has great benefits for improving residents` awareness of environmental protection.

11.2.2.4 Fundamental Data can be Provided for Regional Pollution Control

The implementation of environmental monitoring and the management capacity building can meet the increasing demand for the environmental monitoring of the society and better serve for regional economic development. At the same time, the implementation of the project can provide fundamental data for further analyzing pollution sources, scientific foundation for the comprehensive treatment decision-making about the regional pollution, foundation for accurately estimating the treatment effect for the regional pollution and effective methods for monitoring the operation of treatment facilities by the functional departments of the government according to laws. All these are good for enhancing the environmental management for the basin.

11.2.3 Economic Benefits

As a water environment management project, this project belongs to public welfare project, which does not have obvious direct investment benefits. The project's major economic benefits are indirect ones, mainly including:

(1) Economic Benefit from Pollution Control

It is mainly shown through the reduction of the social economic loss caused by the pollutants in the sewage, including:

Industries and enterprises: the extra investment and operation management expenses due to separate sewage treatment can be reduced, hence removing the heavy burden of the industries and enterprises;

Agriculture, forestry, animal husbandry and fisheries: the water pollution may cause decline of the production and quality of grain crop, animal product and aquatic product. But the completion of the project may reduce the economic loss caused by such pollution;

Physical health: water pollution will increase morbidity and the health care expenses, and decrease the labor productivity. However, the completion of the project improves the dwelling environment and reduces related medical expenses.

(2) Benefits from Increasing Income

Along with the improvement of the infrastructure and environment, the value of urban land will increase.

11.3 Summary

This project is one part of an integrated plan to improve environmental circumstances of Fengxin County and promote water environment management of Poyang Lake Basin. The construction of proposed pipe network will result in a significant impact on urban infrastructure and ecological environmental protection within the project area and even on national economic and social development at large.

The project helps: ① to consolidate results of environmental treatment within the project area and further improve the environmental quality; ② to improve residents' production and living conditions as well as residents' living quality and heath; ③to promote marketing of Fengxin infrastructure construction and management through importing and absorbing advanced technology and management expertise both from home and abroad, realizing independent and healthy development of regional urban infrastructure; ④to boost Poyang Lake Basin water environmental safety building. the project, aiming at safeguarding economic and social sustainable development driven by environmental sustainable development, creates good conditions for realizing sustainable development strategy and high-level ecological civilization within Poyang Lake Basin Ecological Economic Zone. Indeed, this project has considerable environmental, social and economic benefits.

12 Conclusion

According to the EIA, the following conclusions can be made:

(1) Construction of this project will improve the water environment of Liao River basin and improve regional infrastructure. The project will change the current situation in Fengxin County where domestic sewage is directly discharged into nearby water bodies without being treated, thus protecting the water quality of the receptor Liao River. To some degree, the project can improve Fengxin's environmental hygiene. Also, it will greatly improve residents' living conditions, protect nearby water bodies, beautify the surrounding environment, build a more comfortable and better living environment, and increase the quality of living environment.

(2) Construction of the project is in line with national laws and regulations as well as local overall urban planning and environmental protection planning. Therefore, the implementation of this project has a legal foundation.

(3) The implementation of this project may influence some environmental protection targets (sensitive points), such as residential areas, schools, hospitals and so on. In the EIA, through taking mitigation measures, formulating and implementing EMP, and via public participation and other means, it is likely that negative impact on environmental protection targets (sensitive points) due to the implementation of the project can be further reduced and eliminated, and that potential impact can meet the requirements of state environmental protection laws and regulations as well as standard specifications.

(4) The implementation of this project may also have some adverse impact on the ambient environment. The impact is mainly caused during the construction period.

1) Adverse impact during the construction period mainly includes: impact of dredging on the environment, construction dust on ambient air quality, noise of construction vehicles and machinery on the surrounding environment, installation of sewage pipes on the surrounding traffic; impact of construction domestic sewage; soil erosion caused by temporary earthwork stacking during construction; and damage to vegetation caused by the construction, etc.

2) Environmental impact during the operation period mainly comes from noise of sewage lifting pump stations caused by the operation of machinery. After treatment, the impact on the surrounding environment will be minor.

(5) By taking mitigation measures, implementing EMP, and via public participation and consultation as well as other means, the extent and scope of potential negative impact of the project can be controlled within the limits specified by national laws and regulations as well as standard specifications.

In summary, after taking mitigation measures proposed in this project and implementing EMP and public consultation and other means, the implementation of this project is feasible and the project's impact on the environment is acceptable.

Annex I: Sludge Acceptance Letter of Fengxin County

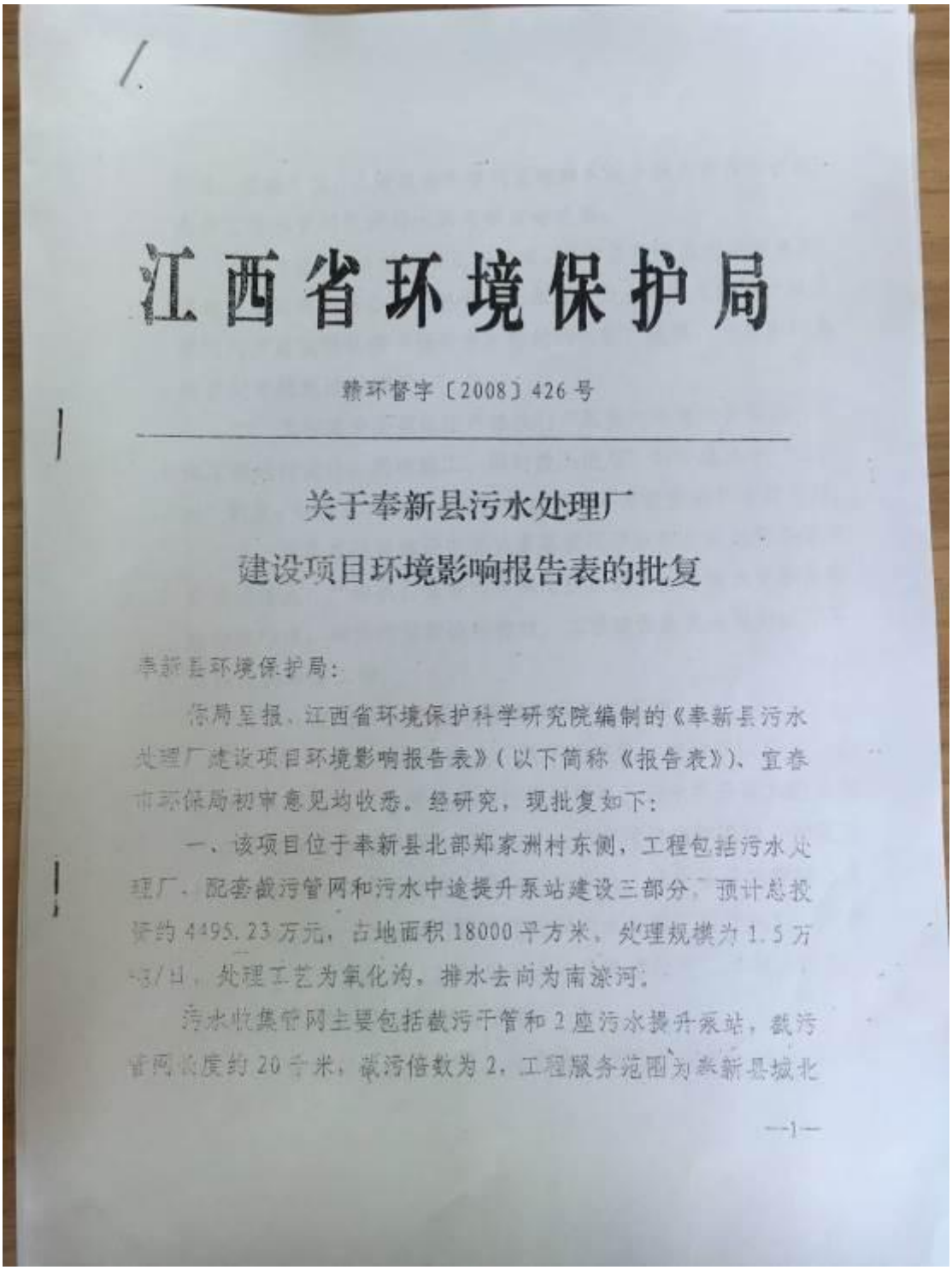
奉新县南渠、大寨渠及北支圳渠
清淤淤泥接收函

世行贷款奉新县水环境管理项目拟对南渠、大寨渠及北支圳渠进行清淤，清淤量分别为3480 m^3、7600 m^3、2400m^3。同意将该淤泥运至我单位干洲镇黄溪村源头组林地林用，特此证明。

奉新县干洲镇人民政府

2016年8月22日

Annex II: Reply of Environmental Protection Department of Jiangxi Province to the EIA Report of Fengxin County Sewage Treatment Plant Construction Project



江西省环境保护局

赣环督字〔2008〕426号

关于奉新县污水处理厂
建设项目环境影响报告表的批复

奉新县环境保护局：

你局呈报、江西省环境保护科学研究院编制的《奉新县污水处理厂建设项目环境影响报告表》（以下简称《报告表》）、宜春市环保局初审意见均收悉。经研究，现批复如下：

一、该项目位于奉新县北部郑家洲村东侧，工程包括污水处理厂、配套截污管网和污水中途提升泵站建设三部分，预计总投资约4495.23万元，占地面积18000平方米，处理规模为1.5万吨/日，处理工艺为氧化沟，排水去向为南涂河。

污水收集管网主要包括截污干管和2座污水提升泵站，截污管网长度约20千米，截污倍数为2，工程服务范围为奉新县城北

—1—

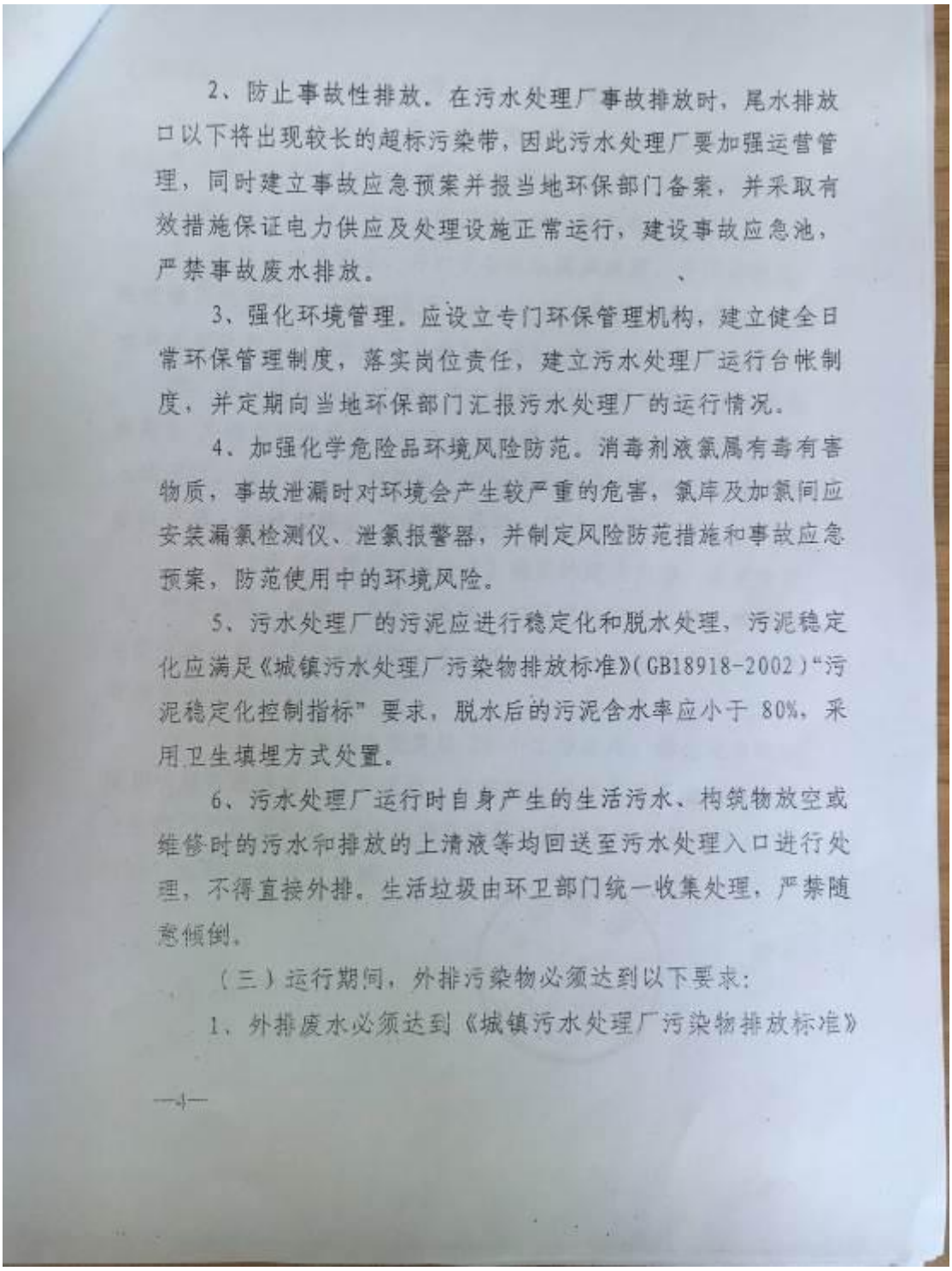
理厂进水水质自动在线监控系统及排放口污水水量自动计量装置、自动比例采样装置和主要水质指标在线监测装置。根据国家和省排污口规范化整治的要求规范合理设置各类排污口，污水在线监测装置应与环保部门联网，接受各级环保部门的实时监控。

3、完善污泥安全处置。妥善考虑污泥去向，严禁污水处理厂污泥随意处置。污泥临时堆场和卫生填埋场的选址建设须满足《生活垃圾填埋污染控制标准》(GB16889-1997)要求，并与污水处理工程同步建设，同步投入使用，确保污泥得到妥善处理，防止产生二次污染。

4、实施施工期环境监理。按照《报告表》的要求，制定并实施施工期环境监理计划，施工招标文件、施工合同和工程监理文件中应明确环保条款和责任，落实施工期污染防治措施，并定期向我局和当地环保局报告。

（二）强化运行期间环境管理。

1、有条件接纳工业废水。为保证污水设施的正常运行，必须按照《报告表》中提出的接纳工业废水限制措施要求对工业废水进行有条件接纳，禁止含有《污水综合排放标准》(GB8978-1996)表1中第一类污染物的工业废水排入污水管网，严格限制排水量大于2000吨/日的工业废水排入污水管网，严禁拒绝含有重金属、持久性有机污染物、病毒体和有毒有害物质的工业废水排入污水管网，各类工业废水预处理达到入水管网要求方能送污水处理厂进行集中处理。



2、防止事故性排放。在污水处理厂事故排放时，尾水排放口以下将出现较长的超标污染带，因此污水处理厂要加强运营管理，同时建立事故应急预案并报当地环保部门备案，并采取有效措施保证电力供应及处理设施正常运行，建设事故应急池，严禁事故废水排放。

3、强化环境管理。应设立专门环保管理机构，建立健全日常环保管理制度，落实岗位责任，建立污水处理厂运行台帐制度，并定期向当地环保部门汇报污水处理厂的运行情况。

4、加强化学危险品环境风险防范。消毒剂液氯属有毒有害物质，事故泄漏时对环境会产生较严重的危害，氯库及加氯间应安装漏氯检测仪、泄氯报警器，并制定风险防范措施和事故应急预案，防范使用中的环境风险。

5、污水处理厂的污泥应进行稳定化和脱水处理，污泥稳定化应满足《城镇污水处理厂污染物排放标准》(GB18918-2002)"污泥稳定化控制指标"要求，脱水后的污泥含水率应小于 80%，采用卫生填埋方式处置。

6、污水处理厂运行时自身产生的生活污水、构筑物放空或维修时的污水和排放的上清液等均回送至污水处理入口进行处理，不得直接外排。生活垃圾由环卫部门统一收集处理，严禁随意倾倒。

（三）运行期间，外排污染物必须达到以下要求：

1、外排废水必须达到《城镇污水处理厂污染物排放标准》

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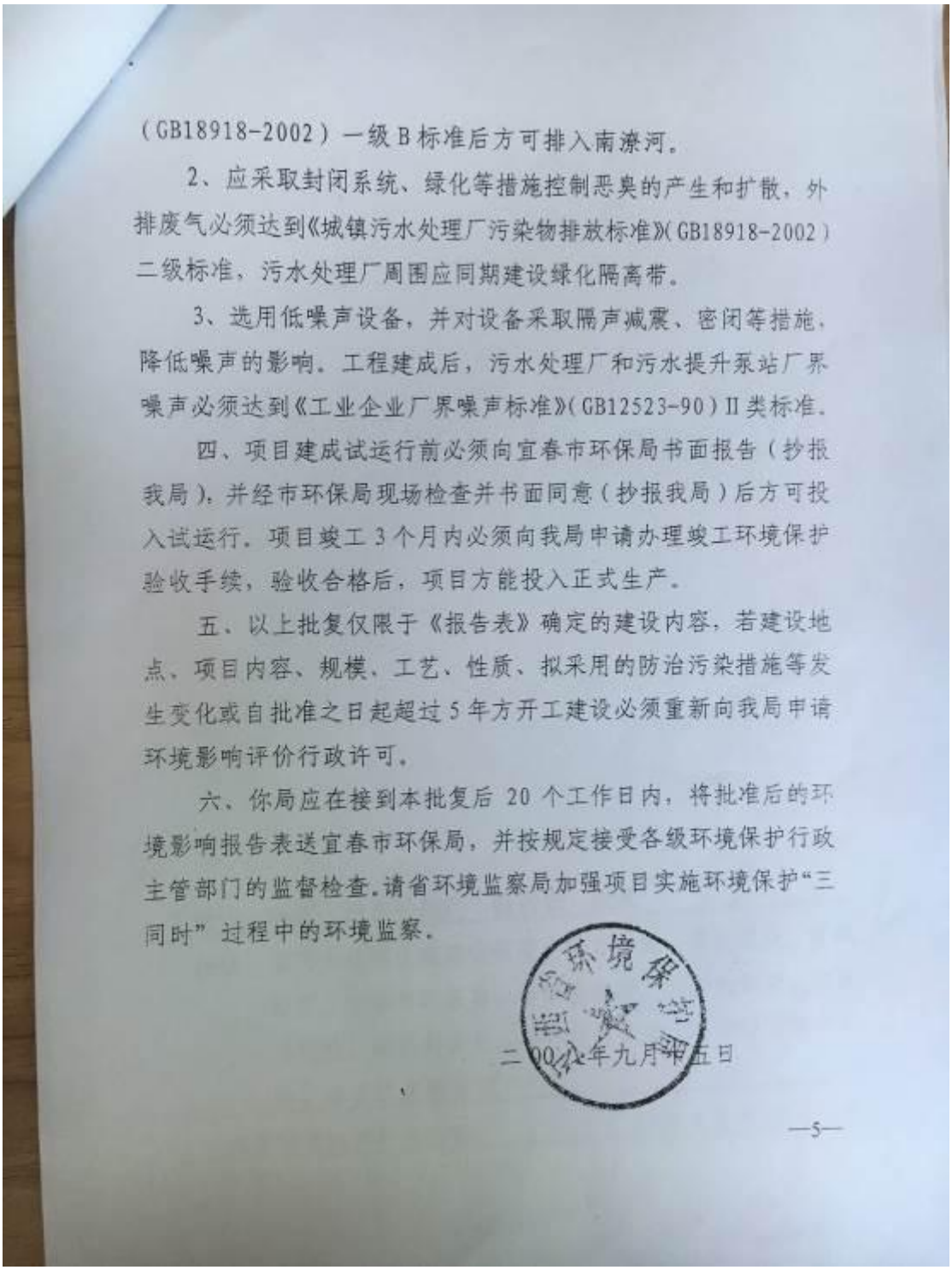

（GB18918-2002）一级B标准后方可排入南潦河。

2、应采取封闭系统、绿化等措施控制恶臭的产生和扩散，外排废气必须达到《城镇污水处理厂污染物排放标准》（GB18918-2002）二级标准，污水处理厂周围应同期建设绿化隔离带。

3、选用低噪声设备，并对设备采取隔声减震、密闭等措施，降低噪声的影响。工程建成后，污水处理厂和污水提升泵站厂界噪声必须达到《工业企业厂界噪声标准》（GB12523-90）II类标准。

四、项目建成试运行前必须向宜春市环保局书面报告（抄报我局），并经市环保局现场检查并书面同意（抄报我局）后方可投入试运行。项目竣工3个月内必须向我局申请办理竣工环境保护验收手续，验收合格后，项目方能投入正式生产。

五、以上批复仅限于《报告表》确定的建设内容，若建设地点、项目内容、规模、工艺、性质、拟采用的防治污染措施等发生变化或自批准之日起超过5年方开工建设必须重新向我局申请环境影响评价行政许可。

六、你局应在接到本批复后20个工作日内，将批准后的环境影响报告表送宜春市环保局，并按规定接受各级环境保护行政主管部门的监督检查。请省环境监察局加强项目实施环境保护"三同时"过程中的环境监察。

环境保护

二00八年九月[illegible]五日

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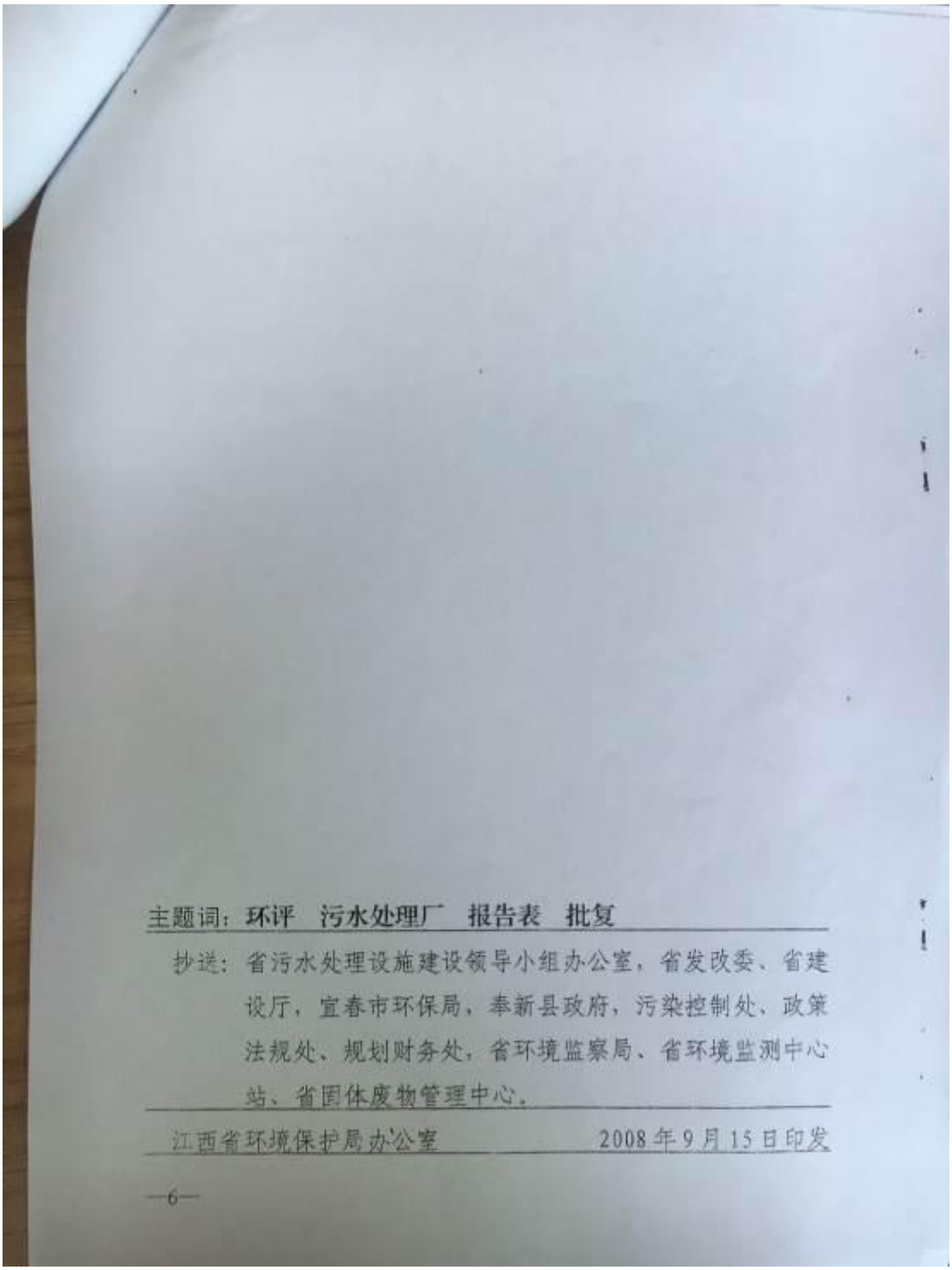

主题词：环评　污水处理厂　报告表　批复

抄送：省污水处理设施建设领导小组办公室，省发改委、省建设厅，宣春市环保局，奉新县政府，污染控制处、政策法规处、规划财务处，省环境监察局、省环境监测中心站、省固体废物管理中心。

江西省环境保护局办公室　　2008年9月15日印发

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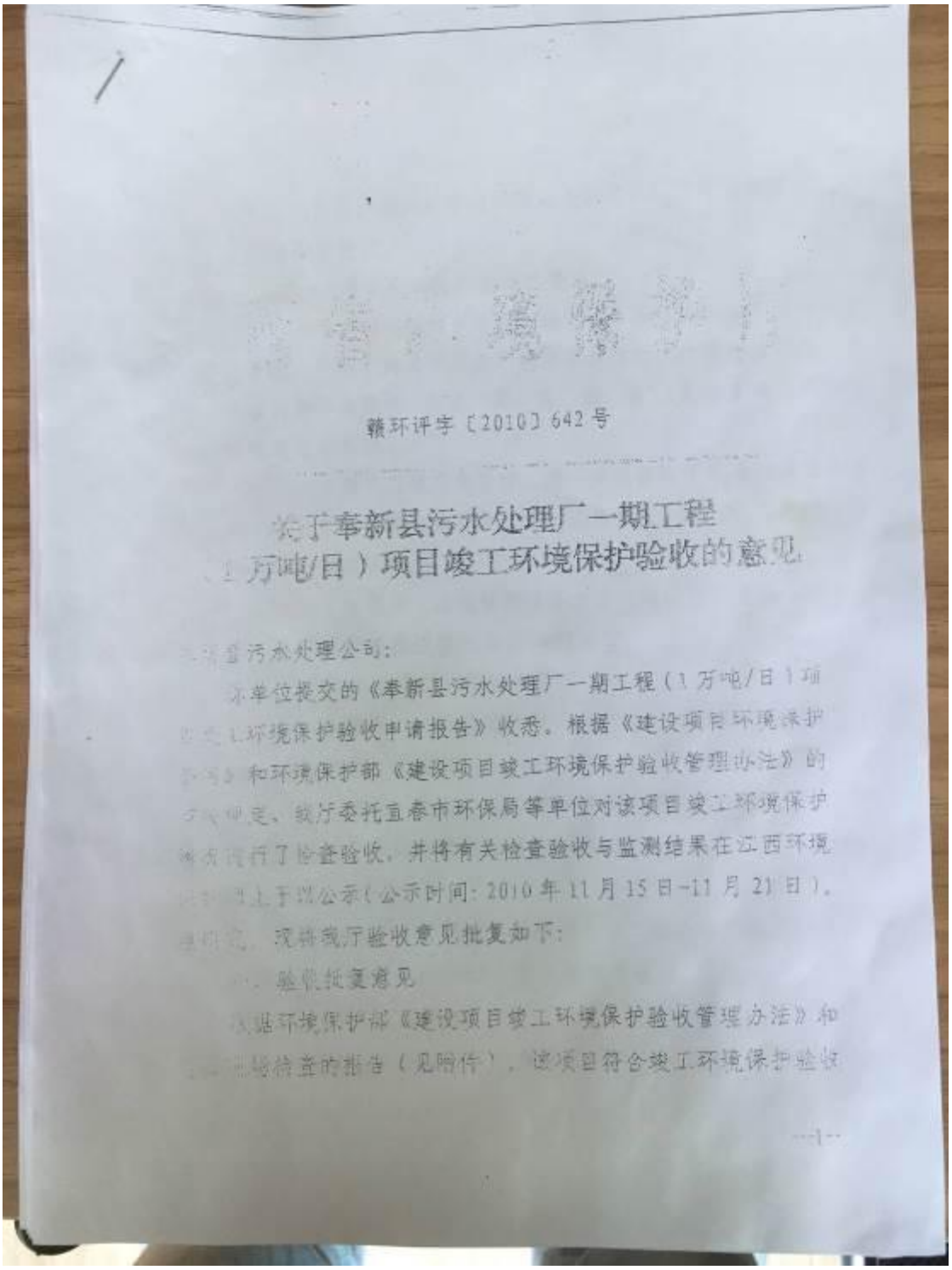
Annex III: Opinion on Environmental Completion Acceptance of the Fengxin County Sewage Treatment Plant's Phase I Project (10,000 t/d)



赣环评字〔2010〕642号

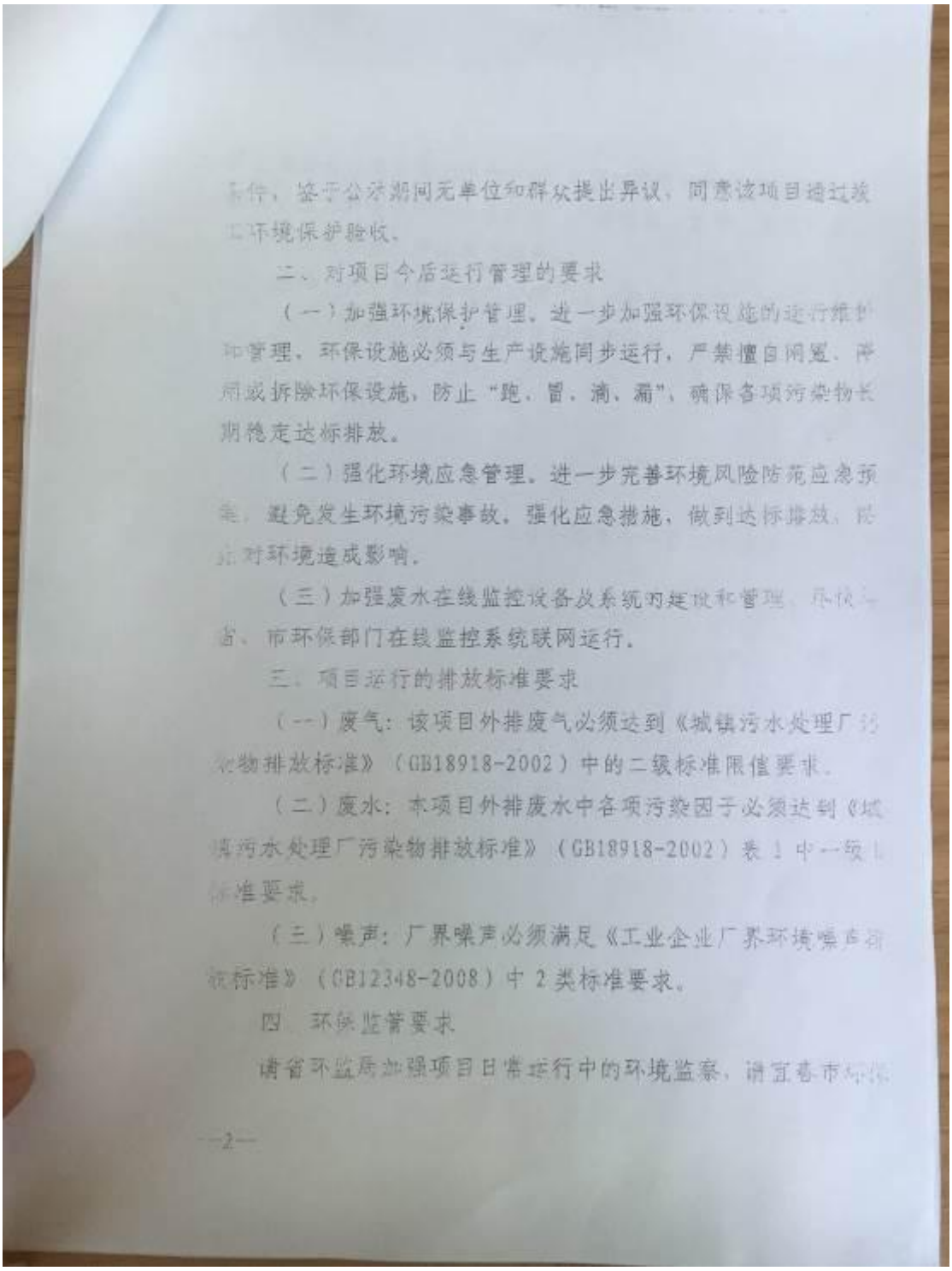
关于奉新县污水处理厂一期工程
（1万吨/日）项目竣工环境保护验收的意见

奉新县污水处理公司：

你单位提交的《奉新县污水处理厂一期工程（1万吨/日）项目竣工环境保护验收申请报告》收悉。根据《建设项目环境保护管理条例》和环境保护部《建设项目竣工环境保护验收管理办法》的有关规定，我厅委托宜春市环保局等单位对该项目竣工环境保护验收进行了检查验收，并将有关检查验收与监测结果在江西环境保护厅网上予以公示（公示时间：2010年11月15日-11月21日）。现将我厅验收意见批复如下：

一、验收批复意见

根据环境保护部《建设项目竣工环境保护验收管理办法》和现场检查的报告（见附件），该项目符合竣工环境保护验收



条件，鉴于公示期间无单位和群众提出异议，同意该项目通过竣工环境保护验收。

二、对项目今后运行管理的要求

（一）加强环境保护管理。进一步加强环保设施的运行维护和管理，环保设施必须与生产设施同步运行，严禁擅自闲置、停用或拆除环保设施，防止“跑、冒、滴、漏”，确保各项污染物长期稳定达标排放。

（二）强化环境应急管理。进一步完善环境风险防范应急预案，避免发生环境污染事故，强化应急措施，做到达标排放，减少对环境造成影响。

（三）加强废水在线监控设备及系统的建设和管理，并按省、市环保部门在线监控系统联网运行。

三、项目运行的排放标准要求

（一）废气：该项目外排废气必须达到《城镇污水处理厂污染物排放标准》（GB18918-2002）中的二级标准限值要求。

（二）废水：本项目外排废水中各项污染因子必须达到《城镇污水处理厂污染物排放标准》（GB18918-2002）表 1 中一级 B 标准要求。

（三）噪声：厂界噪声必须满足《工业企业厂界环境噪声排放标准》（GB12348-2008）中 2 类标准要求。

四、环保监管要求

请省环监局加强项目日常运行中的环境监察，请宜春市环保

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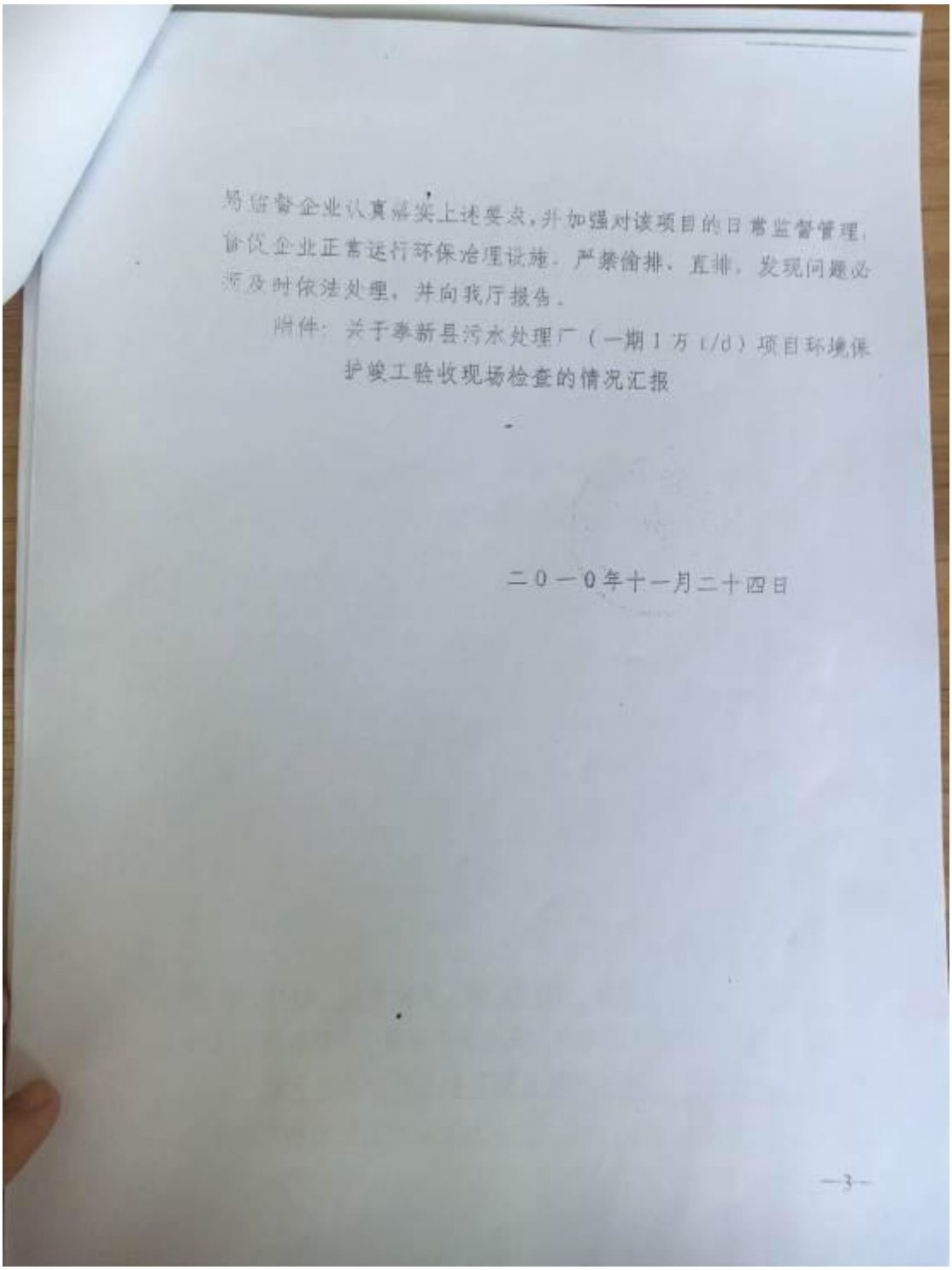

局监督企业认真落实上述要点，并加强对该项目的日常监督管理，督促企业正常运行环保治理设施，严禁偷排、直排，发现问题必须及时依法处理，并向我厅报告。

附件：关于奉新县污水处理厂（一期1万t/d）项目环境保护竣工验收现场检查的情况汇报

二0一0年十一月二十四日

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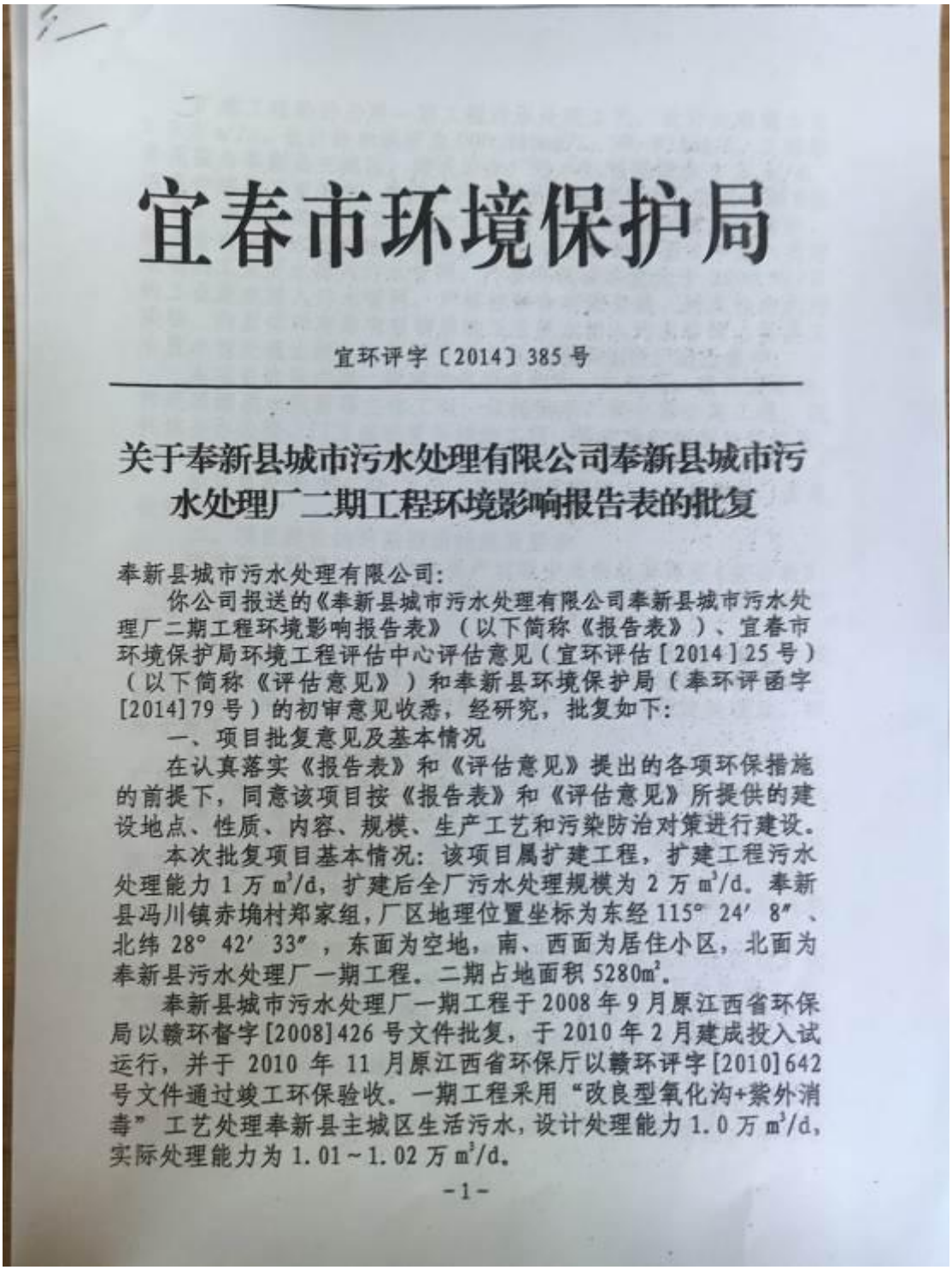
Annex IV: Reply to the EIA report of the Fengxin Urban Sewage Treatment Phase II Project of Fengxin County Urban Sewage Treatment Co., Ltd.



宜春市环境保护局

宜环评字〔2014〕385号

关于奉新县城市污水处理有限公司奉新县城市污水处理厂二期工程环境影响报告表的批复

奉新县城市污水处理有限公司:

你公司报送的《奉新县城市污水处理有限公司奉新县城市污水处理厂二期工程环境影响报告表》（以下简称《报告表》）、宜春市环境保护局环境工程评估中心评估意见（宜环评估[2014]25号）（以下简称《评估意见》）和奉新县环境保护局（奉环评函字[2014]79号）的初审意见收悉，经研究，批复如下:

一、项目批复意见及基本情况

在认真落实《报告表》和《评估意见》提出的各项环保措施的前提下，同意该项目按《报告表》和《评估意见》所提供的建设地点、性质、内容、规模、生产工艺和污染防治对策进行建设。

本次批复项目基本情况: 该项目属扩建工程，扩建工程污水处理能力1万m^3/d，扩建后全厂污水处理规模为2万m^3/d。奉新县冯川镇赤坳村郑家组，厂区地理位置坐标为东经115° 24′ 8″ 、北纬28° 42′ 33″ ，东面为空地，南、西面为居住小区，北面为奉新县污水处理厂一期工程。二期占地面积5280m^2。

奉新县城市污水处理厂一期工程于2008年9月原江西省环保局以赣环督字[2008]426号文件批复，于2010年2月建成投入试运行，并于2010年11月原江西省环保厅以赣环评字[2010]642号文件通过竣工环保验收。一期工程采用“改良型氧化沟+紫外消毒”工艺处理奉新县主城区生活污水，设计处理能力1.0万m^3/d，实际处理能力为1.01～1.02万m^3/d。

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扩建工程设计沿用一期工程污水处理工艺，设计处理能力为1.0万m^3/d，设计进水水质为COD_{cr}280mg/L、NH_3-N25mg/L，工程服务范围为奉新县主城区，建成后全厂污水处理规模为2万m^3/d。有条件接纳工业废水。为保证污水设施的正常运行，必须按照《报告表》中提出的接纳工业废水限值要求对工业废水有条件接纳，禁止含有《污水综合排放标准》（GB8978-1996）表1中第一类污染物的工业废水排入污水管网，严格限制排水量大于2000吨/日的工业废水排入污水管网，严格控制含有重金属、持久性有机污染物、病原体和有毒有害物质的工业废水排入污水管网，各类工业废水预处理达到入水管网要求方能送污水处理厂进行集中。

本项目建设内容：新建改良型氧化沟、二沉池、紫外消毒池、污泥浓缩脱水机房等主体工程；依托供水、供电等公用工程；依托综合办公楼、门卫值班室等辅助工程；新建废气收集处理装置、污水处理设施、设备减振降噪设施等环保工程。

项目总投资976.46万元，其中环保投资976.46万元，占总投资的100%。

二、项目建设的污染防治措施及要求

项目在工程设计、建设和生产过程中必须认真落实《报告表》、《评估意见》和《初审意见》提出的各项环保要求，并重点做好以下几项工作：

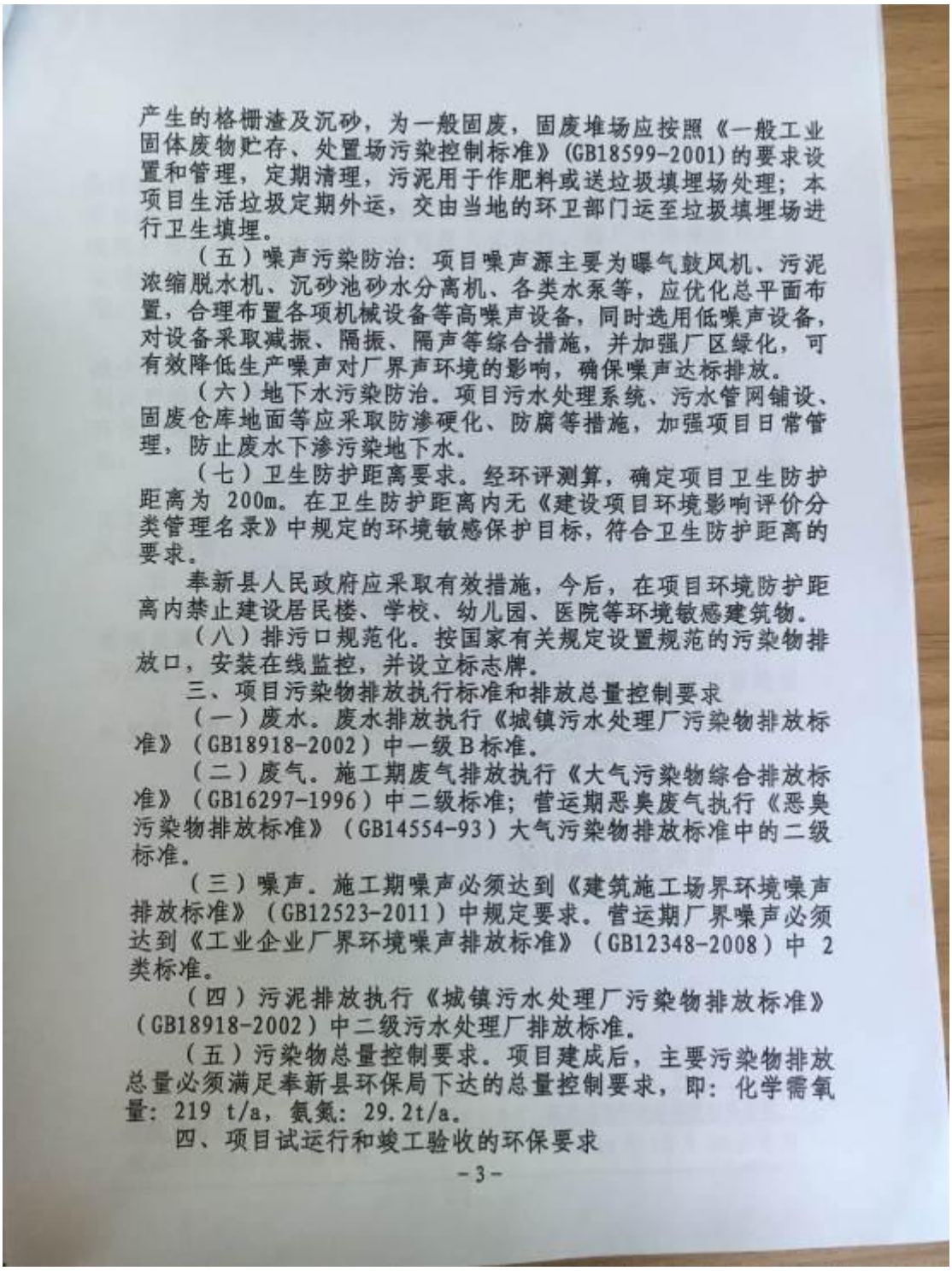
（一）施工期污染防治。必须合理安排施工时间和施工机械的使用，夜间禁止使用打桩机等高噪声设备，同时认真落实扬尘防治措施，减少扬尘对环境的影响。施工废水经沉淀处理后，回用于施工。

（二）废水污染防治：按“清污分流、雨污分流”原则建设厂区排水管网。本项目接纳污水量365万m^3/a，采用“改良型氧化沟+紫外消毒”污水处理工艺处理后排入南潦河。

（三）废气污染防治：项目应采用先进的、密闭性能好的处理工艺与设备，采取有效措施加强无组织排放恶臭废气的治理。项目大气污染源主要为二沉池、氧化沟、沉砂池、污泥浓缩脱水机房产生的恶臭。

采用一体化浓缩脱水机对污泥进行浓缩、脱水，污泥在厂内停留时间短，脱水后泥饼及时外运填埋；厂内加强卫生防疫工作，定期进行消毒剂杀灭蚊、蝇；通过加强厂区绿化，建立有一定宽度的“乔木+灌木+乔木”三层结构的绿化带，使恶臭污染物无组织排放厂界监控点浓度达到国家相关标准。

（四）固废污染防治：应按“资源化、减量化、无害化”处置原则，认真落实固废分类收集、处置和综合利用措施。本项目



产生的格栅渣及沉砂，为一般固废，固废堆场应按照《一般工业固体废物贮存、处置场污染控制标准》(GB18599-2001)的要求设置和管理，定期清理，污泥用于作肥料或送垃圾填埋场处理；本项目生活垃圾定期外运，交由当地的环卫部门运至垃圾填埋场进行卫生填埋。

（五）噪声污染防治：项目噪声源主要为曝气鼓风机、污泥浓缩脱水机、沉砂池砂水分离机、各类水泵等，应优化总平面布置，合理布置各项机械设备等高噪声设备，同时选用低噪声设备，对设备采取减振、隔振、隔声等综合措施，并加强厂区绿化，可有效降低生产噪声对厂界声环境的影响，确保噪声达标排放。

（六）地下水污染防治。项目污水处理系统、污水管网铺设、固废仓库地面等应采取防渗硬化、防腐等措施，加强项目日常管理，防止废水下渗污染地下水。

（七）卫生防护距离要求。经环评测算，确定项目卫生防护距离为 200m。在卫生防护距离内无《建设项目环境影响评价分类管理名录》中规定的环境敏感保护目标，符合卫生防护距离的要求。

奉新县人民政府应采取有效措施，今后，在项目环境防护距离内禁止建设居民楼、学校、幼儿园、医院等环境敏感建筑物。

（八）排污口规范化。按国家有关规定设置规范的污染物排放口，安装在线监控，并设立标志牌。

三、项目污染物排放执行标准和排放总量控制要求

（一）废水。废水排放执行《城镇污水处理厂污染物排放标准》（GB18918-2002）中一级B标准。

（二）废气。施工期废气排放执行《大气污染物综合排放标准》（GB16297-1996）中二级标准；营运期恶臭废气执行《恶臭污染物排放标准》（GB14554-93）大气污染物排放标准中的二级标准。

（三）噪声。施工期噪声必须达到《建筑施工场界环境噪声排放标准》（GB12523-2011）中规定要求。营运期厂界噪声必须达到《工业企业厂界环境噪声排放标准》（GB12348-2008）中 2 类标准。

（四）污泥排放执行《城镇污水处理厂污染物排放标准》（GB18918-2002）中二级污水处理厂排放标准。

（五）污染物总量控制要求。项目建成后，主要污染物排放总量必须满足奉新县环保局下达的总量控制要求，即：化学需氧量：219 t/a，氨氮：29.2t/a。

四、项目试运行和竣工验收的环保要求

-3-

（一）试运行要求。项目建设必须确保环保资金的投入，污染防治设施应与主体工程同时设计、同时施工、同时投入运行。项目建成投产试运行须向奉新县环境保护局申请，并经奉新县环境保护局现场检查同意后，方可投入试运行。你厂不得擅息延长试运行期限，若需延期必须于试运营（三个月）结束前报我局批准。

（二）运行管理要求。加强生产各环节的管理，最大限度地减少无组织排放。按规定设置环保管理机构，健全环保规章制度，制定严格的环境保护岗位责任制及风险防范预案和措施，并加强环保设施运行维护管理，严禁擅自闲置、停用或拆除环保治理设施。

（三）环保竣工验收要求。项目试运行三个月内，必须按规定向我局申请办理竣工环境保护验收手续，验收合格后，方可投入正式运营。

五、其他环保要求

（一）项目变更环保要求。本批复仅限按报告表的建设内容，若项目建设性质、规模、地点、内容、采用的生产工艺或者防治污染的措施等发生重大变化必须重新报批。

（二）日常环保监管。请奉新县环境保护局负责该项目建设的监管，请宜春市环境监察支队负责企业环保“三同时”的检查。

宜春市环境保护局

2014年12月30日

抄送：奉新县环保局，局相关科室，局直属有关单位，福建高科环保研究院有限公司。

宜春市环境保护局秘书科　　2014年12月30日印发

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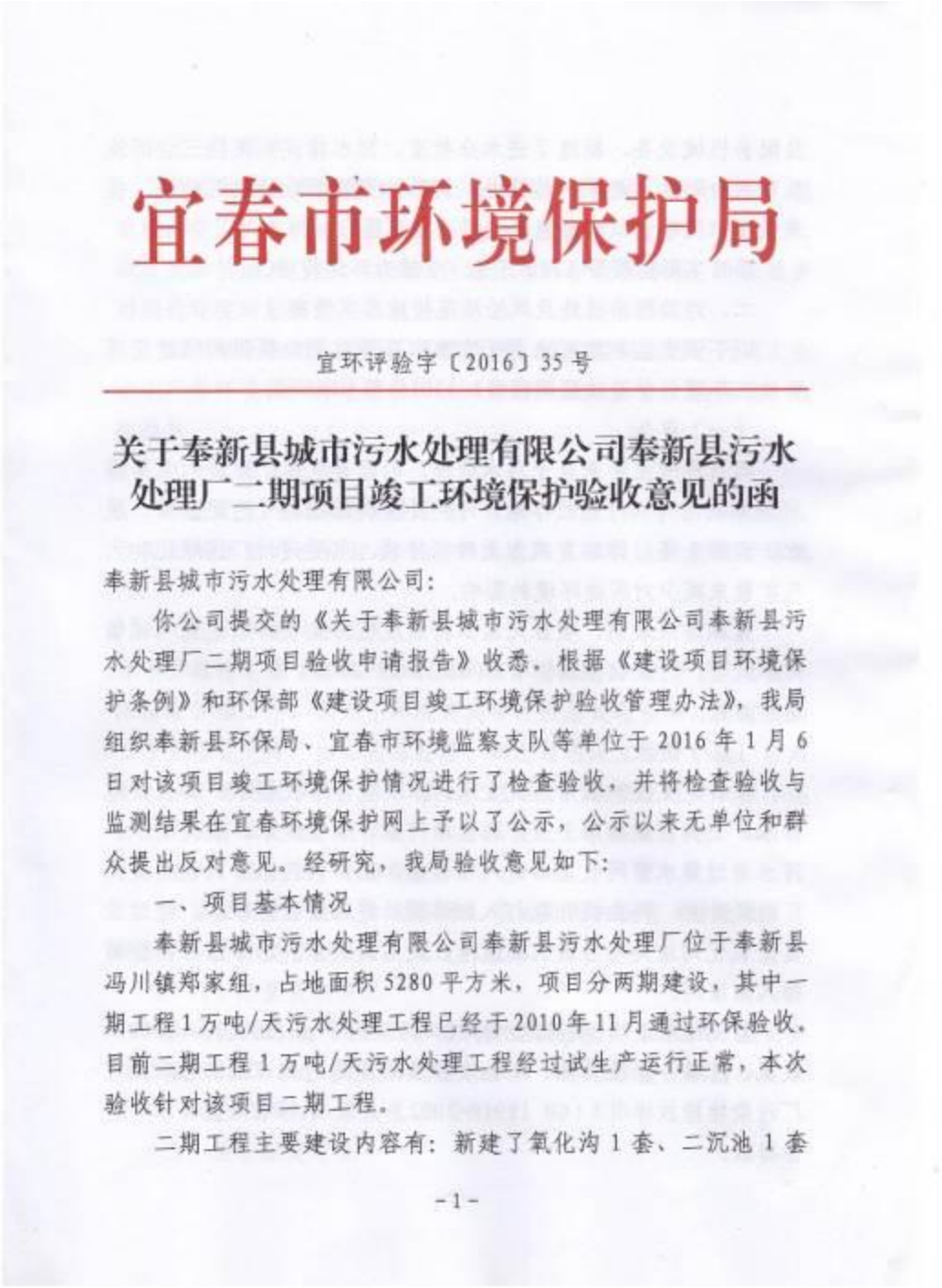
Annex V: Environmental Acceptance Reply to the EIA report of the Fengxin Urban Sewage Treatment Phase II Project of Fengxin County Urban Sewage Treatment Co., Ltd.



宜春市环境保护局

宜环评验字〔2016〕35号

关于奉新县城市污水处理有限公司奉新县污水处理厂二期项目竣工环境保护验收意见的函

奉新县城市污水处理有限公司：

你公司提交的《关于奉新县城市污水处理有限公司奉新县污水处理厂二期项目验收申请报告》收悉。根据《建设项目环境保护条例》和环保部《建设项目竣工环境保护验收管理办法》，我局组织奉新县环保局、宜春市环境监察支队等单位于2016年1月6日对该项目竣工环境保护情况进行了检查验收，并将检查验收与监测结果在宜春环境保护网上予以了公示，公示以来无单位和群众提出反对意见。经研究，我局验收意见如下：

一、项目基本情况

奉新县城市污水处理有限公司奉新县污水处理厂位于奉新县冯川镇郑家组，占地面积5280平方米，项目分两期建设，其中一期工程1万吨/天污水处理工程已经于2010年11月通过环保验收，目前二期工程1万吨/天污水处理工程经过试生产运行正常，本次验收针对该项目二期工程。

二期工程主要建设内容有：新建了氧化沟1套、二沉池1套

-1-

及配套机械设备，新建了进水分析室、配水排泥井更换三台回流泵和两台剩余污泥泵、格栅井、沉砂池更换两台旋流沉砂机。提升泵房、沉砂池、消毒池等依托一期工程。

项目实际总投资 1200 万元，全部为环保投资。

二、污染防治措施及风险防范措施落实情况

以下调查监测情况来源于宜春市环境监测站提供的《建设项目竣工环境保护验收监测报告》(2015)第 y145 号。

（一）废气

项目废气主要来自于污水处理厂的恶臭气体。恶臭的主要排放点为氧化沟、污泥贮存池、污泥处置构筑物内（污泥浓缩、脱水、泥棚）等，排放方式为无组织排放，主要通过厂区绿化和大气扩散来减少对周边环境的影响。

监测结果表明，项目无组织排放废气污染物排放达到《城镇污水处理厂污染物排放标准》（GB 18918-2002）表 4 中二级标准，达标排放。

（二）废水

项目主要接纳城市居民生活污水（包括居民排水、商业设施排水、公共设施排水）及厂内生活污水、食堂废水、脱泥废水。污水通过集水管网收集后进入粗格栅，由厂内污水管网收集流向厂内提升井，再由提升泵打入细格栅后进入旋流沉砂池，经过改良型氧化沟法处理后进入二沉池，最后通过紫外消毒池后由管道排入南潦河。

监测结果表明，项目尾水排放口污染因子 pH、SS、CODcr、BOD5、氨氮、总磷、动植物油、石油类排放浓度均达到《城镇污水处理厂污染物排放标准》（GB 18918-2002）一级 B 标准限值要求，达标排放。

（三）噪声

项目主要噪声源为污水泵、鼓风机、污泥泵、提升泵站、脱水机、空压机等机械设备产生。通过选用低噪声设备，采取吸声、减震及加装隔声门窗、加强厂区绿化等综合治理措施，降低噪声对周边环境的影响。

监测结果表明，项目厂界噪声昼、夜间监测值均达到《工业企业厂界环境噪声排放标准》（GB12348—2008）中 2 类标准，达标排放。

（四）固体废物

项目产生的固体废物格栅渣、沉砂、污泥，属一般固体废物，污泥经脱水后与生活垃圾一起交当地环卫部门送垃圾填埋场填埋。

（五）环境风险防范

公司制定了《废水、固体废弃物管理制度》，设有专人负责环保档案管理工作。制定了环境突发事件应急处理预案，同时编制了作业指导文件，由公司总经理、副总经理成立指挥小组，应对废水等环境突发事件，在日常生产过程中严格按规范要求操作运行生产和环保设施，确保生产和环保设施正常稳定运行。

（六）卫生防护距离检查

项目卫生防护距离为 200 米，在此范围内没有《建设项目环境影响评价分类管理名录》规定的敏感点存在。

（六）总量控制情况

验收监测期间，项目化学需氧量排放总量为 129t/a，氨氮排放总量为 2.54t/a，达到奉新县环保局下达的总量控制指标要求（即：COD：219 t/a、氨氮 29.2t/a）

三、验收批复意见

该项目基本符合竣工环境保护验收条件，公示期间无单位和群众提出异议，同意该项目通过竣工环境保护验收。

四、对项目今后运行管理的要求

进一步加强污水处理设备的日常管理和维护，防止“跑、冒、滴、漏”，确保项目废水中各污染物长期稳定达标排放，若出现超标排放现象，必须立即整改。

五、日常环境监管要求

请奉新县环保局负责该项目的日常管理及以上措施落实情况的监督管理，督促企业正常运行环保治理设施，严禁偷排、直排，发现问题必须及时依法处理，并向我局报告。请宜春市环境监察支队负责该项目日常运行中的环境监察。

宜春市环境保护局

2016 年 5 月 26 日

抄送：奉新县环保局，局相关科室，局直属有关单位。

宜春市环境保护局秘书科　　2016 年 5 月 26 印发

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Annex VI: Test Annual Report of Jiangxi Hongcheng Water Environmental Protection Co., Ltd. (Fengxin County)

江西洪城水业环保有限公司

奉新县分公司化验年报表

2015 年1 月 1 日至 12月 31日

检测项目		检定次数	最大值	最小值	平均值	合格次数	合格率（%）
进水	色度（倍）	364	128	32	72.88	364	100%
	PH 值	364	7.99	7.01	7.70	364	100%
	COD (mg/l)	364	219.1	90.3	157.73	364	100%
	BOD_5 (mg/l)	364	108.3	38.1	68.87	364	100%
	SS (mg/l)	361	142	32	73.67	361	100%
	NH_3-N (mg/l)	355	27.4	9.1	19.18	338	95.21%
	TN (mg/l)	355	38.6	14.3	25.59	349	98.31%
	TP (mg/l)	355	3.195	1.001	2.29	349	98.31%
	Cl (mg/l)	364	40.41	12.81	27.70	364	100%
	NO_3-N (mg/l)	355	5.5	0.3	1.13	355	100%
	粪大肠菌群（个/l）						
出水	色度（倍）	364	16	2	9.66	364	100%
	PH 值	361	7.70	6.72	7.04	361	100%
	COD (mg/l)	364	41.2	7.2	18.24	364	100%
	BOD_5 (mg/l)	364	18.3	3.3	8.38	364	100%
	SS (mg/l)	364	18	3	8.51	364	100%
	NH_3-N (mg/l)	355	4.9	0.3	1.46	355	100%
	TN (mg/l)	355	11.2	2.7	5.18	355	100%
	TP (mg/l)	355	0.971	0.200	0.66	355	100%
	Cl (mg/l)	364	57.16	15.18	28.63	364	100%
	NO_3-N (mg/l)	355	2.7	0.03	0.49	355	100%
	粪大肠菌群（个/l）						
污泥	含水率（处理后）	313	79.2	76.5	78.08	313	100%
	PH	313	7.11	6.12	6.74	313	100%
	有机质	313	39.30	35.53	38.02	313	100%
	粪大肠菌群（个/l）						
一组氧化沟	水温（℃）	364	27	13	19.68	364	100%
	SV_{30}（%）	364	92	17	52.40	364	100%
	ML5S(mg/l)	364	8941	3008	5354.14	364	100%
	SVI（ml/g）	364	156.57	40.29	98.99	364	100%
	MLVSS(mg/l)	364	5047	1382	2643.22	364	100%
	好氧区 DO(mg/l)	364	6.2	1.5	2.91	364	100%
	厌氧区 DO(mg/l)						
	镜检						
二组氧化沟	水温（℃）	364	27	13	19.68	364	100%
	SV_{30}（%）	364	92	20	54.04	364	100%
	ML5S(mg/l)	364	8652	2952	5366.74	364	100%
	SVI（ml/g）	364	143.99	49.75	99.83	364	100%
	MLVSS(mg/l)	364	4617	1233	2701.18	364	100%
	好氧区 DO(mg/l)	364	5.6	1.0	2.64	364	100%
	厌氧区 DO(mg/l)						
	镜检						

备注：6月15日 6月23日紫外-线分光光度计损坏，NH3-N、TP、TN、NO3-N无数据。11月9日停运。

填表人：余卉　　审核：邓功勋　　主管：

Annex VII Minutes of Discussion Meeting for Public Consultation

(1) Time: 1:30pm, May 25, 2016

(2) Venue: conference room of Fengxin County Development and Reform Commission

(3) Content: public consultation and information disclosure discussion meeting about Environment Impact Assessment (EIA) for World Bank-financed Fengxin County Water Environment Management Project

(4) Attendees: Deng Gong from Fengxin County PMO; director Mao from the County sewage treatment plant; Liu Gong from the Fengxin Department of Environmental Protection; Zhang Gong from the county traffic police brigade; representatives from Fengchuan No.2 Primary School and from Fengxin County No.3 Secondary School; representatives of affected residents and personnel from EIA Preparation institutes. Altogether there were 15 attendees.

(5) Chairperson: Deng Gong from Fengxin County PMO

(6) Meeting minutes

In the meeting, public consultation was conducted on the completion phrase of the draft of Jing'an County Water Environment Management Project EIA, and discussion was made on mitigation measures of project environmental impact. All parties reached a consensus. Subject matters of the meeting are hereby documented as follows:

①The chairperson introduced the attendees and distributed questionnaires.

②The EIA institutes introduced the purposes of public consultation:

Pursuant to requirements of PRC laws and regulations as well as management regulations and World Bank Operation Policy (OP4.01), two rounds of public consultation and information disclosure were conducted. The first round of public consultation was carried out after environmental issues were screened and before the terms of reference for EIA was finalized, mainly for briefly introducing the project and its potential impact on the environment to affected residents; the second round was conducted when the draft EIA was finished, mainly for discussion about environmental issues or problems of public concern and related mitigation measures to obtain public's understanding of the construction and the mitigation measures.

Relevant information was offered to the project areas and the public who are concerned about the project for the purpose of: 1) keeping them informed of the project's main content, its implementation and operation features as well as significant environmental issues or problems related to the project; 2) helping assessment staff identify issues or problems, confirm the feasibility of environmental protection measures and ensure implementation of optimal measures.

③ The EIA institutes briefly introduced the project and its environmental impact, the prevention and control measures, and conclusions of the EIA draft:

The proposed project, financed by the World Bank, will carry out pipe network reconstruction works in the South District and the North District, river course treatment, and other non-structural measures to reduce emission of pollutants into the Liao River and water bodies of Poyang Lake Basin. The implementation of the project will bring us a more comprehensive urban drainage system to safeguard ecological safety of urban water environment, to improve the urban diversion system of rainfall and sewage, and to increase

the collection and treatment rate of sewage. Therefore, pollution of Poyang Lake will be reduced from the source and sustainable urbanization will be achieved.

The project's potential environmental impact will be caused by both the construction and operation of the project. The impact during the construction period is mainly caused by environment pollution such as machinery noises, dusts, construction waste water, domestic sewage and construction waste, etc. Also, the dredging will impact the environment. Besides, conducting pipe network construction on both sides of the roads will cause inconvenience to the traffic and travel security especially that near the sensitive areas like hospitals, schools, kindergartens and nursing homes. When the construction is completed, the pipe network will function under the ground in an enclosed space, and will not cause any pollution. After taking appropriate mitigation measures, this project is feasible and the project's impact on the environment is acceptable.

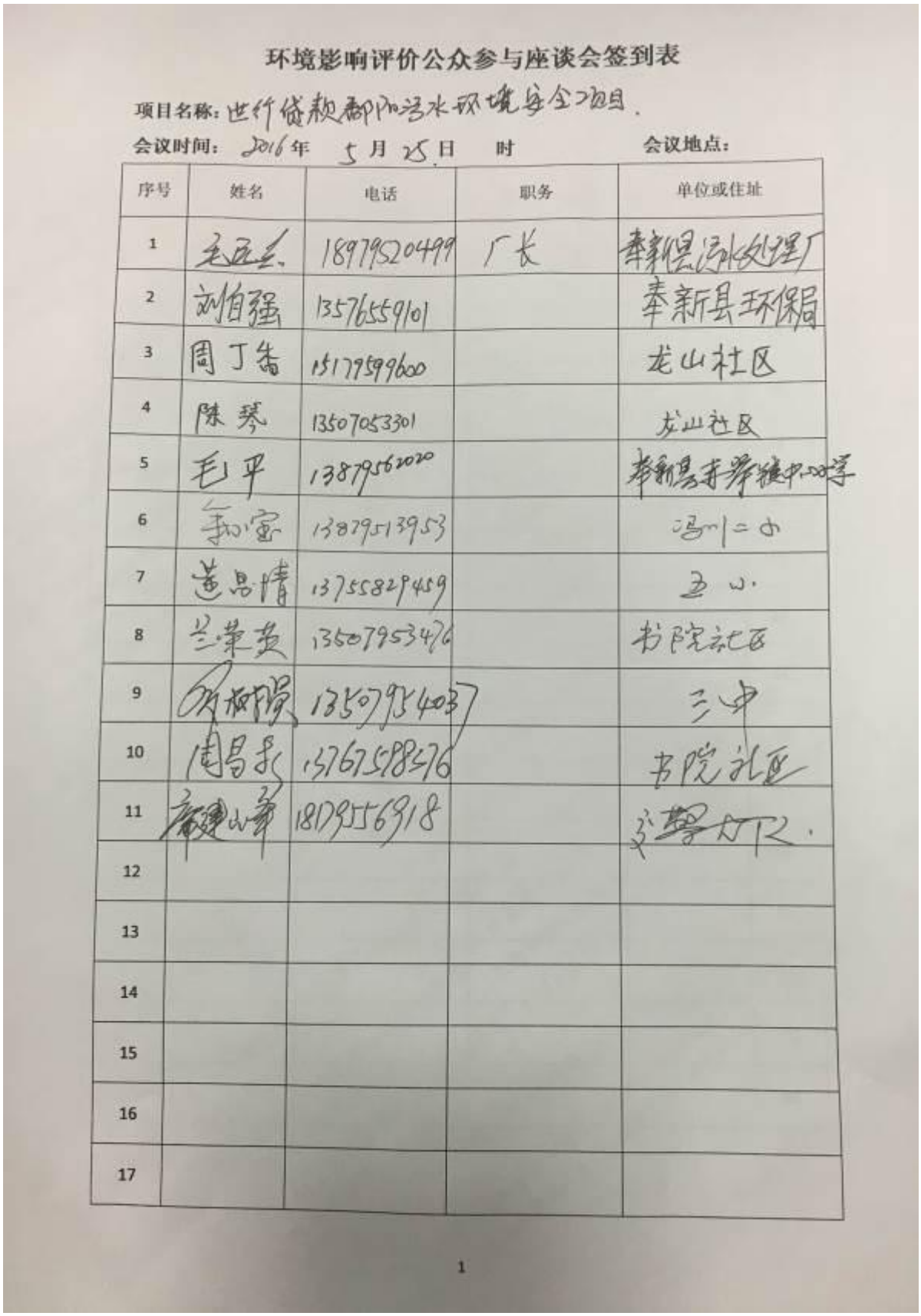
④ Representatives of affected residents and units delivered speeches: The delegates present all expressed support to the project, regarding it as a promoter of people's livelihood and urban development. Also, the environmental protection measures were accepted.

⑤Feedback

Response of the County PMO and EIA institutes: They appreciated understanding and support of the public and would strictly implement all environmental protection measures in the EMP.

⑥Last, the chairperson summarized the content and the meeting was over.

Figure 1 Discussion Meeting Pictures of Fengxin County



环境影响评价公众参与座谈会签到表

项目名称：世行贷款都阳污水环境安全项目

会议时间：2016年 5月 25日 时 会议地点：

序号	姓名	电话	职务	单位或住址
1	毛正兵	18979520499	厂长	奉新县污水处理厂
2	刘伯强	13576559101		奉新县环保局
3	周丁备	15179599600		龙山社区
4	陈琴	13507053301		龙山社区
5	毛平	13879562020		奉新县非公经济中心
6	余和宝	13879513953		冯川小
7	黄昌清	13755829459		五小
8	兰荣发	13507953476		书院社区
9	万柳陵	13507954037		三中
10	周昌彩	15767588576		书院社区
11	熊建华	18179556918		实验小学
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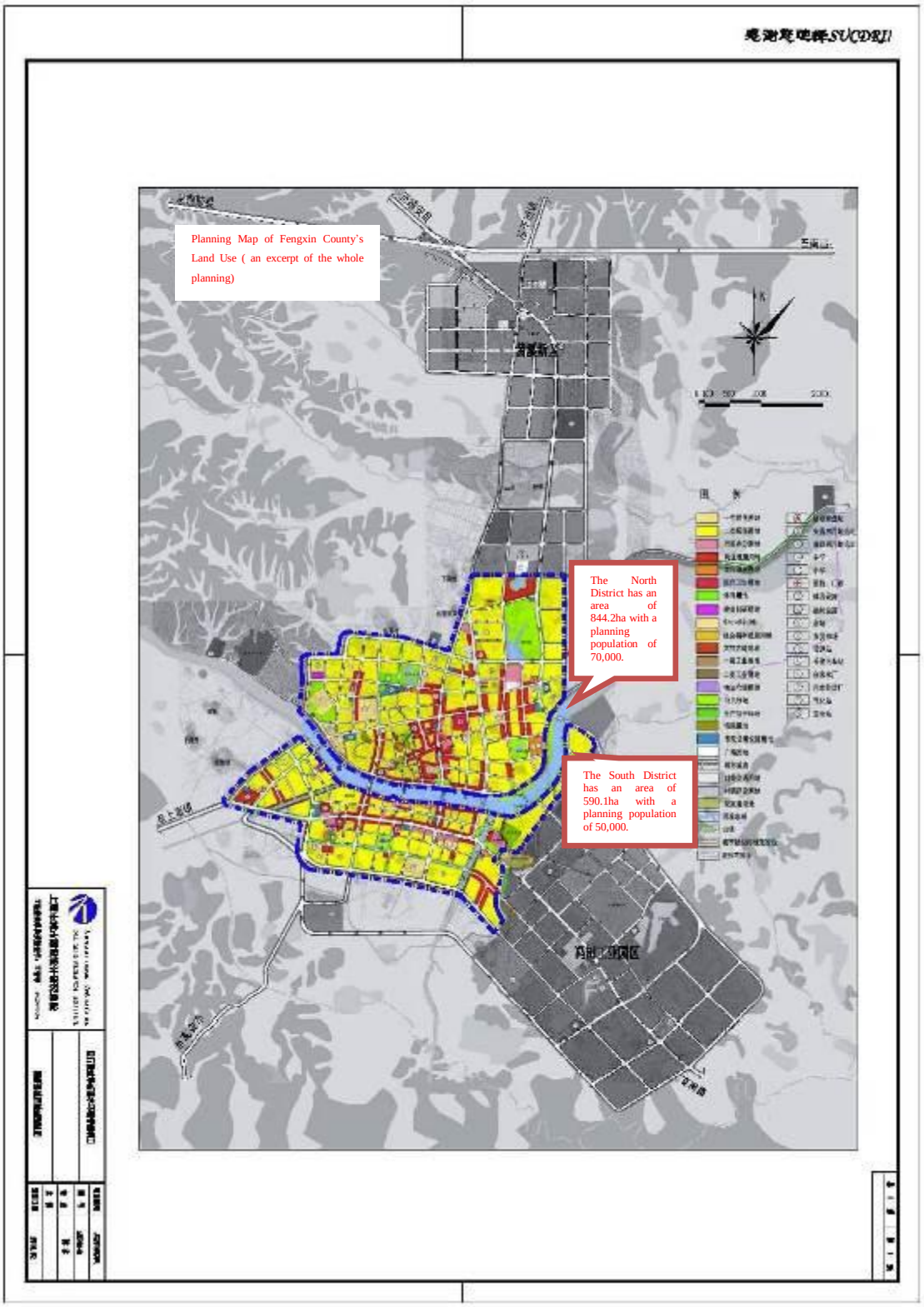
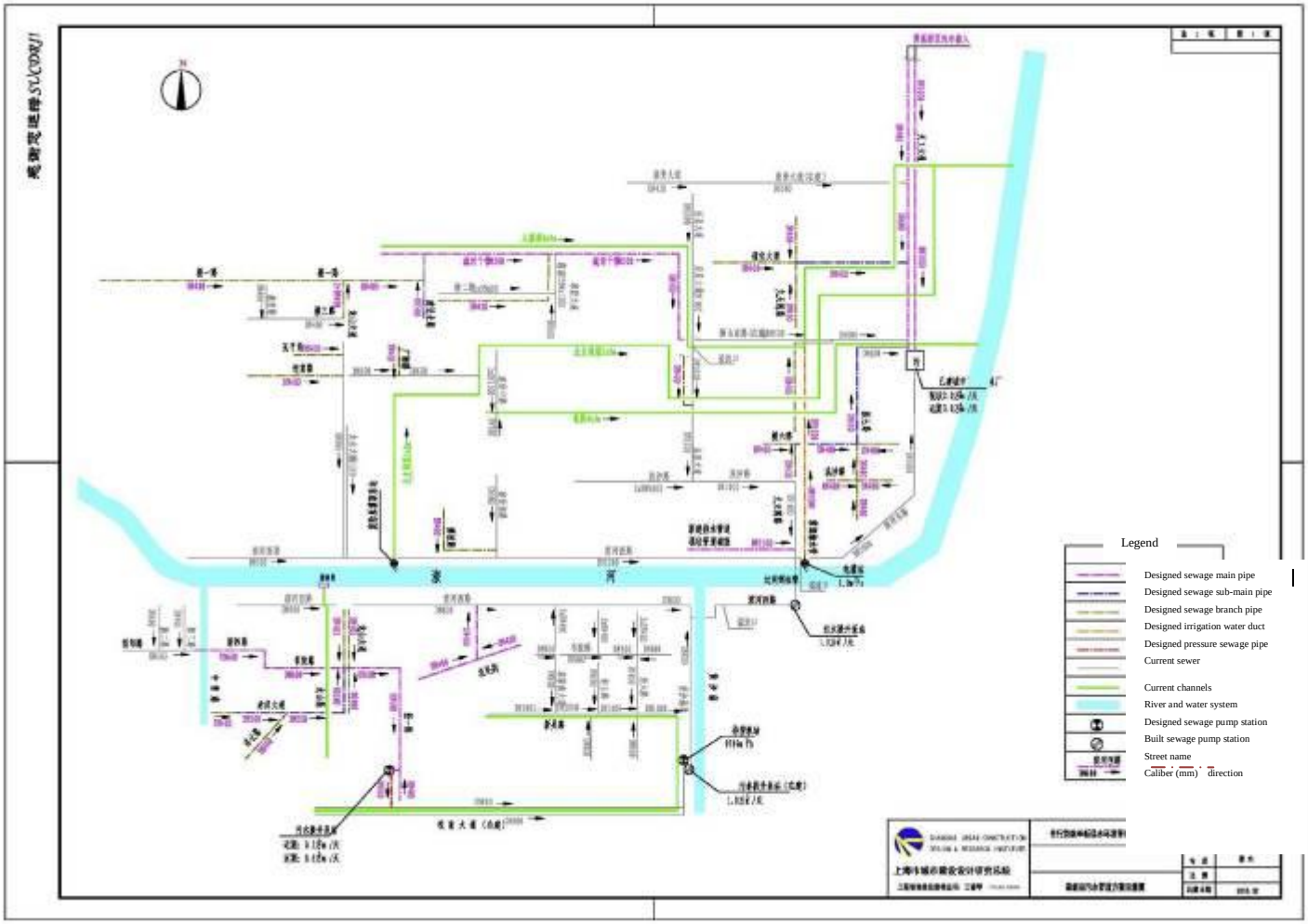
Map 1: Project Geographic Location

Map 2: Current Situation of Fengxin County's Land Use



Map 3: Layout of Sewage Pipe Network



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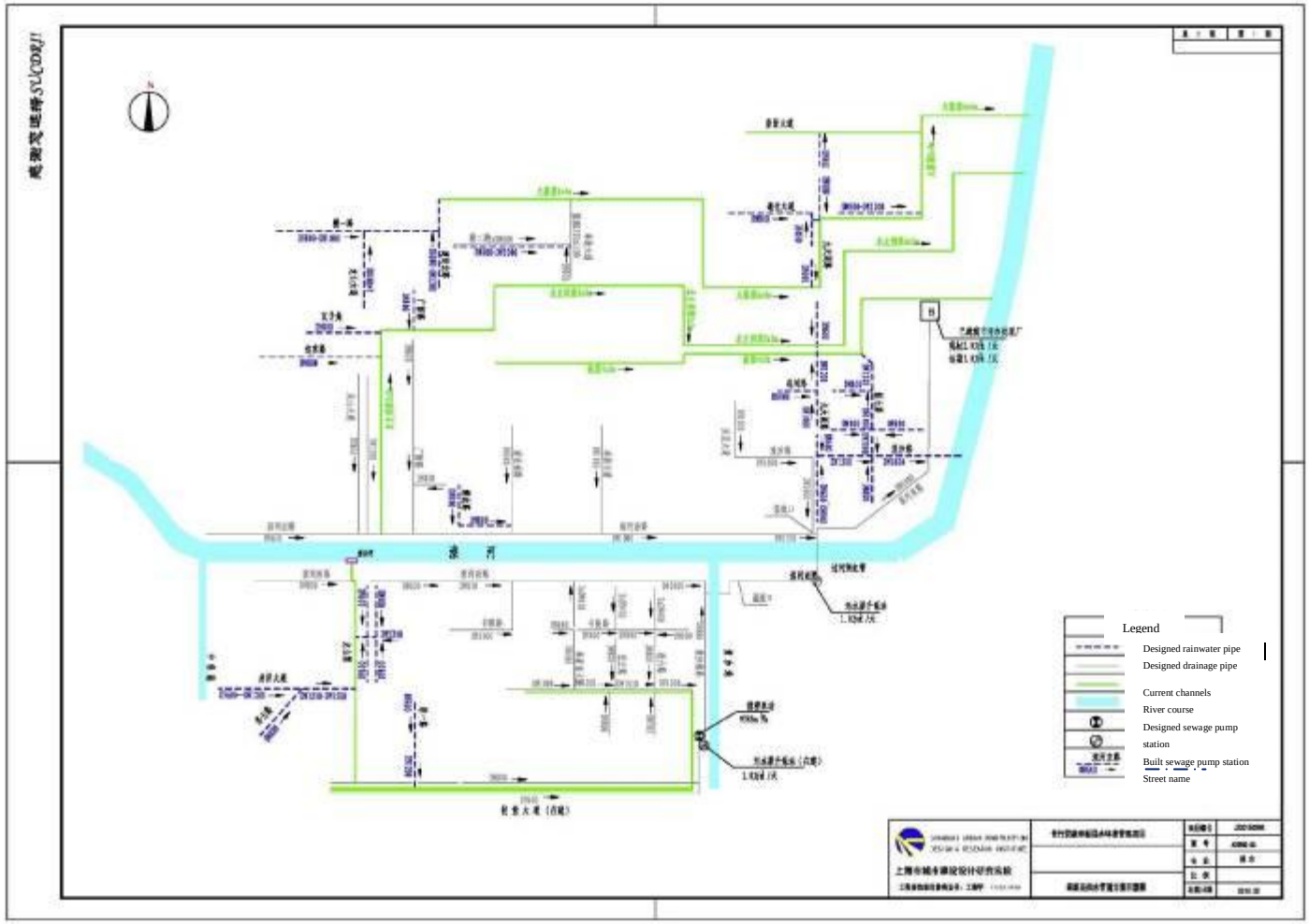
Map 4: Layout of Rainwater Pipe Network



Map 5: Location of Sensitive Points