CHINA
HUAINAN MINING AREA REHABILITATION PROJECT

E4682 v1

Environment Impact Report

Hefei Design Research
Institute for Coal Industry

September, 2014

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Environment Impact Report

Project No.:

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Institute director:

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Hefei Design Research Institute for Coal Industry

September, 2014

建设项目环境影响评价资质证书

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Subcomponent 1

Roadside Dumpsite

Coal Gangue Dumps

Brick Factory Debris

Quarry Gravel Field

Abandoned Coal Mine No.3

Abandoned Coal Mine Shaft No.9

Poor Vegetation Area

Lowland Area

Subcomponent 2

Existing Datong Drainage Channel

Existing Chenxiang Drainage Channel

Existing Jiulonggang Drainage Channel

Existing Sundian Drainage Channel

Pond in Subsidence Area (1)

Pond in Subsidence Area (2)

Existing Jiulonggang Drainage Channel

Pond Formed by Subsidence

Subcomponent 3

Existing Datong Landfill (1)

Existing Datong Landfill (2)

Drainage Channel around the Landfill (1)

Drainage Channel around the Landfill (2)

West Pile of Datong Landfill

East Pile of Datong Landfill

Management Area of Datong Landfill

Access Road to Datong Landfill

Subcomponent 4

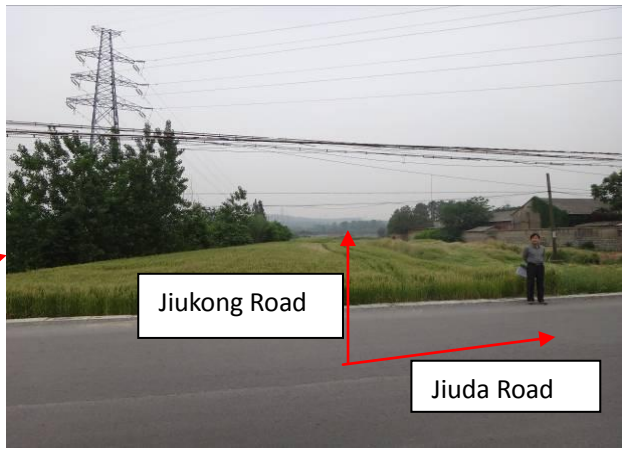
Nanshan Road

206 National Road

Wanxiang Road

Linchang Road

Start of Zhongxing (from Lingchang Road)



Start of Jiukong Road (from Jiuda Road)

Subcomponent 5

Wheat Field in Project Area

Boiler Parts Factory

Nursery Garden (1)

Nursery Garden (2)

Flowers and trees market

Nursery garden

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Introduction

1. Background

Huainan City is located in midstream of Huai River and in the middle part of Anhui Province, which lies between 116°21′21″~117°11′59″ east longitude and 32°32′45″~33°0′24″ northern latitude. Huainan City is a new-type energy base in our country, which was founded in 1950 relying on the mine; it is rich in coal resources, and is one of the major coal bases with coal storage more than 1400 million coal tons in China. However, since 1960s, due to years of continuous coal resources mining, a large area of ground subsidence has occurred; such coal mining subsidence area affects five districts and one county of the whole city, including 27 villages and towns; the total subsidence area is about 204.6 km2, which occupies 7.9% of the whole city's area; and the population affected is about 311,000, which occupies 12.8% of the whole population.

In Huainan, Jiulonggang and Datong mining areas ("Jiuda area" for short) had been exploited since the seventeenth century; the two mining areas were closed in the late 1970s and early 1980s respectively. Due to long-term and large scope exploitation, the subsidence area has reached 387 hm2 by far. At present, the subsidence area of Jiuda area faces severe development issues. The ground subsidence - caused by coal mining has further destroyed rural infrastructure and farmers' houses, affected agricultural production, and polluted ecological environment, and led to poverty of local residents. Moreover, domestic solid waste was dumped into the simple landfill, which occupies land area of 147.8 mu; During the 25 years of service period from 1984 to 2009, the landfill received 1,136,860m3 solid waste. Without seepage-proofing, collection of landfill gas or any other anti-pollution measures, the landfill has polluted air and groundwater in the surrounding area to some extent.

Explicit goals have been put forward in the Twelfth Five-Year Planning Outline for National Economy and Social Development of Huainan City: at the end of the Twelfth Five-Year, a significant progress shall be made for the comprehensive treatment of coal mining subsidence area, gradually forming a coal mining subsidence area comprehensive treatment mode with Huainan characteristics to strive to realize the coal mining subsidence

area comprehensive treatment goals of “life urbanization, production diversification, and ecology reclamation”. Strengthen the comprehensive treatment of coal mining subsidence area, establish ecology compensation mechanism for the damages - to agriculture, ecology and environment by coal mining subsidence and the resources compensation mechanism for resident moving resettlement, training, employment and social security caused by coal mining subsidence, and repair the ecological environment to improve the living environment and living conditions of the local residents.

In order to improve the ecological environment of the subsidence area, build a green link connecting the main urban area from south to north in Huainan and accelerate the construction pace of “Two-oriented city” of Huainan City, the municipal government plans to implement the “Comprehensive Treatment of Coal Mining Subsidence Area in Resource-Based City (Huainan City) as A Sustainable Development Project Loaned from World Bank”. Through ecological environment remediation, this project can increase the green area, prevent the further deterioration of the ecological environment in this area, recover the ecology of the coal mining subsidence area, effectively improve the urban ecology functions and green land area, gradually improve the current situations of abominable ecological and living environment, and form a graceful human settlement where people and nature blend harmoniously, thus providing an example of environmental remediation and exploitation for the resource exhausted mining areas in our country, and becoming a demonstration project of mining city with livable environment.

2. Project Features

Covering an area of 9.3km2, this project is located in Jiulonggang-Datong (“Nine Mining Areas” for short) subsidence area, east urban area of Huainan, and is administered by Datong District. With Shungeng Mountain lying in the south, Linchang Road in the north, Hefei-Fuyang Railway in the east, and the South Huaishun Road to the west, the project area has a width of 0.9~2.0km (north-south), and a length of 8.4km (east-west) with the No.206 national road crossing the subsidence area from north to south.

“Jiuda Coal Mining Subsidence Area” rehabilitation project includes three components: environmental remediation and water management, infrastructure improvement and site utilization and environmental management and technical assistance and capacity building. Environmental remediation and water management and infrastructure improvement and site utilization include five subcomponents*: (1) environmental remediati*on; (2) water stream rehabilitation; (3) -Datong dumpsite closure; (4) urban infrastructure improvement; (5) site utilization for community development. Total project cost RMB1018. 18 million (or $166.92 million), RMB610 million (or $100 million) will be financed by World Bank loan with the remaining RMB408.18 million (or $66.915, 4 million) to be supported by counterpart fund from Huainan City.

3. Environmental Impact Assessment Procedure

This project has been approved to carry out the preparatory work by the NDRC and the Ministry of Finance in the Circular on the Instruction of Using World Bank Loans to the Selected Project Plan in the 2013-2015 Fiscal Year (No. [2208], 2012, FI.NDRC) on July 25, 2012. On August 1, 2013, the Proposal for the Comprehensive Treatment of Coal Mining Subsidence Area in Resource-Based City (Huainan City) as A Sustainable Development Project Loaned from World Bank compiled by Anhui Urban Construction Design Institute was passed after appraisal. By July 10, 2014, Anhui Urban Construction Design Institute has finished the compilation of the Feasibility Study Report for the Comprehensive Treatment of Coal Mining Subsidence Area in Resource-Based City (Huainan City) as A Sustainable Development Project Loaned from World Bank.

The environmental impact assessment must be conducted during the process of project feasibility study according to the relevant provisions in the Environment Protection Law of the People's Republic of China, Environmental Impact Assessment Law of the People's Republic of China and Ordinance on Administration for Environmental Protection of Construction Projects (Decree No.253 of the State Council). The environmental impact assessment of this project is categorized as "A" based on the impact features of this project to the environment, characteristics of the surrounding environment and provisions in the Circular on Strengthening the Management of Environmental Impact Assessment of Construction Project Loaned from International Financial Organizations (HJ [1993] NO. 324) as well as the requirements of OP4.01 Environmental Evaluation of the World Bank Safeguard Policies.

For this reason, the Hefei Design & Research Institute for Coal Industry was entrusted by the executive office of leading group of "The Comprehensive Treatment of Coal Mining Subsidence Area in Resource-Based City (Huainan City) as A Sustainable Development Project Loaned from World Bank" (hereinafter referred to as "Project Management Office")to carry out the environment assessment on May 1, 2013. After accepting this commission, our unit did lots of site surveys, monitored the environmental status by entrusting the environmental protection monitoring station of Huainan City and conducted public participation and field surveys by cooperating with the Program Executive Office. We collected and analyzed the data from site surveys and related materials, and earnestly implemented the principle of "Sanitary Production, Up-to-Standard Release and Total Pollution Load Control" according to guiding principles for environmental evaluation and requirements of related standards. We compiled this environmental impact statement in line with the spirit of "Objectivity, Equity and Standard" and now we submit it to the administrative department of environmental protection for approval.

I would like to express my heartfelt thanks to the strong support and active assistance from the Datong District People's Government of Huainan City, Huainan City environmental protection monitoring station, School of Civil and Hydraulic Engineering of Hefei University of Technology, College of Resource and Environmental Engineering of Anhui University and relevant units and personnel from executive office of World Bank Loan Project of Coal Mining Subsidence Area Comprehensive Treatment of Huainan City during the compilation of this report.

4. The Main Environment Concerns

The project is located in coal mining subsidence area with karst growth in some area which may pose risk of subsidence. Therefore, main focuses of this environmental impact assessment are: the impact of instability of regional geological structure on the surrounding environment and mitigation measures to be adopted from the perspective of environmental protection; the controllability of landfill closure in terms of pollutant discharge; the impact of environmental remediation and water systemrehabilitation on regional ecosystem and landscape environment and associated mitigation measures; the impact of regional environmental improvement on resettlement and social aspect and associated mitigation measures; and attitudes and comments of forestry authority, environmental protection authority, environmental sanitation authority, other relevant authorities and affected people around to project construction.

Environmental impact assessment of this project will focus on pollution of the landfill before and after dumpsite closure, ecological benefits contributed by the proposed project, potential impact of plant diseases and insect pests caused by site utilization and lessons learned from subsidence area rehabilitation.

5. Main Conclusions of the Environmental Impact Assessment

The proposed project is in line with national sector policy and relevant plans. Applicable pollutant discharge standards can be met and extent and scope of environmental impact by pollutant discharge will be insignificant. The public are very supportive to the proposed project with no counterviews. The proposed project positive social, economic and environmental benefits and is feasible from the prospective of environmental impact.

Chapter I General

1.1 Purpose and Principle of Environmental Impact Assessment

1.1.1 Purpose

Environmental status monitoring and field investigations are carried out during this evaluation on the basis of fully utilizing various existing data and we strive to evaluate the impact of this project on the environment comprehensively, objectively and justly. During the evaluation, the possible environmental impact of this project is recognized, screened, predicatively analyzed to mainly analyze its impact on the regional environment during the construction period, the pollution control after -dumpsite closure and traffic noise impact on the environment and to emphatically analyze the environmental benefits brought by the project implementation. Scientific, reasonable, economic and feasible mitigation measures are brought about to the main unavoidable negative environmental impacts with environmental management plan formulated. The feasibility of this project has been proved from the perspective of environmental protection.

The environmental protection measures proposed in the feasibility report shall be analytically demonstrated during the evaluation to provide the basis for the independent evaluation of the World Bank and basis for the decision-making and management of Government Comprehensive Management Department and the Environmental Management Department.

1.1.2 Principle

This evaluation should be carried out under the principle of earnestly implementing the industrial and environmental protection policies of the state and Anhui Province, the World Bank safeguard policies and thoughts of regional sustainable development strategy, and adhere to principles of fairness, justice and publicity to evaluate the influence of the project on various environmental elements objectively and comprehensively.

1.1.3 Guidelines

Analyze if the pollutants emitted by the project can reach the discharge standard according to the design content of the proposed project, the related environmental protection regulations and standards and relevant stipulations, and put forward reasonable, reliable and feasible controlling measures.

Rationally confirm the evaluation scope and monitoring program according to the requirements in Technical Guidelines for Environmental Impact Assessment. Select typical monitoring sites, monitoring factors and prediction models according to project characteristics and the distribution of sensitive spots around to prominently analyze the influence of the instability of regional geological structure to the surrounding environment and mitigation measures that should be adopted from the perspective of environmental protection, analyze the controllability of the closure of dumpsite in project area to the pollutants emission and analyze the influence of environmental remediation and comprehensive improvement of water system on regional ecosystem and landscape environment and the corresponding mitigation measures.

The evaluation shall stick to the principles of “Sanitary Production”, “Up-to-Standard Release”, “Total Pollution Load Control”, “Equal Emphasis on Pollution Control and Ecological Protection” and “Complying with the Environmental Function Division”, and the conclusion should be scientific, objective, impartial and specific.

1.2 Applicable Laws, Regulations and Policies

1.2.1 Environmental Laws, Regulations and Policies

(1) Environmental Protection Law of the People's Republic of China (1989-12-26);

(2) Law of the People's Republic of China on Prevention and Control of Water Pollution (2008-2-28);

(3) Environmental Noise Pollution Prevention Law of the People's Republic of China (1996-11-4);

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

(5) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution Caused by Solid Waste (2005-4-1);

(6) Law of the People's Republic of China on Appraising of Environment Impacts (2002-10);

(7) Law of the People's Republic of China on Water and Soil Conservation (2010-12);

(8) Law of the People's Republic of China on Protection of Cultural Relics (2007-12);

(9) Urban and Rural Planning Law of the People's Republic of China (2007-10-28);

(10) Land Administration Law of the People's Republic of China (1999-1-1);

(11) Law of the People's Republic of China on the Protection of Wildlife (1988-11);

(12) Implementing Regulations of Law of the People's Republic of China on the Protection of Wildlife (1992-3);

(13) Regulations on the Prevention of Geological Disasters (State Council Order No. 394);

(14) Notice on Strengthening Ecological Protection Work of the Wetland (2004-6);

(15) State Council Order No.253, the People's Republic of China: Regulations on the Administration of Construction Project Environmental Protection (1998-11-29);

(16) Anhui Provincial People's Congress: Environmental Protection Regulations of Anhui Province (effective date: 2010-11-1);

(17) Anhui Provincial People's Congress: Prevention and Control Regulations of Water Pollution in Huaihe River Basin of Anhui Province (2006-6);

(18) State Council Order No. 183: Provisional Prevention and Control Regulations of Water Pollution of Huaihe River Basin (1995-8);

(19) Preparation Outline of the 12th Five Year Plan for Prevention and Control of Water Pollution in Huaihe River Basin of Anhui Province (2011-1);

(20) Anhui Provincial People's Congress: Mine Geological Environmental Protection Regulations of Anhui Province (2007-6-23).

1.2.2 Regulations of Relevant Authorities

(1) State Council Order No.31 [1996]: Decision on Several Issues of Environmental Protection (1996-8);

(2) State Council Order No.39 [2005]: Decision of the State Council on the Implementation of Scientific Outlook on Development and Strengthening Environmental Protection (2005-12);

(3) State Council Order No.38 [2000]: Outline of the National Environmental Protection (November 26, 2000);

(4) State Council Order No.50 [2004]: Circular Concerning Strengthening the Wetland Protection Management (June 5, 2004);

(5) National Development and Reform Commission Order No.9 [2011]: Guidance Catalogue of the Industrial Structure Adjustment (2011 Edition) (Amendment) (2013-2);

(6) Formal National Environmental Protection Bureau, State Development Planning Commission, Ministry of Finance and People's Bank of China, HJ [2011] No.324: Circular Concerning Strengthen the Management of Environmental Impact Assessment of Construction Project Loans from International Financial Organizations (1993-6);

(7) National Development and Reform Commission No.306, [2008], FI.NDRC: Circular of NDRC Concerning Further Strengthening the Management of Project Loans from International Financial Organizations (2008-5);

(8) National Development and Reform Commission No.408, [2006], FI.NDRC: Circular Concerning Related Matters of Managing the Project Confirming Orders for Loans from the International Financial Organizations and Foreign Government (2006-3);

(9) National Development and Reform Commission No.1126, [2004], FI.NDRC: Circular of NDRC Concerning Accelerating the Development of Coal Mining Subsidence Area Treatment (2007-7);

(10) Former State Bureau of Environmental Protection HF [1999] No.107: Circular Concerning Related Matters of Implementing the Environmental Impact Assessment System of Construction Project (1999-4);

(11) Former State Bureau of Environmental Protection HF [2006] No. 28: Circular on Issuing the “Temporary Act Concerning the Public in Environmental Impact Assessment” (2006-2);

(12) Ministry of Environmental Protection HF [2012] No.77: Circular Concerning Further Strengthening the Management of Environmental Impact Assessment to Prevent the Environmental Risk (2012-7);

(13) Ministry of Environmental Protection HF [2012] No.98: Circular on Conscientiously Strengthening Risk Prevention and Strictly Managing the Environmental Impact Assessment (2012-8);

(14) Ministry of Environmental Protection Decree No.2: Administration of Construction Project Environmental Impact Assessment by Means of Classification Catalogue (2008-9);

(15) People's government of Anhui Province (Anhui Government No. 89 [2013]: Circular on Issuing the Implementation Plan of Atmospheric Pollution Prevention and Control Action (2014-4) ;

(16) Former Environmental Protection Agency of Anhui Province HJ [2002] No.46: Several Opinions on Further Improving the Quality of Environmental Impact Evaluation (April 10, 2002);

(17) Former Environmental Protection Agency of Anhui Province HP [2012] No.113: Circular on Issuing “Rules on Normalized Compilation of the Construction Project Environmental Impact Statement (Trial)” (June 16, 2006);

(18) Department of Environmental Protection of Anhui Province HJH [2012] No.329: Circular on Issuing “Measures for the Implementation of the Pilot Work of Construction Project Environmental Supervision” (2012-4);

(19) Office Documents of Huainan Municipal People's Government HFB [2011] No.102: Opinions on House Expropriation Compensation of State-owned Land of Huainan City;

(20) The 16th meeting of the Standing Committee of 14th Session of Huainan’s People's Congress (February 25, 2010) Shungeng Mountain Scenic Area Management Regulations of Huainan City;

1.2.3 Technical Guidelines

(1)Technical Guidelines for Environmental Impact Assessment---General Principles HJ2.1-2011;

(2)Technical Guidelines for Environmental Impact Assessment---Atmospheric Environment HJ2.2-2008;

(3)Technical Guidelines for Environmental Impact Assessment---Water Environment HJ/T2.3-93;

(4) Technical Guidelines for Environmental Impact Assessment---Acoustic Environment HJ2.4-2009;

(5)Technical Guidelines for Environmental Impact Assessment---Ecological impact HJ19-2011;

(6)Technical Guidelines for Environmental Impact Assessment---Groundwater Environment HJ610-2011;

(7) Technical Guidelines for Environmental Risk Assessment on Projects HJ/T169-2004;

(8)Technical Specifications of Eco-environmental Protection and Reclamation for Mining HJ651-2013;

(9)Technical Guideline for Assessment on Environmental Risk of Alien Species HJ624-2011;

(10)Guideline for Eco-Environmental Biosafety Assessment of Insect-resistant Transgenic Plants HJ625-2011;

(11) Technical Guideline on Environmental Safety Application of Pesticides HJ556-2010

1.2.4 World Bank Safeguard Policies

(1) World Bank OP/BP4.01 and its appendix (Environmental Assessment);

(2) World Bank OP/BP4.04 (Natural Habitat);

(3) World Bank OP/BP4.11 (Cultural Relic);

(4) World Bank OP4.09 (Pest Management);

(5) World Bank OP/BP4.12 (Involuntary Resettlement);

(6) World Bank GP4.07 (Water Resource Management);

(7) World Bank OP/BP4.36 (Forestry);

(8) World Bank BP17.50 (Policy of Information Disclosure);

(9) Suggestions for Classification of Pesticides Enacted According to the Harmfulness and Manual of Classification (Geneva, WHO).

1.2.5 Evaluation Planning and Standards/Codes

(1)Technical Regulation on Water and Soil Conservation Plan of Development and Construction Project SL204-98;

(2) Code for Classification of Urban Land Use and Planning Standards of Development Land GB50137-2011;

(3) Code for Design of Urban Road Engineering CJJ37-2012;

(4) Planning and Design of Urban Road Traffic GB50220-95;

(5)Project Construction Standards for the Closure of Municipal Solid Waste Landfill Building standard 140-2010;

(6) Technical Code for Municipal Solid Waste Sanitary Landfill Closure CJJ 112-2007;

(7) Standard for Pollution Control on the Landfill Site of Municipal Solid Waste GB 16889-2008;

(8) Technical Code for Municipal Solid Waste Sanitary Landfill CJJ 17-2004;

(9) Technical Code for Liner System of Municipal Solid Waste Landfill CJJ 113-2007;

(10) Technical Code for Projects of Landfill Gas Collection Treatment and Utilization CJJ 133-2009;

(11)Technical Criterion for Eco-environmental Status Evaluation (Trial) HJ/T192-2006;

(12) Planning of Ecological Urban Construction of Huainan City (2005-2020);

(13) Urban Green Space System Planning of Huainan City (2002-2010);

(14) Scenic Area Planning of Shungeng Mountain in Huainan City of Anhui Province (2009-2020);

(15) Construction Planning of Huainan Eco-city (April, 2006);

(16) The Twelfth Five-Year Plan for National Economic and Social Development of Huainan City (August, 2011);

(17) Urban Master Planning of Huainan City (2010-2020);

(18) Planning of Historical Buildings Preservation of Huainan city (Purple Line);

(19) Immediate Plan of Huainan City (2011-2015);

(20)The Twelfth Five-Year Plan for National Economic and Social Development of Huainan City;

(21)The Overall Renovation Plan of World Bank Project Area of Huainan City (2013-2020);

(22) Comprehensive Treatment Planning for Coal Mining Subsidence Area in Six Cities of North of Anhui Province (2012-2020)

(23) Ecological Management Planning for Coal Mining Subsidence Area in the West of Huainan City (2010-2025);

(24) Comprehensive Treatment Planning for Lands in the Coal Mining Subsidence Area of Huainan City (2009-2020);

(25) Urban Flood Control Planning of Huainan City (1995-2010);

(26) Specialized planning for drainage of flooded districts in Huainan City (2012-2020).

1.2.6 Relevant Documents and Materials

(1) Urban Construction Design and Research Institute: Project Feasibility Study Report for the Comprehensive Treatment of Coal Mining Subsidence Area of Resource-Based City (Huainan City) as A Sustainable Development Project Loaned from World Bank (2014-7);

(2) Authorization letter designed by Program Executive Office of the Comprehensive Treatment of Huainan Coal Mining Subsidence Area Loaned from World Bank (May, 2013);

(3) National Development and Reform Commission and Ministry of Finance: Circular Concerning the Planning of Selected Projects in 2013-2015 Fiscal Year Using the World Bank Loan (FGWZ [2012] No. 2208);

(4) Huainan City Environmental Protection Agency: Reply Letter to the Executive Standard for Environmental Impact Assessment of the Comprehensive Treatment of Coal Mining Subsidence Area of Resource-Based City (Huainan City) as A Sustainable Development Project Loaned from World Bank (Letter from Huainan Environmental Protection Agency [2013] No.142);

(5) Documents from Huainan City Cultural Relic Administration: Opinions of Primary Examinations on the Heritage Conservation of the Comprehensive Treatment Project of Coal Mining Subsidence Area from Jiulonggang to Datong in the East of Huainan City (Huainan City Cultural Relic Administration [2013] No.11);

1.3 Applicable Standards

According to the standard confirmation letters of Huainan Environmental Protection Agency, the environmental quality standards and pollution discharge standards performed in this evaluation are as follows:

1.3.1 Environmental Quality Standards

(1) Regional environmental air quality shall follow the secondary standard of Ambient Air Quality Standard (GB3095-1996) and its remediation lists; ammonia and sulfuretted hydrogen shall refer to the maximum acceptable concentration of residential area stated in Hygienic Standards for the Design of Industrial Enterprises (TJ36-79); methyl mercaptan shall follow Hygienic Standard for Methylmercaptan in Air of Residential Area (GB 18056-2000);

(2)Environmental quality standard for surface water in Huainan part of Huaihe River and Gaotang Lake shall follow the tertiary standard of Environmental Quality Standard for Surface Water (GB3838-2002);

(3)The acoustic environment of project area shall follow the secondary standard of Acoustic Environment Quality Standards (GB3096-2008), and both sides of road traffic area shall follow the standard of Class 4a in Acoustic Environment Quality Standards (GB3096-2008);

(4)Soils and sediments in the project area shall follow the secondary standard of Soil Environmental Quality Standard (GB15618-1995);

(5)The underground water shall follow the tertiary standard of Underground Water Quality Standard (GB/T14848-93).

Please see Table 1.3-1 for the standard values of environmental quality evaluation.

1.3.2 Pollutant Discharge Standards

(1)Air pollutants emission shall follow the secondary standard of Comprehensive Emission Standard of Air Pollutants (GB16297-1996) and the monitoring concentration threshold of fugitive emission; Odor gas emission of dumpsites shall follow the secondary standard of Emission Standard for Odor Pollutants; landfill exhaust gas of dumpsites shall follow emission concentration limits of gas boiler in Table 2 of Emission Standard of Air Pollutants for Coal-Burning Boilers (GB13271-2014).

(2)The sewage discharge shall follow the tertiary standard of Integrated Wastewater Discharge Standard (GB8978-1996) and the takeover standard of the first sewage treatment plant of Huainan City; leachate from municipal solid waste landfill shall follow the standard in Table 2 of Standard for Pollution Control on the Landfill Site for Domestic Waste and shall be emitted to the municipal waste water pipe.

(3) The noise during construction shall follow Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011); community noise during operation shall follow the secondary standard of Emission Standard for Community Noise (GB22337-2008);

(4) Sediment shall follow the Standard for Pollution on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001). Please see Table 1.3-2 for standard values of pollutant emission.

Table1.3-1 Environmental Quality Standards (Excerpt)

Environmental	Standard	Parameter	Limit

elements			Unit	Values	
Ambient air	Ambient Air Quality Standard (GB3095-1996) Class 2	SO2	mg/m3	Daily average	0.15
				Hourly average	0.50
		NO2	mg/m3	Daily average	0.12
				Hourly average	0.24
		TSP	mg/m3	Daily average	0.30
		PM10	mg/m3	Daily average	0.15
	Hygienic standard for the design of industrial enterprises (TJ36—79) Maximum allowable concentration of hazardous substance in residential area	Ammonia	mg/m3	Once	0.2
		Sulfuretted hydrogen	mg/m3	Once	0.01
	Hygienic standard for methyl mercaptan in Hygienic Standard for Methyl Mercaptan in Residential Area (GB18056-2000)	Methyl mercaptan	mg/m3	Momentary maximum allowable concentration	0.0007
Surface Water	Environmental Quality Standards for Surface Water (GB3838-2002), Category V	pH	---	6～9	
		DO	mg/L	≥2.0	
		COD	mg/L	≤40	
		BOD5	mg/L	≤10	
		NH3-N	mg/L	≤ 2.0	
		TP	mg/L	≤0.4 (lake and reservoir 0.2)	
		TN	mg/L	≤2.0	
		Arsenic	mg/L	≤0.1	
		Total Lead	mg/L	≤0.1	
		Hexavalent Chromium	mg/L	≤0.1	
		Total Cadmium	mg/L	≤0.01	
		Sulfide	mg/L	≤1.0	
Groundwater	Quality Standard for Ground Water (GB/T14848-93), Category III	Parameter and Unit		Category III	
		pH	---	6.5～8.5	
		Total hardness	mg/L	≤450	
		Chromacity	Degree	≤15	
		Total dissolved solids	mg/L	≤1000	
		Permanganate index	mg/L	≤3.0	
		Ammonia nitrogen	mg/L	≤0.2	
		Volatile phenol	mg/L	≤0.002	
		Chloride	mg/L	≤250	
		Chromium (sexavalence)	mg/L	≤0.05	
		Fluoride	mg/L	≤1.0	
		Sulfate	mg/L	≤250	
		Nitrate	mg/L	≤20	

		Nitrite	mg/L	≤0.02		
		Copper	mg/L	≤1.0		
		Zinc	mg/L	≤1.0		
		Arsenic	mg/L	≤0.05		
		Mercury	mg/L	≤0.001		
		Lead	mg/L	≤0.05		
		Cadmium	mg/L	≤0.01		
		Selenium	mg/L	≤0.001		
		Nickel	mg/L	≤0.05		
		Total bacterial count	number/L	≤100		
		Total coliform group	number/L	≤3.0		
Acoustic Environment	Environmental Quality Standard for Noise (GB3096-2008)	Parameter and Unit		Area	Daytime	Night
		Equivalent sound level	dB(A)	Area of class 2	60	50
		Equivalent sound level	dB(A)	Area of class 4a	70	55
Soil and Sediment	Environmental Quality Standard for Soil (GB15618-1995) Class 2	Parameter	Unit	PH›7.5	6.5—7.5	
		Arsenic	mg/kg	≤25	≤20	
		Mercury	mg/kg	≤1.0	≤0.5	
		Lead	mg/kg	≤350	≤300	
		Copper	mg/kg	≤100	≤100	
		Chromium	mg/kg	≤250	≤200	
		Cadmium	mg/kg	≤0.60	≤0.30	
		Nickel	mg/kg	≤60	≤50	
		Hexachloro-cyclohexane soprocide	mg/kg	≤0.5	≤0.5	
		DDT	mg/kg	≤0.5	≤0.5	
		Lead	mg/kg	≤350	≤300	
		Zinc	mg/kg	≤300	≤250	

Table1.3-2 Pollutant Discharge Standards (Excerpt)

Type	Standard name and level	Pollutants	Standard Limits	
			Unit	Values
Waste Gas	Emission Standards for Odor Pollutants (GB14554-93) Standards for reconstruction and expansion, Class 2	Ammonia	mg/m3	1.5
		Sulfuretted hydrogen	mg/m3	0.06
		Methyl mercaptan	mg/m3	0.007
		Odor concentration	Dimensionless	20
	Emission Standard of Air Pollutants (GB16297-1996)	Pollutants	Standard Limits	
		Sulfur dioxide	mg/m3	0.4
		Nitric oxide	mg/m3	0.12
		PM	mg/m3	1.0
	Pollutant Emission Standard for Gas-Fired Boiler (GB13271-2014)	Sulfur Dioxide	mg/m3	50
		Nitric Oxide	mg/m3	200
		PM	mg/m3	20
Waste water	Integrated Wastewater Discharge Standard (GB8978—1996) Class 3	pH	Dimensionless	6～9
		COD	mg/L	500
		BOD5	mg/L	300
		SS	mg/L	---
		NH3-N	mg/L	---
	Standard for Discharge into Sewer Networks in Service	COD	mg/L	400
		BOD5	mg/L	170

	Area of Huainan WWTP No.1	SS	mg/L	200	
		NH3-N	mg/L	30	
	Pollution Control Standard for Domestic Solid Waste Landfill (GB16889-2008) Table 2	pH	Dimensionless		
		Chromacity	Degree	40	
		COD	mg/L	100	
		BOD5	mg/L	30	
		Ammonia nitrogen	mg/L	25	
		Hexavalent chromium	mg/L	0.05	
		Total phosphorus	mg/L	3	
		Total nitrogen	mg/L	40	
		Total chromium	mg/L	0.1	
		Arsenic	mg/L	0.1	
		Mercury	mg/L	0.001	
		Lead	mg/L	0.1	
		Cadmium	mg/L	0.01	
		Number of fecal coliform	number/L	10000	
Noise	Emission Standard of Environment Noise at Boundary of Construction Site (GB12523-2011)	Noise Level at Site Boundary	Period	Daytime	Night
			dB(A)	70	50
	Emission Standard for Community Noise (GB22337-2008) Class 2	Noise Level at Site Boundary	Period	Daytime	Night
			dB(A)	60	50

1.4 Focus of the EIA

The project area is part of coal mining subsidence area with karst growth in some area which may pose risk of subsidence. Therefore, main focuses of this environmental impact assessment are: the impact of instability of regional geological structure on the surrounding environment and mitigation measures to be adopted from the perspective of environmental protection; the controllability of closure of dumpsite in - the project area on the emission of pollutants; the impact of environmental remediation and -water stream rehabilitation on the regional ecosystem and landscape environment and its mitigation measures; the impact of regional environmental governance on the project area immigrants and social environment and its mitigation measures; and attitudes and opinions of forestry authority, environmental protection authority, environmental sanitation authority, other relevant authorities and affected people around to the project construction.

This environmental impact assessment shall focus on pollution before and after landfill closure, ecological benefits contributed by the proposed project, impact of plant diseases and insect pests caused by site utilization and lessons learned from subsidence area rehabilitation.

1.5 Evaluation Period

As a non-contaminating ecological project, the implementation of this project shall contribute to improving regional environment, and the influence of the project on the external environment mainly focuses on the construction period, which should be the emphasis of the evaluation; the emphasis of the project during operation shall be laid on the improvement of the ecological environment and regional social environment, the impact of road traffic noise on the regional acoustic environment and the pollution control measures to the dumpsite.

1.6 Working Procedure of the Evaluation

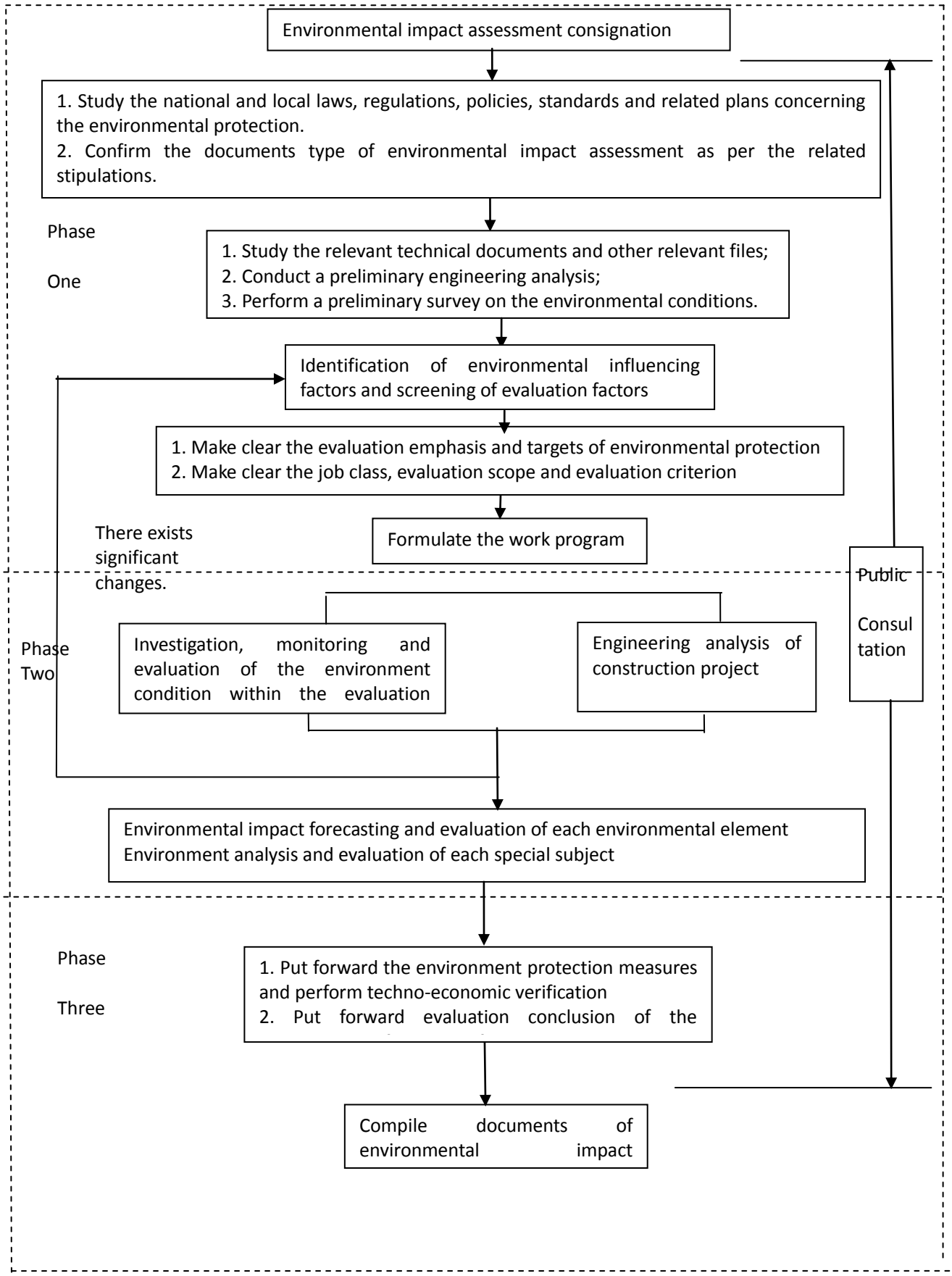


Figure 1.6-1 Technology Roadmap of the Environmental Impact Assessment

Chapter II Project Overview

2.1 Significance of Project Construction

1. Implement national policies and achieve targets of the 12th five-year plan

Notice of the National Development and Reform Commission on Speeding up the Treatment of Coal Mining Subsidence Area requests clearly coal mining cities to speed up the treatment of the coal mining subsidence area. The Twelfth Five-Year Planning Outline for National Economy and Social Development of Huainan City points out to strengthen the comprehensive treatment of coal mining subsidence area, adhere to the comprehensice treatment ideas of “centralized relocation, developed resettlement and exploited treatment”, gradually form a coal mining subsidence area comprehensive treatment mode with Huainan characteristics and strive to realize the coal mining subsidence area comprehensive treatment goals of “life urbanization, production diversification, and ecology reclamation”. Strengthening environmental protection and management and promoting ecological sustainable development are put forword in the requirements of “speeding up the transformation of development mode and building comprehensively two types of cities”.

Huainan Jiulonggang-Datong subsidence area is the key rehabilitation region. The project will take measures like digging deep, padding shallow, backfilling and repairing slope, and restore the water subsidence area into green scenic area. The implementation of this project is to carry out relevant national policies, improve the regional ecological environment and make residents’ living environment more beautiful in the project area. It can add more jobs, alleviate the employment pressure, improve the regional traffic conditions in Huainan City and optimize the city’s water supply and drainage pipe system.

2. Mining Cities’ Sustainable Development Strategy

Huainan is an important mining city in Anhui Province. It has become a top priority in Huainan City strategic planning that how to keep pace with times and turn “resource-exhausted city” into “ecological, sustainable and circular economic type of city” to realize the regional sustainable development.

Therefore, the ecological environment -remediation of the subsidence area focuses on protecting the ecological environment and achieving the comprehensive benefits. We should restore the ecological environment according to the ecological general ideas of building the subsidence area into a virtuous cycle. It will bring new opportunities for the industrial transformation and sustainable development and inject new impetus to the sustainable development of Huainan City.

3.Avoid the continued deterioration of the environment and improve environmental benefits

Datong old dumpsite causes environmental degradation and surface water pollution since use, affecting seriously the use of the local community and land. It isn’t closed until 2011 although the villagers have lots of complaints. Only part of it is covered with soil currently. If unchecked, left it alone, the environment deterioration will accelerate in the coal mining subsidence area and the surrounding area.

The implementation of this project will improve the regional ecological environment and solve the problems of regional dirty, disorder, poor, sewage crosscurrent and deterioration of water quality, creating the project area into the highlights of Huainan ecological beautiful environment and doing contributions to building Huainan into a landscape garden city and environment friendly city. It has great significance in improving residents living, working and leisure environment, improving the landscape in the surroundings of the exhausted area, creating livable city environment, and expanding the city development and improving city development taste.

4.Achieve the combination of ecological -remediation with limited development

This project will bring forth ideas of comprehensive treatment in the coal mining subsidence area, combine ecological -remediation with development in the subsidence area, and combine developing production with residents' employment and entrepreneurship. By comprehensive treatment in the subsidence area, it can reduce - risks of public security, flood control and geomorphic subsidence etc. What's more, it can provide good living environment, production conditions and more job opportunities for the residents in the subsidence area, increase their income and make them live happily. Conservation and reuse of the subsidence land and water can tap production potential of mining subsidence land resources. On one hand, we should ensure environmental ecological benefits, on the other hand, we should plan unified and treat comprehensively. According to the principle of "combining ecological remediation with industrial development", we should restore the damaged ecological environment, rehabilitate the degraded ecosystem and improve synchronously the social, economic and ecological benefits.

In conclusion, by the implementation of this project, it can change the ecological environment in the coal mining subsidence area, solve the residents' employment in the subsidence area and the surroundings, increase their income, adjust measures to local conditions to build and restore livable environment and explore a new development model for the economic transformation of resource-based city and sustainable development. The implementation of the project will have certain significance for industrial transformation of resources city and sustainable development.

2.2 Management experience

The coal seams are multiple, and the sinking is deep and the steady time is long in Huainan Panxie mining area. Huainan mining group is also active in the subsidence area treatment project. The specific work is as follows:

Use coal gangue to backfill the mining steady sinking area, and then reclaim it into agricultural land and industrial land. Since 2004, we implement the coal gangue backfilling reclamation project in Xinzhuangzi, Panyi and Zhangji mine three mining steady sinking areas. We invest RMB 47 million, reclaim 1.2 sq. km. subsidence area and use as agricultural land and industrial land. Some of the reclamation land is used as construction land of Xinhuai Factory, so it alleviates greatly the contradiction between factory land and cultivated land protection. We use the reclaimed land in Xinzhuangzi mine and Panyi mine to implement mining area green engineering, invest 20 million Yuan, plant thousands of trees and effectively improve the regional ecological environment.

(1) Don't fill the unsteady sinking area and manage and use in stages. For the area that the sinking isn't deep and the water isn't much, we adopt the methods of taking drainage, repairing irrigation and drainage systems and improving planting conditions to continue agricultural production. Take the method of sewer drainage to treat the subsidence area with the characteristics of easy reclamation, less investment, quick effect -without changing the original land use. Currently we use the above method to treat most of the unsteady sinking areas and then still plant on them. For the perennial water subsidence area, first clean the bottom of the pool, then develop aquaculture, adjust the industrial structure and turn the area into a benefit.

(2) Adopt engineering methods to reinforce or reconstruct the roads, drainages, bridges, dams and so on in the subsidence area. Huainan Mining invests special project funds each year to maintain and reinforce the damaged railways, roads, bridges and drainage systems in the subsidence area. We totally invest 140 million Yuan since 2004, which ensures the safety of the mine production and, on the other hand, guarantees the residents' normal production and living in the subsidence area.

2.3 Project Overview

This project covers an area of 9.3km2, which is located in the Jiulonggang-Datong (Jiuda) subsidence area, and is administered by Datong District. Shungeng Mountain lies in the south of this area, in the north, Linchang Road is connected to the old city; Hefei-Fuyang Railway lies in the east, and the South Huaishun Road in the west; it has a width of 0.9~2.0km (north-south), and a length of 8.4km (east-west).

Name of the Project: World Bank Funded Coal Mining Subsidence Area Rehabilitation

Project Location: Jiulonggang- Datong subsidence area in Huainan City, Anhui Province;

Project Management Agency: WB Funded Coal Mining Subsidence Area Rehabilitation Project Executing Office

Project Implementation Agency: Huainan City Agricultural and Water Investment Company Ltd.

2.4 Project Features

This project includes three components, i.e. environmental remediation and water management, infrastructure improvement and site utilization, project management and technical assitance, among which project management and technical -assitance is consulting service. This EIA only covers physical components. The first two components include five subcomponents: (1) environmental remediation; (2) water stream rehabilitation; (3) closure of Datong old dumpsite; (4) urban infrastructure improvement; and (5) site utilization for community development. See Table 2.4-1 for the project subcomponents.

图2.2-1 项目区地理位置图

Figure 2.2-1 Project Location Map

Table 2.4-1 List of project Subcomponents

No.	Subcomponent		Description
1	Environmental Remediation	Greening	Totally 411.91hm2, of which, 12.27 hm2 of stone sloping field remediation; 10.92 hm2 of closed waste yard -remediation; 28.26 hm2 of refuse stock dumpsite remediation; 31.95 hm2 of thick soil layer lowland remediation; 220.84 hm2 of thick soil layer sloping field remediation; 69.73 hm2 of low efficiency forest land remediation; 37.94 hm2 of ordinary forest land maintains the current situation.
		Greenway	Total length of greenway network is 16.4km, with a width of 3.5~4.5m; the total building area of #1, #4 and #5 stages is 90 m2.
2	Water Stream Rehabilitation		The length of streams for dredging and embankment is 7,740m, quantity of sediment to be dredged is 7,680 m3, the excavation volume is 591,600 m3, and the filling volume is 429,100 m3. The current water surface area is

			0.508km2 and the water surface area after rehabilitation will be 0.56 km2.
			Ecological embankment: 15197m, 137622m2.
			Water retention structures: two overflow weirs, one is 15m long and 10m wide; the othe is 16m long and 10.5m wide.
3	Closure of Datong old dumpsite	Main Works	The total covered area of the current waste heap in the Datong old dumpsite is 98,542m2, and the classification of closure engineering construction scale is Class III.
			Dump pile shaping: turn-over of 137,846m3 solid waste.
			Retaining wall around the dump pile. Elevation is 38m and 37m in the west and east respectively. The width of the wall top is 6m, the maximum height is 3m and the centerline length is 1470m.
			Dumpsite seepage-proof. 19110m2 of seepage prevention curtain is laid.
			Landfill leachate collection: 1,413m of collecting pipes, 613m of conveying pipes, 21 connecting wells, 3 collecting wells and 400m3 of storage tank, and 2 leachate transportation trucks.
			Landfill gas collection and flaring system. 2,993m of gas pipes are laid, 53 gas guiding gabions, 6 gas -collecting stations, and 1 set of air exhaust and burning flare system with the handling capacity of 300Nm3/h are set.
			Rainwater draining system: 3,140m of drainage channel, 1,456m of cover plate, and 2 water outlets.
			Landfill capping. Total thickness of covered structural layer is 120cm, which includes (from top to bottom): 15cm of nutrition vegetation stratum, 45cm of cover support soil layer, 6.3mm of soil engineering composite drainage network, 1mm of HDPE rough surface membrane, 25cm of clay protective layer under the membrane, 200g/m2 of spun geotechnical cloth, 35cm of rubble gas guiding layer, and the old waste heap after being ground and leveled.
			Monitoring well setting.
		Ancillary works	Maintainenance of the existing management rooms, 2 watering carts, and 2 project inspection cars.
		Water Supply and Drainage	The domestic water is supplied by the municipal administration water supply network; while the production water is supplied by the surrounding water systems. The rainwater will directly enter into the nearby surface water system after being collected by the drainage channel, the leachate will be sent to the regulating reservoir after being collected by the blind ditch, and then transported to the sanitary landfill leachate treatment station by the leachate suction truck, and finally drained to Huainan No 1 WWTP after receiving standard treatment. Domestic wastewater will directly enter municipal sewage network.
		Power supply system	Connect to the three-phase four-wire municipal electric supply nearby.
4	Urban Infrastructure Improvement	Roads	Zhongxing Road, Wanxiang Road, Jiukong Road and Yanshan Road, totally 8.334km. of which, Zhongxing Road is about 1,356m long, and the red line is 30m wide; Wanxiang Road is about 1,520m long, and the red

			line is 25m wide; Jiukong Road is about 1,388m long, and the red line is 10m wide; and Yanshan Road is about 4,070m long, and the red line is 10m wide.
		Water supply	This is the water supply pipe project laying underneath under Zhongxing Road, Jiukong Road, Wanxiang Road and Yanshan Road; the overall length of water supply pipes is 8.574km (8.108km of main pipes), and the pipe diameter is DN150~DN300.
		Drainage	The total length of the rainwater pipes is 15,260m. For the neighbouring area and western part of No.206 National Road, the rainwater will be discharged into Huaihe River through the open -channel at the intersection of the planned Jiukong Road and Linchang Road, the pipe diameter is d600~d800; for the eastern part, the rainwater will be eastward discharged into Gaotang Lake through the planned water body, the pipe diameter is d600~d1200.
		Sewage	The pipe diameter is DN400 and the length is 4.98km. They are laid along Zhongxing Road, Wanxiang Road, and Yanshan Road.
5	Site Utilization for Community Development	Service Centers	Totally 2 service centers will be constructed. -The middle part - service center covers an area of 3621.9m2, and the building area is 1200.0m2, the bicycle renting point covers 40m2, 25 parking spaces; the east part - service center covers an area of 4732.0m2, and the building area is 419.4m2, the bicycle renting point covers 73m2, 32 parking spaces.
		Flower Market	It covers an area of 83,539.85m2, and the building area is 35,267.79m2; it mainly includes the steel structure greenhouse and solar greenhouse on the first floor, and the frame structure house building on the second and third floors. It contains administrative management rooms, electronic trade center, boutique flowers and trees exhibition and spot sale center, flowers and trees trading market, and the trading market for fish, bird, insect and gems; 200 parking spaces for sedan car, and 30 parking spaces for truck.
		Bonsai Garden	The total area - is 7.4 hm2, including open field production area and greenhouse production area. The open field production area covers 52,435m2; the solar greenhouse covers 2,000m2; the management rooms for operators cover 1,200 m2; the road is 829m long;and 110 parking spaces.
		Nursery	It covers an area of 54.06 hm2. The production area includes greenhouse nursery garden, open field breeding area, introduction and domestication area, nursery stock transplant area, large seedling breeding area, sunning ground, and comprehensive storeroom, etc., the building area is 30,495 m2; the non-production area includes garden affairs management area (including management center and tissue culture center) and garden roads, and the building area is 1,638m2.

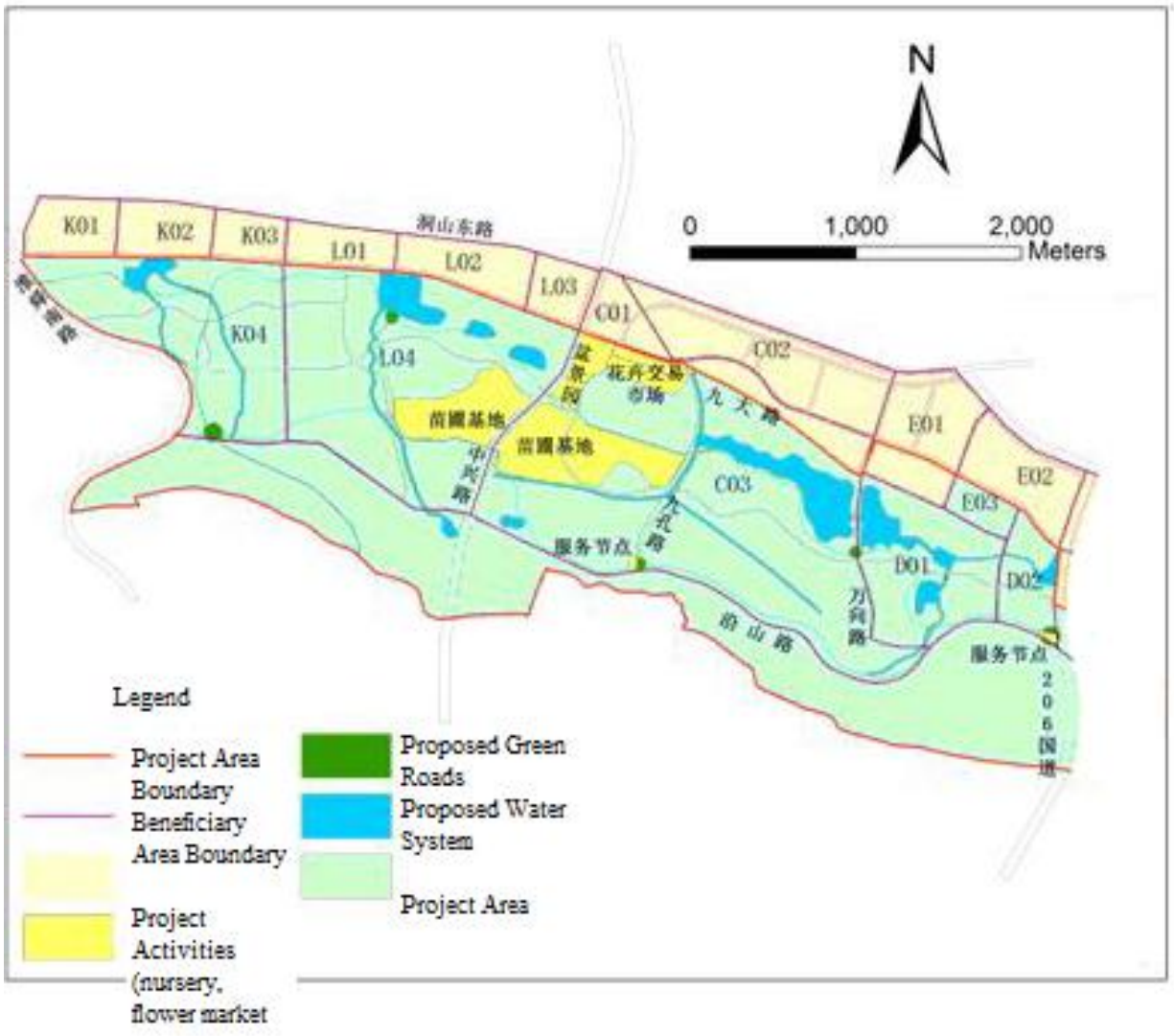


Figure 2.3-1 General Arrangement Plan for the Project

2.5 Project Implementation Schedule

Project preparation will be finished before the end of 2014. Project implementation will be from 2016 to 2020 and the built facilities will be put into operation in the end of 2020.

The project construction schedule:

Subcomponnet 1 – April 2017 to September, 2020;

Subcomponent 2 - April 2017 to April 2019;

Subcomponent 3 - January 2016 to December 2017;

Subcomponent 4 - May 2016 to June 2017;

Subcomponent 5 - April 2017 to April 2019.

See table 2.5-1 for construction schedule.

2.6 Project Cost

The totalcost of the project is RMB1018.1837 million - among which loan applied from World Bank is RMB610 million - (US$ 100 million). See table 2.6-1.

Table 2.6-1 Project Cost Estimate

No.	Description	Estimated Cost	Percentage
		RMB(million)	(%)
I	Physical Works	717.718	70.5
1	Environmental remediation and water management	522.825	51.3
2	Infrastructure improvement and site utilization	194.893	19.1
II	Non-physical Works	165.642	16.3
III	Preparation costs	88.336	8.7
IV	Interest during Construction	28.102	2.8
V	Front-end and Commitment Fee	69.79	0.7
VI	Capacity Building	114.07	1.1
VIII	Total	1018.184	100.0

2.7 Associated Facilities

Facilities associated with the proposed project are shown in the following table.

Table 2.7-1 Associated Facilities

	Associated Facility	Description	Current Status (existing, building, to be built and to be dismantled)	Environmental Impact and Treatment Measures	Project Manager	Mitigation Measure	Responsible Party of Implementing Mitigation Measures
Sewage	Leachate treatment station of life waste dumpsite in eastern of Huainan City	Daily treatment capacity is 200m³/d; current daily treatment capacity of leachate is about 80～110m³/d. Use the process of "coagulating sedimentation + membrane biological reactor (MBR) +nanofiltration（NF）+reverse osmosis（RO）". The effluent meets *Standard for Pollution Control on the Landfill Site of Municipal Solid Waste* (GB 16889-2008).	Existing and running	Meet the requirements of EIA in China and pass the approval procedures of EIA in China.	Huainan Huaiqing Environmental Protection Co. Ltd.	Regularly collect the running conditions of the leachate treatment station.	Huainan Huaiqing Environmental Protection Co. Ltd.
Sewage	Shouchuang Sewage Treatment Plant in Huainan	100,000 m³/d; Carrousel oxidation ditch secondary biochemical	Existing and running	Meet the requirements of EIA in China and pass the approval	Huainan Shouchuang Water Management Co. Ltd.	Regularly collect the running conditions of the sewage treatment station.	Huainan Shouchuang Water Management Co. Ltd.

		treatment, current treatment capacity is 90,000 m^3/d; the effluent meets level B of *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB 18918-2002).		procedures of EIA in China.			
Drainage	Drainage channel in Longwang Ditch	It has been included in the ADB loan project of Huainan city. The storm drainage standard will be for protection against 1 in 30 year floods from rainstorms.	Building	Meet the requirements of EIA in China and Asian Development Bank (ADB) and pass the approval procedures of EIA in China and ADB.	Project Management Office (PMO) of water management in Huainan City	Regularly collect the project progress and the implementation of EMP.	Project Management Office (PMO) of water management in Huainan City
Water supply	Water supply pressure station in Zhongxin South Road	2020 planning; scale is 27,800 m^3/d; land use is 2 hectares.	To be built	The main influence is the noise. Take measures of vibration and noise reduction; high noise equipment should be installed indoor	Huainan Shouchuang Water Management Co. Ltd.	Regularly collect the project progress; the plans of to be prepared EIA/Environmental Management include: • The specific environmental protection	Huainan Shouchuang Water Management Co. Ltd.

				with independent doors and windows; make the plant area green.		measures that should be taken during construction period and operation period(especially the measures of sound insulation and vibration reduction for the pump house); • The specification of construction environment; • Monitoring plan; • Cost; • The situations of public consultation and publicity	
Roads	Linchang Road	The width of red line is 25m and the length is 5.4km, from Zhongxing Road to Huaishun South Road.	Under Construction	Meet the requirement of EIA in China; it was approved in 2010 and begun in December, 2013 and it is predicted to be	Huainan Urban Construction Committee	Regularly collect the project progress; the plans of to be prepared EIA/Environmental Management include: • The specific	Huainan Urban Construction Committee

				finished in December, 2014. Pass the approval procedures of EIA in China. According to due diligence, the pollution control measures proposed in EIA have been implemented in the construction without pollution and disturbing the residents.		environmental protection measures that should be taken during construction period and operation period(especially the measures of sound insulation and vibration reduction for the pump house); • The specification of construction environment; • Monitoring plan; • Cost; • The situations of public consultation and publicity	
	Zhongxing North Road	The width of the line is 60m.	To be built.	The main influence is the noise.	Huainan Urban Construction Committee		

The enterprises to be demolished	The industrial and mining enterprises to be demolished	Now 28 enterprises have entirely shut down or stopped production and 5 enterprises are still in production. During project execution, some enterprises may remove to meet the needs in project implement.	To be demolished	The problems of environment pollution (waste disposal or processing etc.) may be caused in the process of enterprise demolition.	The government in Datong District of Huainan City	During World Bank project implement, once there are some enterprises which are to remove because of the project, he responsible party should perform the following steps: • Hire professional environmental experts or organizations to do a field investigation for enterprise. • On the basis of investigation, make a classification in the demolition of enterprises (Class A, Class B, Class C) • Analyze the environmental impact and prepare the demolition plan	

						for enterprise (similar to the environmental management plan). This plan should definite the position, properties, quantity, and treatment or disposal way of various wastes as well as the mitigation measures (such as worker safety and health protection measures); • Monitoring or supervision plan; • Cost; • The situations of public consultation and publicity; • Investigation report, the environmental impact analysis report of the demolition and	

						demolition plan should be timely sent to the World Bank for review.	

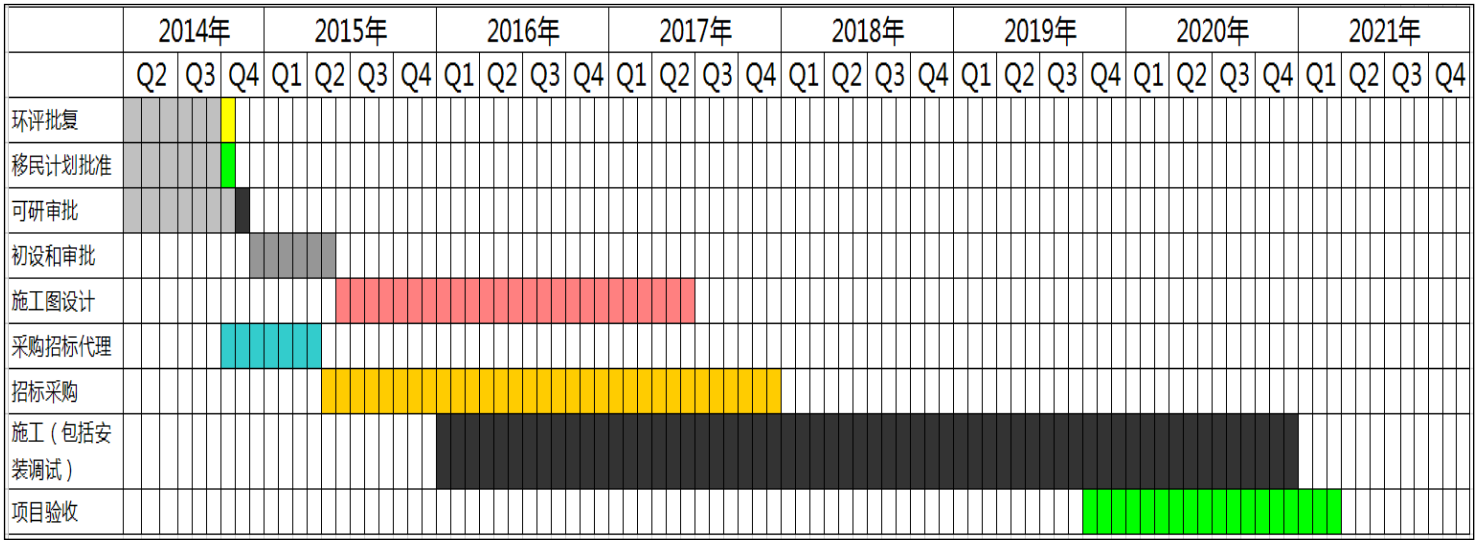


Table 2.5-1 Project Implementation Schedule

环评批复	Environmental Impact Assessment (EIA) Approval
移民计划批准	Resettlement Action Plan Approval
可研审批	Feasibility Study Report Approval
初设和审批	Preliminary Design and Approval
施工图设计	Construction Drawings
采购招标代理	Procurement of Tendering Company
招标采购	Tendering and Procurement
施工（包括安装调试）	Construction (including equipment installation and testing)
项目验收	Project Acceptance

Chapter III Reginonal Environmental Condition

3.1 Natural Environment

3.1.1 Landforms

This project is located in the Jiulonggang- Datong (Jiuda) subsidence area, east urban area of Huainan, and is administered by Datong district. Shungeng Mountain lies in the south of this area and in the north is Linchang Road; Hefei-Fuyang railway lies in the east, and the south Huaishun Road in the west.

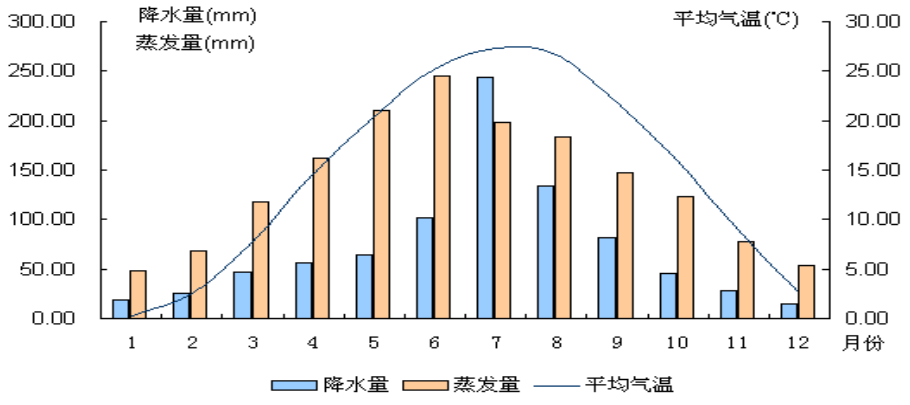
This project area lies in the transition zone between Huaihe River alluvial plain and Jianghuai hills with the south higher than the north in terms of terrain. Main landforms in this area are classified into two major categories: hills and plains. Hills are low hills, namely, Shungeng Mountain, which lies in the south of this area with highest peak elevation of 215.4m. Plains in this area are located in the north of Shungeng Mountain with basic ground elevation ranging between 18～60m.

3.1.2 Climate

This project area lies in the transition zone between subtropical zone and temperate zone in the Northern Hemisphere with a warm temperate climate. Its climatic characteristics are as follows: rich heat, sufficient sunshine, mild climate, moderate rainfall, rainy summer and droughty winter, four distinct seasons, remarkable monsoon, and a long frost-free period.

According to 1949-2011 data from the meteorological station of Huainan City, the annual average temperature is 15.3℃. The highest temperature of the year is in July with an average temperature of 28－28.4℃. The lowest temperature is in January with an average temperature of 1.2℃. Extreme maximum temperature appeared on 28 August 1959, reaching 41.4℃ and the lowest temperature appeared on the January 16, 1955, reaching minus 22.2℃. The annual average wind speed is 2.5m/s and southeast wind blows more in a year.

According to the municipal meteorological statistics for many years, the average annual rainfall is 900mm, but the difference between the annual is big and seasonal The rainfall is uneven. largest was rainfall which in 1956 reached 1428.3m and the smallest rainfall was in 1966, only 471.9mm.



降水量	Amount of precipitation
蒸发量	Evaporation capacity
平均温度	Average temperature

月份	Month

Figure 3.1-1 the average meteorological condition for many years in Huainan City

3.1.3 Surface Water

This project area is located in Datong district within which Huaihe River and Gaotang Lake are two major river systems. At present, there are four flood drainage channels in this area, that is, Datong flood drainage channel, Chengxiang flood drainage channel, Jiulonggang flood drainage channel and Sundian flood drainage channel. The surface water system in the project area is shown in the figure 3.1-2.

(1) Gaotang Lake

Gaotang Lake is located in the region of Yao River downstream in the south of the Huaihe River and is connected with the Huaihe River by the gate of Yao River and Yao River. Gaotang Lake basin is fan-shaped with east-west length of 49km and north-south width of 46km. The normal water storage level of Gaotang Lake is 17.5m. In recent years, the storage level is controlled and is between 18～18.5m in order to make full use of local water resources. The total area of the basin above Yao River gate is 1500km2. When the storage level reaches 17.5m, the area of Lake is 50 km2 and the volume is 85 million m3.

Gaotang Lake belongs to Datong district administered by Huainan City, Changfeng County administered by Hefei City and Fengyang County and Dingyuan County administered by Chuzhou City. The water area of Gaotang Lake administered by Huainan City is 21.57 km2. Gaotang Lake is the main source of agricultural irrigation water for surrounding cities and counties and fishery industry is fully developed, which can meet those requirements of large-scale agricultural irrigation, certain scale fishery breeding and providing water for landscape and recreation.

(2) The Huaihe River

The Huaihe River flows in Fengtai County by Lujia trench and is distributed into two branches when it flows to Yongxing River gate. The north branch flows to the north, and then turns to the east into Jiuli Bay and at last flows into Panji District of the city. The south branch (also known as the Chaohe River) flows to the east into Pijia Road and then flows into Bagongshan District of the city and flows out the city by the Luohe River cross dam in Datong District.

The Huaihe River is an important source of water for industrial and agricultural production and everyday life. The river length in Datong District is 12.2km, river width 65--115m, and depth 2.5--9.5m. It is also an important waterway. Its minimum average annual flow rate is 111m3/s, and minimum average monthly flow rate for many years is 104m3/s. For many years the average flow rate in dry seasons is only58.7 m3/s.

(3) Flood diversion channel of Longwang trench

Flood diversion channel of Longwang trench belongs to catchment area of Dajian trench, whose water-collecting area is 25.10km2. Main River originates in area around Qishanji garden spot, flows through Shandong Road, Datong railway station and then flows in Dajian trench by Jianshe Road and Zhenxing Road.

(4) Water system in the project area

In the project area, the south is higher than the north in terms of terrain and the elevation difference is relatively large. At present, there are four - drainage channels in the area, that is, Datong - drainage channel, Chengxiang - drainage channel, Jiulong -drainage channel and Sundian - drainage channel. They mainly collect mountain torrents of Shungeng Mountain in the south in the rainy season. They are seasonal rivers and often dry out in the years of drought and the dry season. Drought occurs occasionally. Datong -drainage channel and Chenxiang - drainage channel, these two channels flow into the Huaihe River through the flood diversion channel of Longwang trench which is outside the area of the project.

Jiulonggang -drainage channel and Sundian drainage channel, these two water systems flow into Gaotang Lake. In the project area, the total surface area of water system is 50.8hm2 at present, in which water surface area of river is 12.3 hm2, water area of concentrated water reservoirs like pond is 38.5 hm2, and the status quo water surface rate is about 4.3%.

Due to long-term mining activities and ground subsidence, water system at present has varying degrees of damage. - Datong flood drainage channel and Jiulonggang flood drainage channel are so badly damaged that it can't find where their main channels move towards, and several small vertical grooves and a more spacious pond has formed. The - pond is unmanaged for a long time and the river silt and garbage choke the river course, making the river flow section smaller and conveyance capacity diminished.

In the project area, there are 45~50 pit-ponds which are formed by subsidence. Among these ponds, there are 30 ponds with water with 3.88 hm2 maximum water area, 0.017 hm2 minimum water area and 30.2 hm2 total water area. The ponds left have become dry depression or have been reclaimed as vegetable gardens by people around due to water loss and soil erosion and silt blockage. The current water system in project area is shown in the figure 3.1-1.

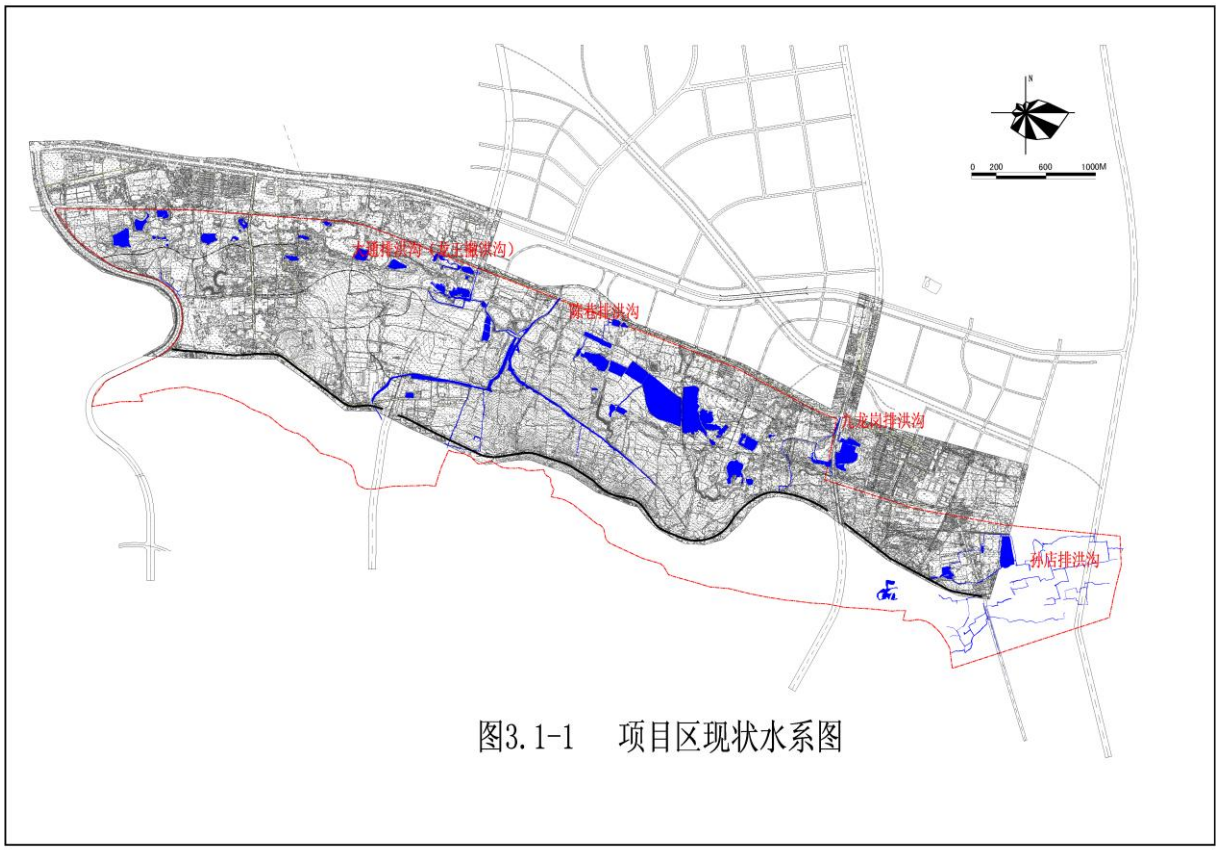


图3.1-1　项目区现状水系图

Figure 3.1-1 The current water system in project area

大通排洪沟	Datong -drainage channel (Longwang flood discharge channel)
陈巷排洪沟	Chenxiang - drainage channel
九龙岗排洪沟	Jiulonggang - drainage channel
孙店排洪沟	Sundian - drainage channel

3.1.4 Geological Condition

The stratigraphic area of the project area belongs to Huainan stratigraphic area of Xu Huai stratigraphic sub region in stratigraphic regions of the north China. The northern part of

the bedrock is covered by Quaternary. Low monadnock mountain area in the south owns kinds of stratums such as Pre-Sinian, Cambrian, Ordovician strata, etc. Basic conditions of stratigraphic area are shown in the table 3.1-1.

Table 3.1-1 Geological Condition

Chronolithologic Unit			Lithostratigraphic unit	Code	Thickness（m）	Main Lithology
Erathem	System	Series				
Cenozoic	Quaternary	Holocene	Bengbu formation	Q4b	13	Silty clay, silt, sand inclusion, distributed in the flood land.
		Upper Pleistocene	Yingshang formation	Q3y	30	Silty clay, with silt, with silt at the bottom, distributed in interfluves
		middle pleistocene	Linquan formation	Q2l	15	Pebbly silty clay, sand, widespread distribution
	Neogene	Pliocene	Minghuazhen formation	N2m	＞71	Marlstone, silty clay with sand, distributed in the north of the Huai river and along the south bank of the Huai river
Mesozoic	Cretaceous	Upper	Zhangqiao formation	K2z	＞699	Thick layer glutenite，distributed in the south of Dong Mountain and the area from Yao River to Changjiafen.
	Triassic	Lower	Heshanggou formation	T1hs	＞125	Mudstone with gravel sand, sandy mudstone, mudstone, distributed in the area from Gugouji to Gaohuang
			Kiujiagou formation	T1l	＞323	Sandy mudstone, feldspathic quartz sandstone，distributed in the area from Gugouji to Gaohuan
palaeozoic	Permian	Upper	Shiqianfeng formation	P2sh	146	Sandy mudstone, quartz sandstone，distributed in the north of the Dong Mountain
			Upper Shihezi formation	P2s	300	Sandstone, mudstone, including coal seams，distributed in the north of the Dong Mountain
		Lower	Lower Shihezi formation	P1x	130	Mudstone , sandstone interbedded with coal seams，distributed in the north of the Dong Mountain
			Shanxi formation	P1s	80	Sandstone, siltstone, including coal seams，distributed in the north of the Dong Mountain
	Carboniferous	Upper	Taiyuan formation	C2t	130	Limestone and sandstone, mudstone interbedded，distributed in the north of the Dong Mountain
	Ordovician	Lower	Majiagou formation	O1m	147	Thick layer gray dolomite, dolomitic limestone, distributed in the northern slope of the Shungeng Mountain
			Xiaoxian formation	O1x	123	Gray dolomite of medium thick interbedded with thin layer limestone, distributed in the northern slope of the Shungeng Mountain
			Jiawang formation	O1j	5	Dolomitic marl with sand, distributed in the northern slope of the Shungeng Mountain

	Cambrian	Upper	Tuba formation	Є3tb	172	Thick layer striping and fine grained microlite dolomite with concretion, distributed in the Shungeng Mountain
			Gushan formation	Є3g	21	Thin layer to thick layer gray and argillaceous dolomite, distributed in the Shungeng Mountain
		Middle	Zhangxia formation	Є2z	362	Oolitic gray dolomite, dolomitic limestone sandwiched iron mud-banded limestone shale, the lower thick layer dolomitic limestone containing oolitic banded, distributed in the Shungeng Mountain
			Xuzhuang formation	Є2x	68	Feldspar quartz sandstone, shale, distributed in the Shungeng Mountain
			Maozhuang formation	Є2m	174	Dolomitic limestone containing folder silty shale, distributed in the Shungeng Mountain
		Lower	Mantou formation	Є1m	232	Argillaceous limestone with medium thick layer interbedded with shale, leopard -like limestone with medium thick layer, dolomitic limestone, lower shale, distributed in the Shungeng Mountain
			Houjiashan formation	Є1hj	152	Thin to medium layer dolomite, distributed in the Shungeng Mountain
Upper Proterozoic	Sinian	Lower	Sidingshan formation	Z1sd	184	Thick layer dolomite, distributed in the area of Shanyujia

3.1.5 Hydrogeological Condition

1. Types of Groundwater

In the project area, groundwater can be classified into three types according to the occurrence conditions and hydraulic characteristics of groundwater, that is, pore water in loose rocks, fissure water in clastic rocks and karstic water in carbonate rocks.

(1) Pore water in loose rocks

Pore water in loose rocks in the project area is mainly distributed in the piedmont and plain areas of Shungeng Mountain which belongs to Quaternary loose layer with lithology of pebbly clay, silty clay, weak water yield property and 3-20m general thickness. Hydraulic characteristics are phreatic water and perched water. Due to a large number of coal mines unwatering groundwater, most of pore water in loose rocks dries up and single-well water inflow is less than 10m3/h.

(2) Fissure water in clastic rocks

This mainly refers to pore-fissure water in underlying Permian sandstones, including sandshale in Shiqianfeng formation and upper and lower Shihezi formation. The regional drilling reveals that lithology is mainly composed of purple argillaceous siltstone, fine sandstone and coarse sandstone and the thickness of single layer is 1--5m. Sandstone fissure is less, water yield property is weak and water inflow of single-well is small, less than 5m3/h. Due to a large number of coal mines unwatering and draining groundwater, groundwater level is rather deep, which is about 200m. The main type of water chemistry is HCO3 --- Na • Ca and total dissolved solids are generally 1.5--3g / L.

(3) Karstic water in carbonate rocks

This mainly refers to karstic water in Cambrian - Ordovician limestone and

Carboniferous limestone interbedded with mudstone distributed in the district of limestone in the south of Longwang Mountain. Shallow karst is a little more developed. According to closure information of Jiuda coal mine, at the -100m level, the Carboniferous limestone karst rate is 0.33% on average and the height of visible cave is 0.1-2.46m; Ordovician limestone karst rate is 3.12% on average and the height of visible cave is 0.5-9.15m. Caves are mostly filled with such substances as silty clay, silt and so on. Single well water inflow of Cambrian - Ordovician limestone karst fissure water is 99-318m3/h in general and 480m3/h at maximum. Groundwater belongs to HCO3-Ca·Mg and its degree of mineralization is 0.189-0.447g/L.

2. Discharge conditions and hydraulic connection of supplying runoff by each aquifer

Pore water in loose rocks, fissure water in clastic rocks and karstic water in carbonate rocks are closely connected and form a unified entirety of aquifer.

Pore water in loose rocks is mainly supplied by atmospheric precipitation, followed by side runoff of groundwater in the area of the southern bedrock hills, and the side surface water infiltration and irrigation return water seepage. Karst water and fissure water are mainly supplied by the direct infiltration of atmospheric precipitation in the carbonate rocks exposed area as well as side runoff in the favorable location for construct.

The groundwater flow direction is from south to north. The main methods of groundwater discharge are mine water drainage, evaporation and labor exploitation.

Due to the high intensity of water drainage in the northern coal mines, karst water and fissure water channels are dredged, forming a unified transport network of groundwater. The conditions of karst groundwater alternation and migration are good. Although Longgang mine in Datong district has not been in production for many years, later small coal mining makes groundwater level dropped to 180m below the ground. The groundwater in this district is in sparse and dry conditions all the year round and some surrounding units are exploiting groundwater, thus causing the groundwater level to decline.

According to the investigation about wells in Huainan Fuqiang concrete mixing station and welfare house of Huainan city, the buried depth of groundwater is 50-60 m and the water level is on the decline. The general decline in groundwater level leads to the change in the conditions of groundwater runoff, making the main groundwater movement change from horizontal movement to horizontal - vertical movement.

3.1.6 Ecological Condition

1. Soil

Main soil types in project area are siliceous yellow brown soil, chicken liver soil, brown limestone soil, purple soil, moisture soil and silt.

Siliceous yellow brown soil: It distributes in hillock top and steep hill. Parent material is quartz sandstone residual. Surface soil usually contains gravel. The soil property is neutral. Soil layer thickness is 30-50cm, and it is easy to have soil erosion.

Chicken liver soil: It distributes in hill, hillside and middle and lower part of a mountain. It is the residual of brown limestone soil and develops from the slope wash on the bottom of limestone hills. It becomes soil-ripening after many years of manual farming.

Brown limestone soil: It distributes in hillside and hill. Parent material is contras-carbonate rock. The soil quality is heavy. The soil property is neutral to alkalescence. Vegetation coverage is high. Parts of the limestone are exposed to the air. Soil layer thickness is 30cm, and parent rock is below 50cm.

Purple soil: It distributes sporadically in the hill and hillside of Shangyao forest farm. It is easy to have soil erosion. Parent materials are purple sandstone, shale and the residual slope wash of mudstone. The parent material of another kind of the purple soil is purple shale and residual slope wash of mudstone. The quality is clay, the clastic rock of half weathering parent rock. Sparse grass grows on it.

Moisture soil: After many years of deposition of river alluvium, the soil ripens into dry soil after being cultivated. The character is much of sand and clay. It mainly distributes in the Luohe river bend near Huaihe River.

Silt: It distributes in the Luohe river bend far from Huaihe River, where the landscape is flat. Parent material is sediments of modern Yellow River flood. The character is heavy. The soil is expanded and the contractility is big. The soil bonds together when damped, and cracks when dried. But the soil water content is big. And the ability to keep a full stand of seedlings is great.

2. Vegetation

Vegetation types of the project area belong to north China provincial fauna with the character of north-south transition. Coal mining activities have a certain effect on the green space system of the project area. Within the subsidence area, the green lands are small and fragmented without connection between each part. The ecosystem is fragile. In the project area, the type of zonal vegetation is deciduous broad-leaved tree. The species are simple and they are all man-made forest such as timberland of locust and aspen, fruit trees of pear and apple, and economic trees of amorpha fruticosa and fraxinus chinensis. Reeds, typha angustifolia and other plants grow in the zone of banks, rivers, lakes and swamps. The forest area is 218 hm2 and the green coverage ratio is 18.5% in the project area. See Table 3.1-3 for current vegetation distribution diagram. Rare and endangered tree species were not found during the evaluation and investigation process.

Vegetation cover area of farmland is big. Dry drop mainly contains wheat, rape, soybean, broomcorn, corn, peanut, sweet potato and so on. Rice distributes over bank, river, lake, depression and inter-channel plains. The current forest and grass coverage of the project area is 16.7%.

3. Animals

The project area belongs to industry and mining enterprises and agricultural district. Wild animals become less gradually affected by human activities. No wild animals of large-scale mammal exist. The common wild animals are swallows, owls, magpies, swans, turtledove, wild ducks, murine and so on. Rare animals and plants were not found during evaluation and investigation process.

4. Water and Soil Conservation

(1) Three district division of soil erosion

According to Notice on Dividing Key National Soil Erosion Regionalization and Notice on Dividing Key Soil Erosion Regionalization and Enhancing the Conservation of Water and Soil (Anhui Government [1999] No.53), the project area does not belong to key national soil erosion regionalization, but belongs to “Huainan mining area” of Anhui key soil erosion supervised area.

(2) Type and intensity of soil erosion

According to the classification and grading standard of soil erosion intensity in Classification and Grading Standard of Soil Erosion (SL190-2007), the soil erosion type of project area is I3 north earth-rock mountain area the 6th district Huanghuaihai Plain in the national soil erosion type regionalization. The intensity of soil erosion is mild. The main type of soil erosion is water erosion. The main manifestation pattern is surface erosion, and the permissible soil loss is 200t/km2.a.

3.1.7 Seismic Intensity

Geotectonics of project area is the south rim of Sino Korean paraplatform,belonging to Huainan sink fault-fold belt of Huaihe River syneclise. It is located in the southeast wing of Huainan synclinorium. Stratigraphic regionalization belongs to Huainan stratum district of Xvhuai stratum subregion in northeast stratum region. According to the regional geological

survey, no deep fracture was found in the engineering district.

According to Ground Motion Parameters Zoning Map of China (GB 18306-2001), ground motion peak acceleration of the project area is 0.05g (exceeding probability is 10% in 50 years), and the corresponding seismic basic intensity is 6 degree.

3.1.8 Geological Disasters

According to Geological Hazard Assessment Report on Coal Mining Subsidence Area Comprehensive Treatment Project of Sustainable Development Engineering in Resources-based City (Huainan City) (April 2014), the current geological disasters of the project area mainly contain mining subsidence of nine big coal mines, karst subsidence and quarry subsidence.

1. Mining subsidence

The nine large coal mines have been closed for over 30 years since 1980 to 1982. Therefore mining subsidence caused by the mining of the nine big coal mines has been stable. It would not cause any big surface deformation. In order to know the stability of Datong subsidence district and the influence of small coal mine activities, the mapping team of Huainan Mining Industry (Group) Co. Ltd made a settlement observation for over 2 years at Datong subsidence district from January 19, 2007 to February 11, 2009 (757 days). Four measuring lines (L line, R line, S line, T line) and nineteen periphery stations (BX1-BX19) were made. Some subsidence values of earthing large coal shown in the table below.

Table 3.1-2 Accumulated Subsidence Values of Some Earth Surface's Stations (2007.1.19-2009.2.11)

Observation Point	BX1	BX2	BX3	BX4	BX5	BX6		
Accumulated Subsidence Value (mm)	8	43	231	17	16	49		
Observation Point	L12	L13	L14	L15	L16	L17	L18	
Accumulated Subsidence Value (mm)	6	1	-6	6	/	32	0	
Observation Point	S9	S10	S11	S12	S13	S14	S15	
Accumulated Subsidence Value (mm)	11	55	116	23	54	40	29	
Observation Point	T1	T2	T3	T4	T5	T6	T7	T8
Accumulated Subsidence Value (mm)	72	62	50	44	28	19	43	54

Seeing from the observation data, certain surface deformation still exists within the influenced area of mining subsidence. But the deflection is less and tends to be stable on the whole; however, in the area influenced by the mining of small coal mines, the surface deformation is relatively larger, and the earth's surface is still instable, which will keep on developing.

At present, subsidence pits with subsidence depth of 1.2-5.0m have come out on the small coal mines in evaluation area such as Changqing coal mine, Shuguang coal mine, Datong the 3rd coal mine, Datong the 10th coal mine and the 9th mine of Jiulonggang the 2nd Company. Water in some areas has accumulated into a pool. Thus the current mining

subsidence is of great risk and danger.

Table 3.1-3 Information of Coal Mining Subsidence

Name of Coal Mine	Subsidence Area (hm2)	Maximum Subsidence Depth (m)
Jiuda Coal Mine	1, 100	＞10
Changqing Coal Mine	39.62	5.0
Shuguang Coal Mine	14.25	3.99
Datong No.3 Coal Mine	7.81	1.0
Datong No.9 Coal Mine	22.32	1.0
Datong No.10 Coal Mine	9.39	1.3
No.9 Coal Mine of Jiu'er Company	33.16	4.0
Total	1, 226.55	----

According to the spirit of the documents such as Datong Government Declaration of Closing the 9th Coal Mine and Shuguang Coal Mine in Datong District, Jiu'er Company and the 9th Mine (Datong Government Secreariat 2012 [105]), Datong Government Declaration of Closing the 3rd and 10th Coal Mine (Datong Government Secreariat 2012 [88]), Changqing coal mine, Shuguang coal mine, Datong the 3rd coal mine, Datong the 9th coal mine, Datong the 10th coal mine and the 9th mine of Jiulonggang the 2nd Company and other six small coal mines were closed in the end of 2012. See the 11th, 12th, 13th and 14th attachments for specific documents about well closing.

2. Karst Subsidence

At present, the distribution area of covered karst in the project area is about 5.76m2. 62 karst subsidences have been found (82 subsidence pits). Subsidence density coefficient is n=17/km2. Karst subsidence intensity is medium development. The subsidence scale is uniform. Parts of subsidence pits have been backfilled. Therefore, the risk of current karst subsidence is medium.

3. Collapse

Now there are 6 stopes in the south outside the project area. The mining wall is 10-70m high. Parts of area have small subsidence. Thus current subsidence is of small risk and danger. The six stopes have stopped mining so far.

3.2 Social Environment

3.2.1 Administrative Division

Huainan City contains six districts and one county, namely Datong District, Tianjia'an District, Xiejiaji District, Bagongshan District, Panji District, Maoji experimental District and Fengtai County from east to west. Total area of the city is 2,596.4km2.The urban area is 1, 566.4km2 and Fengtai County is 1, 030km2. The total residential number is 751,653. The total population is 2,424,162.

Datong District of Huainan City locates in the south bank of the Huaihe River midstream, including three towns, one country and one street, namely Shangya Town, Luohe Town, Jiulonggang Town, Kongdian County and Datong Street. There are 17 communities and 51 administrative villages. The total population of the district is 180 thousand and the total area is 350km2.

The population in the project area is 4,594 except the industrial enterprises. There are villages such as Jiefang Village and Kuangbei Village, schools such as Huainan No.14 Middle School and departments such as social welfare institute and funeral parlour. See Table 3.2-1 below for the current situation of the villages, residential district, school and public buildings in the project area.

Table 3.2-1 Current Situation of Villages, Residential Districts, Schools and Other Public Buildings in Project Area

No.	Name	Scale (person)	No.	Name	Scale (person)
1	Datong social welfare institute	410	10	Lu Village	486
2	Garden spot comfortable housing project	504	11	Nanshan fort	---
3	Funeral parlor	57	12	Nanshan Christian Church	400
4	Mass grave	10	13	Sanyou Village	30
5	Secret water dungeon	---	14	Chongwen Village	60
6	Yuannan Village	120	15	Jiulonggang primary school	600
7	Fort water dungeon	---	16	Jiefang Village	200
8	Kuangbei Village	212	17	Huainan No. 14 middle school	1305
9	Gaolu Village	200			
Total: 4594 persons					

3.2.2 Social Economy

Huainan City is the provincial city of Anhui Province in China. It locates in the hinterland of Yangtze River Delta, north of Anhui Province, coast of the Huaihe River. It was established in 1950 depending on the mine. It is usually known as “the throat of central plain, the shield of the Southern Yangtze River”. It is the key link point of the city group along the Huaihe River. It is the center city and threshold of Hefei economic circle which can promote city development along the Huaihe River and radiates the north of Anhui Province. It is Chinese energy capital, industrial barn of eastern China and important industrial city of Anhui Province including six districts and one county. The total area of the city is 2,596.4km2 with 2.456 million populations. Huaihe River goes through the north of the city, and the city borders on Shungeng in the south. Thus it is said that mountains and water are divided equally, and it likes colorful ribbon strung with bright pearls. There are abundant sources and wealthy products so that it is usually called “colorful Huainan”.

In 2013, the regional GDP came to 12 billion Yuan, an increase of 12%; revenue was 1.5 billion Yuan, an increase of 25%; above-scale industrial added value was 2.8 billion Yuan, an increase of 18%; fixed asset investment was 10 billion Yuan with an increase of 16%; the total retail sales of social consumer goods was 3.6 billion Yuan, achieving an increase of 17%; the average wage of workers of urban non-private units was 36,330 Yuan with a year-on-year increase of 15%; per capita net income of farmers was 7,888 Yuan with an increase of more than 15%.

Datong District locates on the east of Huainan City, north of Shungeng Mountain, south bank of Huaihe River. In the north, Datong District is separated from Panji District by a river. There are Shangyao Mountain and Gaotang Lake in the east. It borders with Tianjia’an District in the east. It borders with Shangyao Mountain and Gaotang Lake Lakeouth to north. The total area is 350km2. Its south terrain is high and north terrain is low. The south and middle part is hilly land. And between the two mountains is a plain. The total population is 181 thousand (in the end of 2013). There are one street, three towns and a village in the district, namely Datong Street, Shangyao Town, Luohe Town, Jiulonggang Town and Kongdian Country, including 17 communities and 51 administrative villages. District Government is located in Datong Street. See the table 3.2-2 for the main social economic parameters of Datong District.

Table 3.2-2 Socio-economic Condition of Huainan City

Region	Total Area (km2)	Total population (ten thousand)	Agricultural population (ten thousand)	GDP (hundred million Yuan)	Land Area Per Capita (mu/person)	Total Farmland Area (ten thousand mu)	Farmland Area Per Capita (mu)	Agricultural Output (ten million Yuan)	Annual Net Income of Farmers (Yuan)
Huainan City	2, 596.4	233.6	127.9	508.8	1.67	175.2	1.37	63.3	5, 000
Datong District	350	18.5	4.13	49	2.84	6.67	1.62	8.8	7, 614

3.2.3 Industrial Enterprises in Project Area

There are 33 industrial enterprises in the district. So far 28 of them have been closed or have stopped production. Five enterprises are in the state of production. According to the current situation investigation, the main enterprise type of the project area is building material industry. See table 3.2-3 and 3.2-4 for the details.

Table 3.2-3 Industrial Enterprises in Production in Project Area

No.	Name of Industry	Number of Employees	Products	Main Environmental Measures	Protection Distance	Enforcement of Three-Synchronies
1	Manhan Building Material Co. Ltd	75	An annual output of 950,000 tons of limestone	Buried sewage treatment system; Crushing, screening and efficient bag dust collector; noise elimination and sound insulation measures;	Broken links 100m	EIA was carried out and accepted
2	Qianchengxin New Type Building Material Co. Ltd	70	Annual output of 50 million pieces of coal gangue sintered hollow bricks；	Buried sewage treatment system; efficient bag dust collector; noise elimination and sound insulation measures;	---	EIA was carried out. And it is being checked.

3	Tianjie Commercial Concrete Co. Ltd	. 135	Annual output of 600,000 cubic meters of ready-mixed concrete and 200,000 dry mixed mortar	Production system settings of bag dedusting; wastewater reuse after precipitation; greening in the sewage plant area without outer drainage; vibration damping and sound insulation measures taken for the high noise equipment;	100m	EIA was carried out. And it is being checked.
4	Huainan Branch of Beijing CEEP Environmental Engineering Material Co. Ltd	35	Annual output of 300,000 tons of desulfurization lime powder	Using bag dust collector in production of dust; vibration damping and sound insulation measures taken for the high noise equipment; buried sewage treatment system;	---	EIA was carried out and accepted
5	Huainan New Type of Building Material Co. Ltd	85	Annual output of 80 million pieces of coal gangue, fly ash and purple sandstone tunnel kiln production line	Buried sewage treatment system; Crushing, screening and efficient bag dust collector; noise elimination and sound insulation measures;	Broken links 100m	EIA was carried out. And it is being checked.

Table 3.2-4 Industrial and Mining Enterprises Closed or Stopped in Project Area

No.	Names of Industry	Year of Closing or Stopping	Remarks

1	Changqing Coal Mine of Huainan City	Closed in 2012	Originally belong to Shungeng Town in Tianjia'an District
2	Machine Factory Bricks and Tiles Factory of Huainan City	Closed in 2009	Originally belong to subordinate Company of Dongchen Cooperation
3	The 1st Mine of Huainan Agriculture and Forestry Office	Closed in 2005	Originally belong to Subordinate Company of Dongchen Cooperation
4	Small Coal Mine of Datong Machine Factory	Closed in 2006	Originally belong to subordinate Company of Dongchen Cooperation
5	The 3rd Mine of Huainan Agriculture and Forestry Office	Closed in 2005	Originally belong to subordinate Company of Dongchen Cooperation
6	The 9th Coal Mine of Jiulonggang second company	Closed in 2012	Originally belong to subordinate Company of Dongchen Cooperation
7	The 1st Coal Mine in Datong District of Huainan City	Closed in 2000	Town business of Jiulonggang Town
8	Tianhe Industrial Boiler Accessories Factory of Huainan City	In production	It might stop production and remove in 2012
9	The 3rd Coal Mine in Datong District of Huainan City	Closed in 2012	Former west side of Huainan wasteyard
10	The 3rd Mine in Datong District	Closed in 2012	The same enterprises to the No.3 mine system in Datong District
11	Jiulong Building Materials Factory of Huainan City	Closed in 2005	Collective enterprise made by administrative office of Huainan No.4 Building Material Factory
12	The 9th Coal Mine in Datong District of Huainan City	Closed in 2012	----
13	The 10th Coal Mine in Datong District of Huainan City	Closed in 2012	In the north of the 9th coal mine of Datong District, Huainan City
14	Huangjian Coating Factory	Stop production	----
15	Stone Material Factory	Closed in 2010	----
16	Huainan Fluorescent Lamp Main Plant	Closed in 2002	Originally belong to subordinate department of Dongchen Cooperation
17	No.4 Building Materials Factory of Huainan City	Stop production in 2000	In the south of the No.14 middle school of Huainan City. Closed in 2009
18	Explosive Magazine of No.4 Building Material Factory of Huainan City	Closed in 2000	Former site of the original No.4 Building Material Factory of Huainan City
19	Huainan Oil Mixture Factory	Stop production	Belong to subordinate company of Datong District
20	Huainan Fytic Acid Chemical Plant	Closed in 2013	----
21	Explosive Magazine of Dongchen No.4 Company	Closed in 2013	----
22	Machinery Factory of Jiuyi Company	Closed in 2013	----
23	Concrete Plant Of Huainan City	Closed in 2013	Removed
24	Huainan Fuqiang Commercial Concrete Mixing Co. Ltd	Closed in 2013	In the southeast of the City Concrete Factory
25	Mingtao Casting Plant of Huainan City	Closed in 2013	Original site of the former No.4 Building Material Factory of Huainan City

26	Botai Mining Electrical Appliance Co. Ltd	Closed in 2013	Locate in the yard of Jiu'er Company of Huainan Dongchen Group Company
27	Liyuan Sports Products Co. Ltd of Huainan City	Closed in 2013	Locate in the yard of Jiu'er Company of Huainan Dongchen Group Company
28	Jiulonggang No. 2 Company of Huainan Dongchen Group Co. Ltd	Closed in 2013	South of Linchang Road (diagonally opposite the Jiulonggang Government). Subordinate Company of Dongchen Cooperation

3.2.4 Resource Development and Groundwater Exploitation

1. Coal Resources Exploitation

The nine mines (Datong – Jiulonggang regions) are resource-exhausted mining areas, where the state-owned coal mines have dropped out. -They have a long history in coal mining; in period of Ming and Qing Dynasty, near-surface coal bed is mined by earth kiln; after China's liberation, mines are constructed in large-scale and exploitation depth reaches 830m; until 1978 and 1982, Datong coal mine and Jiulonggang coal mine are shut down successively. Afterwards, the 6 collective small coal mines of Changqing coal mine, Shuguang coal mine, the third coal mine in Datong district, the ninth coal mine in Datong district, the tenth coal mine in Datong district and the No. 9 well of the second company in Jiulonggang in subsidence area exploit the corner and edge segments left by large mine and re-exploit the high seam left coal with annual output of 60,000 – 150,000 tons. At the end of 2012, the 6 collective small coal mines are all closed.

With the repeated mining of small coal mines, original reserved coal pillar and remaining coal seam have been exploited, resulting the development trend of regional subsidence area; in 2003, ground fracturing happened near the worked out section in the ninth mine. Due to unstable surface subsidence, vegetation deterioration and water and soil loss, local eco-environment has been seriously damaged.

2. Exploitation of Limestone

There are many large and small mining pits generated by limestone mine exploiting within this project area, which mainly distribute in the northern area of Longwang mountain, and the mining wall in partial region exist the danger of subsidence. At present, mining pits within the project area have stopped mining rather than the limestone exploited by Manhan Building Material Company, which is at the south side of the wasteyard that located outside this project.

3. Groundwater Abstraction

Groundwater exploitation within the project area is mainly enterprise water source wells and civil wells.

The Dongda well in the east of Jiulonggang Town of the east project area is the water supply well for Jiulonggang vehicle block of Bengbu railway sub-administration with a total of two wells. The 1# well was built in 1959 and put into official use in 1967; the 2# well was installed in June, 1971 and put into official use in August, 1973. For 20 years of continuous mining groundwater, the largest exploitation quantity is 925,900m3 in 1984; in other normal years, the exploitation quantity is over 300,000m3 and the average daily exploitation quantity is over 1,000m3. Water level has fallen sharply for long-term mining of karst groundwater. At present, Jiulonggang vehicle block of Bengbu railway sub-administration has abandoned this two water supply wells, which is only used for farm irrigation by local villagers and is in little exploitation quantity. In addition, according to survey, the buried depth of groundwater for the wells of Huainan Fuqiang Concrete Mixing Station and Huainan Welfare Institute is 50 – 60m due to mining of karst groundwater, and water level is in downward trend.

Except the industrial enterprises, the current population in the project area is 4,594. The main organizations are Jiefang village, Kuangbei village and other villages, the first primary school in Datong, the fourteen middle school in Huainan and other schools, as well as Datong social welfare institute and funeral parlour, etc. According to the survey of the infrastructure, water consumption is about 500t/d.

Communities and villages within this project area all use well water, of which, the residents and communities near one side of the foot of Shungeng mountain (Qishan gardening, cemetery, resettlement housing and funeral parlour, etc.) use well water. Being located at the foot of a mountain and upstream district, the water is mountain spring in high quality with less water yield, and the water yield of artesian well in a depth of 200m is about 3m3/h.

Near the side of Linchang road at the foot of the mountain, almost every household has one own well. But according to field investigation and actual monitoring, water quality is poor and cannot meet the standard of drinking, and villagers all take water with water wheels from far places. Their wells are in shallow well depth with large quantity, but the water is feculent and astringent, which is generally used for washing clothes and vegetables and other non direct drinking application.

3.2.5 Infrastructure

1. Roads in Project Area

At present, there is the 206 National Road passing through this project area in north-south direction, another 19 gravel roads with width of 4.5 – 6m and 3 cement roads, whose widths are separately 12m for Nanshan road, 7.5m for the 003 county road and 4.5m for the 001 township road.

Due to ground subsidence and subsidence caused by coal mining and the pollution of wasteyard, road infrastructure and supporting facilities are very scarce. Concrete plates of part road segment for current road surface are in relatively serious damaged condition.

2. Water Supply in Project Area

Except the industrial enterprises, the current population in the project area is 4,594. The main organizations are Jiefang village, Kuangbei village and other villages, the first primary school in Datong, the fourteen middle school in Huainan and other schools, as well as Datong social welfare institute and funeral parlour, etc. According to the survey of the infrastructure, water consumption is about 500t/d, and the household water is basically well water.

3. Current Drainage in Project Area

There is still no rain engineering facilities within the project area, so the current rain is drained by current open trench.

There is still no sewerage engineering facilities within the project area and the current sewerage is mainly from scattered residential area with a sewage flow of about 425t/d. Regional domestic sewage cannot be discharged into the municipal sewage pipe network, and the domestic sewage of village, school and hospital are directly discharged into the four flood drainage channels through natural ditches, which has a larger influence to the regional water environment.

3.2.6 Physical Cultural Resources

According to survey on the project area made by Huainan cultural relics administrative organization, underground cultural relics sites have not been found within this project scope, and the ground cultural relics are all kinds of buildings build in Huainan by Japanese invaders, including slaughter hole, secret reservoir and bunker dungeon, the three protection places of the national key cultural relics protection units Huainan ruins evidence of the Japanese invaders and one remaining blockhouse. For the project sites selection of cultural

relics protection opinions, see Attachment six.

3.3 Environment Condition Investigation of Project Area

The industrial and mining enterprises in the project area are currently in the implementation of stopping production or shutting down, but there are still many enterprise storage yards left, and the stockpiling seriously affects the regional ecological environment and the natural landscape. In addition, the project area is in the rural-urban continuum, which will be easily to generate blind spots in supervising and managing, so, pouring and discharging rubbish furtively often occur in the area. Datong dumpsite has been out of service without any sealing measures.

So,the current pollution sources mainly include residential domestic sewage, agricultural non-point source pollution, Datong old dumpsite and scattered storage yards, etc.

3.3.1 Water Pollution Source

1. Domestic Sewage

The existing population in the project area is about 4,594 and the flow of domestic sewage is about 500t/d. Regional domestic sewage cannot be discharged into the municipal sewage pipe network, and the domestic sewage of village and school are directly discharged into the four flood drainage channeles through natural ditches, which has a larger influence to the regional water environment.

2. Landfill leachate of Datong old dumpsite

The bottom of the Datong old dumpsite has not been treated with seepage prevention at present, and the untreated part permeates into Chenxiang flood drainage channel, which is the main flood drainage channel in the eastern urban area, and the leachate finally flows into Huaihe River along Chenxiang flood drainage channel, which seriously pollutes the surrounding surface water and groundwater.

3. Agricultural non-point source pollution

The total area of current green space and land for agricultural production in the project area is 221.69 hm2, which is 19.5% of the project total land.

According to survey, the farmlands in the project area are basically planted with corn, soybean and wheat, part of which is planted in farmer collective land, and the other part are planted in the subsidence area spontaneously used by farmers; the farmlands in this area are basically low-yield farmlands, which are irrigated with rain and applied limited chemical fertilizer, and unless the large area of plant diseases and insect pests, agricultural non-point source pollution is not prominent. But within limited water area, agricultural non-point source pollution is still one pollution factor to regional water environment.

3.3.2 Air pollution sources

1. Dust Suspension

There are a lot of dumpsites in the project area, which mainly include fly ash, coal gangue storage yard, construction waste, domestic garbage, spoil and crushed stone, etc.

These dumpsites will cause wind erosion and dust easily in strong wind meteorological conditions. The enterprise storage yard and scattered storage yard will be canceled gradually as the implement of relocation plan.

2. Landfill Odor

The construction of Datong old dumpsite is not according to national standard, and the stink concentration is higher around the landfill for no biogas collecting and guiding measures being arranged, which has some influence on the environment.

3.3.3 Source of Noise

The noise effect in the project area is mainly from the mining noise of Shungeng mountain quarry and traffic noise.

3.3.4 Source of solid waste pollution

The enterprise storage yards within the project area mainly include the gravel yard of Huainan Fuqiang Commercial Concrete Mixing Co., Ltd., coal fly ash yard, coal gangue yard and coal storage yard, etc. along the Linchang road. Scattered storage yards are mainly referring to the construction waste and domestic garbage storage yard on both road sides of the west side to the Ninth Mine Area in Datong, the construction waste and domestic garbage accumulated on both road sides in front of Chanqing coal company and the accumulated wasted minerals which is in the south subsidence area of China Coal 92 Engineering Co., Ltd.

According to the monitoring data of minerals, gangue and fly ash, the above storage yards do not belong to the hazardous waste and their temporary stockpiling has little influence on the physical and chemical properties of soil, and the main influence is land embezzlement and eco-environmental influence. According to the (DFB [2014] No. 19) Implement Scheme of Site Clearing and Environment Improvement within the Project Area (Nine Subsidence Areas) of Huainan World Bank Loan Project, Datong District Government will strengthen management, prohibit pour rubbish casually and clear the solid waste gradually in the project area to make sure complete liquidation of solid waste yard before the project construction. Statistics of waste clearing quantity is shown in the table 3.3-1 and figure 3.3-1.

Table 5.1-2 Statistics of Solid Waste to be Cleaned

No.	Quantity of Solid Waste (m^3)				Sub-total (m^3)	Disposal Approach
	Industrial Solid Waste			Domestic Solid Waste		
	Fly Ash	Coal Gangue	Construction Waste			
1	10080	2800	0	0	12880	1.Huainan Angrui New Type Wall Co., Ltd. is responsible for the transportation and consumption of the fly ash and coal gangue, and the consumption method is being used of raw materials for manufacturing; 2. Huainan Jinke Renewable Resources Using Co., Ltd. is responsible for the transportation and consumption of the fly ash and coal gangue, and the consumption method is being used of raw
2	650	100	0	0	750	
3	9500	1500	1140	0	12140	
4	0	14000	0	0	14000	
5	0	0	3643	0	3643	
6	0	0	201560	0	201560	
7	1500	0	0	0	1500	
8	1700	400	0	0	2100	
9	0	0	2600	0	2600	
10	7826	0	0	0	7826	
11	12530	1150	0	0	13680	
12	11550	2200	0	0	13750	
13	0	0	20000	0	20000	
14	23100	5070	5000	0	33170	
15	0	1100	0	0	1100	
16	0	0	52000	0	52000	
17	0	0	80557	0	80557	
18	0	0	124492	0	124492	
19	3300	535	0	0	3835	
20	3100	1200	0	0	4300	
21	4540	850	0	0	5390	

22	0	0	0	4120	4120	materials for manufacturing; 3. Scattered domestic garbage in the field is transported to the old wasteyard for closure operation.
Total	89376	30905	490992	4120	615393	

Note: 1. Scattered domestic garbage is dispersed within the environmental remediation land, so No. 22 in this table is only a centralized list of the clearing contents and the specific location of this serial No. is not marked in figure 5-5. 2. The solid waste yard in the project area is a little more in quantity and scattered in distribution, so, this statistics is carried out in unit of relatively concentrated area.

Currently, Datong District government has come to an agreement on the disposal of liquidation of solid waste yard before the project construction with the related companies. Huainan Jinke Renewable Resources Using Co., Ltd. is responsible for the disposition of construction waste within the project area before the project implementation; Huainan Angrui New Type Wall Co., Ltd. is responsible for the disposition of fly ash, coal gangue within the project area; for the disposition agreement, see the Attachment. See the statistical table of waste clearing quantity. The wasted materials clearing is conducted by Datong District Government and supervised by World Bank project office, and the engineering cost is paid from supporting funds.

Figure 3.3-1 Waste Yard Distribution Map

3.4 Current Environmental Problems in Project Area

The main environmental problems existed in this project area are as the follows:

1. Surface landscape is seriously damaged

Due to long-term coal resources mining, ground surface subsidence and subsidence occur in the project area, which changes and destroys the original surface landscapes. There are many subsidence pits of different sizes within the project area. At present, the total subsidence area within the project area is 387 hm2, which is 34.12% of the whole project area.

2. Soil degradation

Underground coal mining and the resulting surface subsidence cause damage to original land vegetation, which increases surface soil erosion of the direct surface runoff. In addition, there are many storage yards on the mining operation surface, and the stockpiling of debris, as well as the weight caused by the transportation of construction operation vehicles, large mining equipments make the surface soil be increased in weight and be harden gradually, which leads to soil degradation. At present, 80% farmlands within this area are inefficient farmland due to soil degradation.

3. Environmental pollution caused by landfill

Datong old dumpsite is the main pollution source in the project area. There is no effective coverage for the top of the waste heap, no impervious barrier on the bottom and around of the landfill, and the - surface rainwater and underground water flowing into the dumpsite increases the output quantity of leachate, which directly falls into Chenxiang Flood Drainage channel and underground water without any collecting and processing system. The dumpsite isn't closed according to national regulation when it is out of service, as a result, the rubbish is exposed outside, resulting in breeding of mosquitoes, flies and mice that spread diseases, and foul gas pollutes the atmospheric environment.

4. Ecological system and water system are damaged

The damage caused by coal mining to water system and soil will directly bring disaster to the ecological system in the project area. Within the scope of the subsidence areas, green space is in small size in fragmented distribution and each part lacks connection to each other, and the ecological system is very fragile. Due to lacking unified management and planning of the green space system, part cultivated man-made forests are in single vegetation type and lacks of mesophanerophytes and shrub layer; the plant community is unstable and easy to be affected with plant diseases and insect pests, and the function of regulating the local ecological environment is difficult to play.

The current situation within this area: there are four drainage channels: Datong - Drainage Channel, Chengxiang - Drainage Channel, Jiulonggang - Drainage Channel and Sundian - Drainage Channel. Due to long-time coal mining activities and surface subsidence, water system has been destroyed in varying degrees, of which Datong - Drainage channel and JiulonggangDrainage channel are destroyed more seriously. Due to lacking of management for a long time, watercourse of the water system within this area is silted up with sludge and rubbish.

5. Poor living environment

The urban infrastructure in the project area and peripheral region is timeworn, residents are living in poor conditions and living quality and part of the subsidence areas are in unstable subsidenced state. The lack of perfect sewage collection system leads to the disorderly wastewater discharge and a certain degree of pollution to the environment, which also affects the living environment of the residents.

Chapter IV Assessment of Regional Environment Quality

4.1 Assessment of Surface Water Quality

4.1.1 Surface Water Quality Monitoring

1. Monitoring Locations

In order to understand present environment quality in project area, 27 monitoring sections are set within the project area. For the setting of monitoring points, see Table 4.1-1

Figure 4.1-1 for details.

Table 4.1-1 Surface Water Monitoring Sections

No.	Monitoring Section	Water Body	Section Nature
Channels			
DT-01#	100m of the upstream of Datong drainage channel	Datong drainage channel	Reference section
DT-02#	500m of the midstream of Datong drainage channel		Control section
DT-03#	500m of the midstream of Datong drainage channel		Control section
DT-04#	1000m of the downstream of Datong drainage channel		Attenuation section
DT-05#	1500m of the midstream of Datong drainage channel		Attenuation section
CX-01#	100m of the upstream of Chenxiang drainage channel	Chenxiang - drainage channel	Reference section
CX-02#	500m of the midstream of Chenxiang drainage channel		Control section
CX-03#	1500m of the downstream of Chenxiang drainage channel		Attenuation cross-section
CX-04#	100m of the upstream of Chenxiang drainage channel		Reference section
CX-05#	500m of the midstream of Chenxiang - drainage channel		Control section
CX-06#	2000m of the downstream of Chenxiang - drainage channel		Attenuation section
JL -01#	Upstream of Jiulonggang - drainage channel	Jiulonggang -drainage channel	Reference section
JL -02#	Midstream of Jiulonggang - drainage channel		Control section
SD-01#	Upstream of Sundian -drainage channel	Sundian - drainage channel	Reference section
SD-02#	Upstream of Sundian -drainage channel		Reference section
SD-03#	Midstream of Sundian - drainage channel		Control section
SD-04#	Midstream of Sundian - drainage channel		Control section
Ponds			
DT-06#	Central pond section of Datong drainage channel	Datong drainage channel	Baseline value
DT-07#	Central pond section of Datong drainage channel		Baseline value
DT-08#	Central pond section of Datong drainage channel		Baseline value
CX-07#	Central pond section of Chenxiang drainage channel	Chenxiang drainage channel	Baseline value
CX-08#	Central pond section of Chenxiang drainage channel		Baseline value
CX-09#	Central pond section of Chenxiang drainage channel		Baseline value
SD-05#	Central pond section of Sundian drainage channel	Sundian drainage channel	Baseline value
SD-06#	Central pond section of Sundian drainage channel		Baseline value

A pond in the east side of the 206 national road	Pond	Baseline value
A pond in the west side of the 206 national road		Baseline value

2. Monitoring Parameters

According to relevant requirements of Environmental Quality Standards for Surface Water (GB3838-2002) and combined with the project pollution discharge characteristics and the known pollution factor in the ground water, this surface water monitoring project includes: water temperature, pH, DO, COD, BOD5, ammonia nitrogen, total phosphorus, arsenic, total lead, hexavalent chromium, total cadmium and sulfide, 13 in total.

3. Monitoring period and frequency

On May 15, 2013 ~ May 18, 2013, Huainan City Environmental Protection Monitoring Station made a continuous monitoring for four days; each surface water body was continuously monitored for two days and composite sample of each section was collected - per day.

4. Sampling and analytical method

The water samples collecting and preservation method are executed according to the relevant regulations of Technical Specifications Requirements for Monitoring Environment. Analytical method is based on the matching analysis method of environmental quality standards for surface water in the requirements of Environmental Quality Standards for Surface Water (GB3838-2002). Analysis method of monitoring the current surface water situation is shown in the table 4.1-2.

Table 4.1-2 Analysis Method of Surface Water Monitoring

No.	Parameter	Analysis Method	Source of method	Detection Limit mg/L(excluding pH)
1	pH	Electrode method	GB/T13580.4-1992	0.1
2	DO	Iodometry	GB7489-1987	0.2
3	COD	Mensuration by COD Analyzer	The water and wastewater monitoring analysis method	2.0
4	BOD5	Dilution and inoculation method	HJ505-2009	0.5
5	NH3-N	Nessler's reagent spectrophotometry	HJ535－2009	0.025
6	Total phosphorus	Ammonium molybdate spectrophotometric method	GB/T11893-1989	0.01
7	Total nitrogen	The alkaline potassium persulfate digestion ultraviolet spectrophotometry	HJ636-2012	0.05
8	Arsenic	Atomic fluorescence spectrophotometry	SL327.1-2005	0.0002
9	Lead	Atomic absorption spectrophotometry	GB/T7475-1987	0.01
10	Hexavalent chromium	Diphenyl carbonyl 2 hydrazine spectral span method	GB7466－1987	0.004
11	Cadmium	Atomic absorption spectrometry (aas)	GB7475－1987	0.001
12	Sulfide	Methylene blue spectrophotometric method	GB/T16489-1996	0.005

5. Monitoring Results

Surface water monitoring results and comparison with applicable standard limits can be found in **Annex 1**.

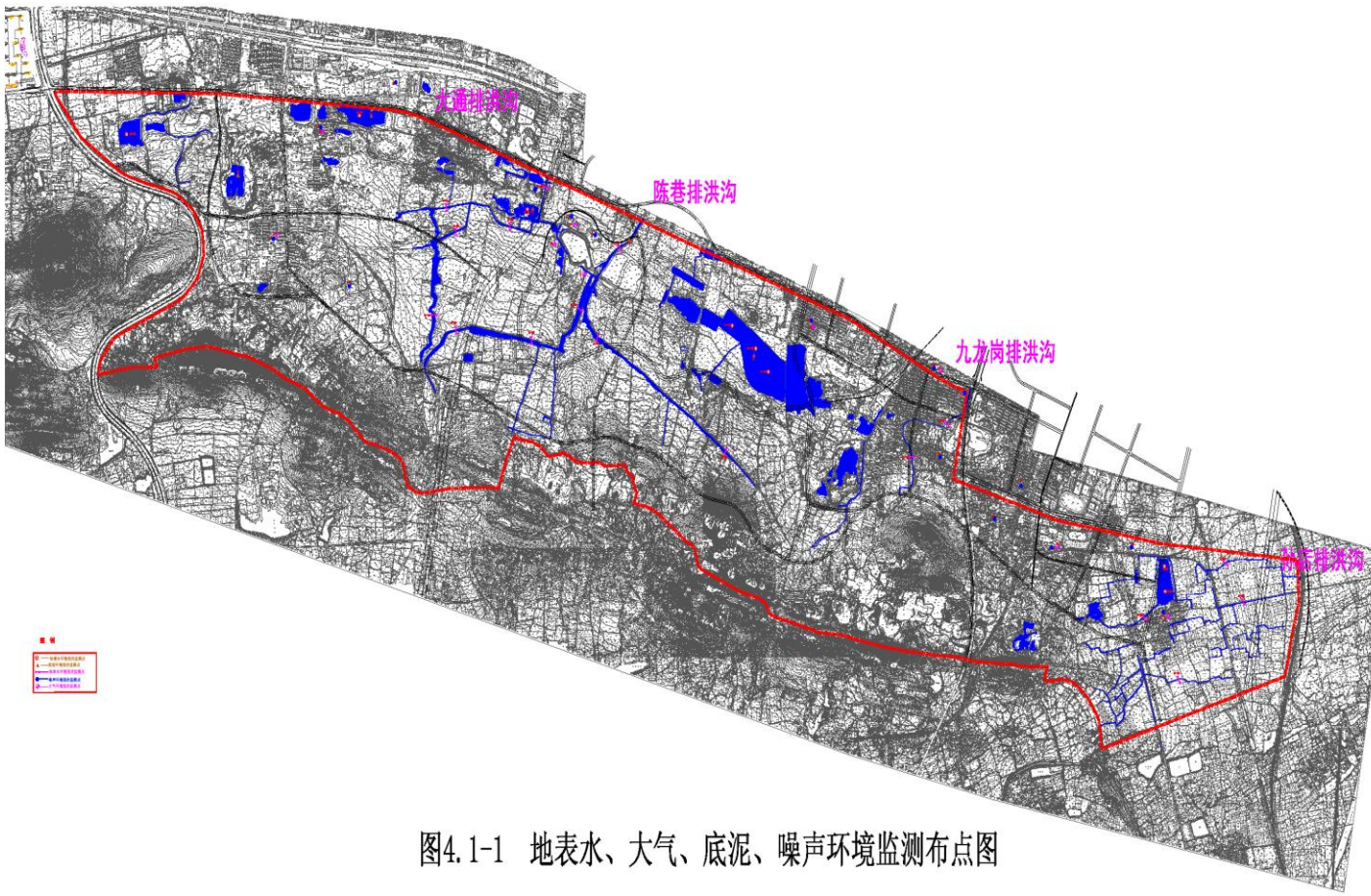


图4.1-1 地表水、大气、底泥、噪声环境监测布点图

Figure 4.1-1 Monitoring Locations of Surface Water, Atmosphere, Sediment and Noise

大通排洪沟	Datong drainage channel
陈巷排洪沟	Chenxiang drainage channel
九龙岗排洪沟	Jiulonggang drainage channel
孙店排洪沟	Sundain drainage channel

4.1.2 Evaluation on Current Surface Water Quality

1. Evaluation method

Calculated by using single factor standard index method and according to the recommended formula in Technical Guidelines for Environmental Impact Assessment Surface Water Environment (HJ/T2.3-93)

(1) The standard index Si of single-factor water-quality parameter is:

$$S_{i,\ j}=C_{i,j}/C_{s,i}$$

Of which: Ci,j——i measured pollutant concentration, mg/L;

Cs,i——i pollutant evaluation criteria, mg/L.

(2) The standard index of pH:

$$S_{pH,j}=\frac{7.0-pH_j}{7.0-pH_{sd}},pH_j\le 7.0$$

$$S_{pH,j}=\frac{pH_j-7.0}{pH_{su}-7.0},pH_j>7.0$$

Of which: pH——pH measured value;

pHsd——The lower limit of pH value regulated in water quality standard of surface water;

pHsu——The upper limit of pH value regulated in water quality standard of surface water.

(3) The standard index of DO is:

$$S_{DO,j}=\frac{\left|DO_f-DO_j\right|}{DO_f-DO_s},DO_j\ge DO_s$$

$$S_{DO,j}=10-9\frac{DO_j}{DO_s},DO_j<DO_s$$

$$DO_f=468/(31.6+T)$$

Of which: SDO. j—The standard index of DO; Dof = 468/ (31.6 + T), T is water temperature, ℃;

DOf —the saturated dissolved oxygen concentration under the condition of a certain water temperature and atmospheric pressure (mg/L), and the computational formula of it is:

DOj —the measured value of dissolved oxygen, mg/L;

DOS—Evaluation standard limiting value of dissolved oxygen, mg/L.

2. Evaluation criterion

According to the water environment functional -zoningof Huainan City, the surface water body within the project areas is not included in the regionalization scope. This project belongs to the project of subsidence area comprehensive treatment and utilization, and the comprehensive treatment and utilization purpose of the water system in the project area aims to realize its landscape function. Therefore, according to the “waters - function and standard classification” of Environmental Quality Standards for Surface Water

(GB3838-2002), the evaluation will aim at V type water system. For the evaluation standard value, see Table 1.3-1.

3. Evaluation result

For the calculation result of each pollutant single factor index in each monitoring section, see Table 4.1-4(1)—4.1-4(4). The calculation result of single factor index is as follows:

(1) Except for COD and BOD5, all indexes of Datong - drainage channel meet the water quality standard of Environmental Quality Standards for Surface Water (GB3838-2002) V Standard; Exceeding standard rates of COD and BOD5 are all 50% and the maximum multiple of exceeding standard are separately 0.8 and 2.14.

(2) Except for ammonia nitrogen, total phosphorus and total nitrogen, all indexes of Jiulonggang - drainage channel meet the water quality standard of Environmental Quality Standards for Surface Water (GB3838-2002) V Standard; Exceeding standard rates of ammonia nitrogen, total phosphorus and total nitrogen are all 100% and the maximum multiple of exceeding standard are separately 1.575, 0.1 and 2.34.

(3) Except for BOD5, all indexes of Sundian - drainage channel meet the water quality standard of Environmental Quality Standards for Surface Water (GB3838-2002) V Standard; exceeding standard rate of BOD5 is 83.3% and the maximum multiple of exceeding standard is 1.03.

(4) The indexes of COD, BOD5, ammonia nitrogen, total phosphorus and total nitrogen in two sides ponds of the 206 National Road are not up to the water quality standard of Environmental Quality Standards for Surface Water (GB3838-2002) V Standard; the exceeding standard rates of COD, BOD5, ammonia nitrogen, total phosphorus and total nitrogen are separately 50%, 100%, 50%, 50% and 50%, and the maximum multiple of exceeding standard are separately 0.625, 1.98, 2.055, 0.153 and 2.425.

(5) The indexes of COD, BOD5, ammonia nitrogen, total phosphorus and total nitrogen of Chenxiang -drainage channel are not up to the water quality standard of Environmental Quality Standards for Surface Water (GB3838-2002) V Standard; the exceeding standard rates of COD, BOD5, ammonia nitrogen, total phosphorus and total nitrogen are separately 66.67%, 88.88%, 33.33%, 33.33% and 33.33%, and the maximum multiple of exceeding standard are separately 3.25, 7.84, 8.8, 19.7 and 10.1.

4. Evaluation conclusion

According to monitoring analysis results, the comprehensive assessment conclusions of the surface water environment present situation in the project area are as follows:

(1) The surface water bodies in the project area are seasonal ditches and - non-normal canalization watercourses, whose functions are mainly flood discharge, and the water quantity and water quality vary in different periods.

(2) The overall water quality of the surface water body in the project area is polluted in different levels and all surface water bodies don’t meet the Environmental Quality Standards for Surface Water (GB3838-2002) V Standard; the main pollution factors are concentrated, including COD, BOD5, ammonia nitrogen, total phosphorus and total nitrogen, etc. The reasons for exceeding standard include: domestic garbage is discarded seriously in the project area and a lot of domestic garbage is floating in - drainage channel; the sewage pipe network in the project area is not in supporting construction and much sanitary sewage flows into- drainage channel; in addition, the agricultural non-point source pollution all contributes to the regional water quality deterioration in a certain extent.

(3) Chenxiang - drainage channel in the project area has the most factors exceeding standard and the maximum multiple of exceeding standard. In addition to the influence of the above reasons, the dumpsite leachate permeates into Chenxiang - drainage channel in the south side of the rubbish heap, which has a big influence on the water quality in the - drainage channel.

(4) Datong - drainage channel and Chenxiang -drainage channel feed into Huaihe River through Longwanggou - drainage channel, and Jiulonggang - drainage channel and Sundian - drainage channel feed into Gaotang Lake, so, the exceeding standard of the water quality in - drainage channel objectively also have an impact in the Huaihe River and Gaotang lake environment.

4.2 Atmospheric environmental status evaluation

4.2.1 Monitoring of atmospheric environmental quality status

1. Layout of sampling points

Nine point locations of atmospheric environmental status monitoring are set respectively in upwind direction of the predominant wind in this area, downwind direction of the predominant wind in this area, surrounding of the waste storage yard and regional sensitive places. For the layout of sampling points, see Table 4.2-1.

Table 4.2-1 Distribution of Atmospheric Environmental Monitoring Points

No.	Sampling Location	Function
1#	Upwind direction of the dumpsite	Project area
2#	Downwind direction of the dumpsite	Project area
3#	Downwind direction of the dumpsite	Project area
4#	Lianghuai courtyard of Kuangnan Village	Sensitive point
5#	Family community of Datong cement plant	Sensitive point
6#	Jiulonggang second company of Dongcheng company	Project area
7#	Luzhuang	Sensitive point
8#	Huainan 14th middle school (Nanchangjie)	Sensitive point
9#	Tumor hospital of Huainan Eastern Hospital Group	Sensitive point

2. Monitoring Parameters

The ambient air monitoring project is daily average concentration monitoring of TSP, PM10, SO2 and NO2, and hourly concentration monitoring of SO2, NO2, ammonia, hydrogen sulfide, methyl mercaptan and effluvium.

3. Monitoring period and frequency

May 16, 2013 ~ May 22, 2013, Huainan City Environmental Protection Monitoring Station made a continuous monitoring of seven days; sampling time is as regulated in Ambient Air Quality Standard (GB3095-1996).

4. Sampling and analytical method

The monitoring analysis is conducted as the methods regulated in Ambient Air Quality Standard (GB3095-1996). The sampling and analysis method adopted by this monitoring of the present ambient air situation are shown in the table 4.2-2.

Table 4.2-2 Sampling and Analysis Method of the Ambient Air

Monitoring Item	Sampling Method	Analysis Method	The source of Analysis Method
TSP	flow membrane filter sampling method	Gravimetric analysis	GB/T15432－1995
PM10		Gravimetric analysis	HJ/T93－2003
NO2	Sampling method by air sampler bottles -	Griess-saltzman method	HJ479－2009
SO2		Formaldehyde absorption - by	HJ482－2009

	porous glass panels	pararosaniline hydrochloric acid colorimetric method	

5. Monitoring results

For the monitoring results of the present atmospheric environment situation and synchronous meteorological observation results, see Annex 1.

4.2.2 Evaluation on Atmospheric Environment Quantity Condition

1. Evaluation method

By using single factor index method, the calculation formula of evaluation on atmospheric environment quality condition is:

$$P_i = \frac{C_i}{C_{si}}$$

Of which: Pi——i pollutant single factor index;

Ci——i measured pollutant concentration, mg/m3;

Csi ——i pollutant evaluation criteria, mg/m3;

If the single index Pi≥1, it means exceeding standard, or it means not exceeding standard. Organize the monitoring data, make statistics of the hourly (or per) and daily average concentration range value of the SO2, NO2, TSP and PM10 in each monitoring point and calculate the single factor index range of pollutant in each monitoring point and the maximum exceeding standard number, etc.

2. Evaluation criterion

According to the standard confirmation letter of Huainan Environmental Protection Agency, the present situation of air environmental quality is evaluated according to the secondary standard of Ambient Air Quality Standard (GB3095-1996); ammonia, hydrogen sulfide, methyl mercaptan and odor concentration around the dumpsite adopt the “secondary current” standard in the Emission standards for odor pollutants (GB 14554-93) and the evaluation standard value is shown in the table 1.3-1 and table 1.3-2.

3. Evaluation result

For the monitoring results of the present atmospheric environment quality situation, see Table4.2-5 (1) — Table 4.2-5 (2).

Evaluation result table of daily average concentration of conventional factor
Table 4.2-5(1)

Serial No.	Monitoring point	Items	Concentration range (mg/m3)	Single factor index range	Exceeding standard No. (each)	Exceeding standard rate (%)	Maximum multiple of exceeding standard (multiple)
1	Upwind direction of the dumpsite	TSP	0.075-0.74	0.25-2.45	1	14.3	1.45
		PM10	0.04-0.24	0.26-1.57	1	14.3	0.57
		SO2	0.004-0.009	0.0266-0.06	0	0	0
		NO2	0.029-0.072	0.242-0.6	0	0	0
2	Downwind direction of the dumpsite	TSP	0.071-0.75	0.24-2.49	1	14.3	1.49
		PM10	0.051-0.40	0.24-2.68	1	14.3	1.68
		SO2	0.015-0.018	0.10-0.12	0	0	0
		NO2	0.04-0.073	0.33-0.61	0	0	0
3	Downwind direction of the dumpsite	TSP	0.066-0.99	0.22--3.29	1	14.3	2.29
		PM10	0.04-0.35	0.266-2.32	1	14.3	1.32
		SO2	0.015-0.20	0.10--0.133	0	0	0

Serial No.	Monitoring point	Items	Concentration range (mg/m3)	Single factor index range	Exceeding standard No. (each)	Exceeding standard rate (%)	Maximum multiple of exceeding standard (multiple)
		NO2	0.04-0.074	0.33-0.62	0	0	0
4	Lianghuai courtyard of Kuangnan Village	TSP	0.065-0.801	0.22-2.67	1	14.3	1.67
		PM10	0.044-0.37	0.293-2.45	1	14.3	1.45
		SO2	0.01-0.016	0.067-0.107	0	0	0
		NO2	0.041-0.057	0.34-0.47	0	0	0
5	Family community of Datong cement plant	TSP	0.068-0.747	0.22-2.49	1	14.3	1.49
		PM10	0.039-0.391	0.26--2.61	1	14.3	1.61
		SO2	0.007-0.017	0.046-0.113	0	0	0
		NO2	0.036-0.10	0.3--0.83	0	0	0
6	Jiulonggang second company of Dongcheng company	TSP	0.043-0.36	0.143-1.2	1	14.3	0.2
		PM10	0.037-0.21	0.246--1.40	3	42.8	0.4
		SO2	0.007-0.011	0.046--0.073	0	0	0
		NO2	0.042-0.097	0.35--0.81	0	0	0
7	Luzhuang	TSP	0.047-0.273	0.156-0.91	0	0	0
		PM10	0.054-0.160	0.36--1.06	1	14.3	0.06
		SO2	0.008-0.011	0.053--0.073	0	0	0
		NO2	0.033-0.087	0.275--0.725	0	0	0
8	Huainan 14th middle school (Nanchangjie)	TSP	0.047-0.49	0.156--1.63	6	85.7	0.63
		PM10	0.06-0.289	0.40--1.93	6	85.7	0.93
		SO2	0.006-0.009	0.04--0.06	0	0	0
		NO2	0.036-0.089	0.3--0.74	0	0	0
9	Tumor hospital of Huainan Eastern Hospital Group	TSP	0.089—0.47	0.296--1.56	6	85.7	0.56
		PM10	0.03-0.266	0.20--1.77	5	71.4	0.77
		SO2	0.006-0.014	0.04--0.093	0	0	0
		NO2	0.039-0.075	0.325--0.625	0	0	0

Evaluation result of hourly conventional factor concentration
Table 4.2-5(2)

Serial No.	Monitoring point	Items	Concentration range (mg/m3)	Single factor index range	Exceeding standard No. (each)	Exceeding standard rate (%)	Maximum multiple of exceeding standard (multiple)

1	Upwind direction of the dumpsite	SO2	0.007-0.009	0.014-0.018	0	0	0
		NO2	0.057-0.146	0.238-0.608	0	0	0
2	Downwind direction of the dumpsite	SO2	0.012-0.02	0.024-0.04	0	0	0
		NO2	0.054-0.148	0.225-0.617	0	0	0
3	Downwind direction of the dumpsite	SO2	0.012-0.024	0.024-0.048	0	0	0
		NO2	0.045-0.109	0.188-0.454	0	0	0
4	Lianghuai courtyard of Kuangnan Village	SO2	0.007-0.02	0.014-0.04	0	0	0
		NO2	0.039-0.082	0.163-0.342	0	0	0
5	Family community of Datong cement plant	SO2	0.007-0.02	0.014-0.04	0	0	0
		NO2	0.047-0.088	0.196-0.367	0	0	0
6	Jiulonggang second company of Dongcheng company	SO2	0.007-0.016	0.014-0.032	0	0	0
		NO2	0.044-0.077	0.183-0.321	0	0	0
7	Luzhuang	SO2	0.007-0.014	0.014-0.028	0	0	0
		NO2	0.042-0.085	0.175-0.354	0	0	0
8	Huainan 14th middle school (Nanchangjie)	SO2	0.007-0.01	0.014-0.02	0	0	0
		NO2	0.044-0.08	0.183-0.333	0	0	0
9	Tumor hospital of Huainan Eastern Hospital Group	SO2	0.007-0.016	0.014-0.032	0	0	0
		NO2	0.044-0.088	0.183-0.367	0	0	0

Evaluation result of characterization factor

Table 4.2-5(3)

Serial No.	Monitoring point	Items	Concentration range (mg/m3)	Single factor index range	Exceeding standard No. (each)	Exceeding standard rate (%)	Maximum multiple of exceeding standard
1	Upwind direction of the dumpsite	Ammonia	0.01--0.201	0.005-0.10	0	0	0
		Hydrogen sulfide	0.005--0.007	0.05-0.07	0	0	0
		Methyl mercaptan	Lower than limit of detection	---	0	0	0
		Odor concentration	12--19	0.4-0.63	0	0	0
2	Downwind direction of the	Ammonia	0.121—0.19	0.06—0.095	0	0	0
		Hydrogen sulfide	0.003--0.006	0.03-0.06	0	0	0

	dumpsite	Methyl mercaptan	Lower than limit of detection	---	0	0	0
		Odor concentration	11--17	0.36—0.56			
3	Downwind direction of the dumpsite	Ammonia	0.107—0.192	0.0535—0.096	0	0	0
		Hydrogen sulfide	0.004--0.009	0.04-0.09	0	0	0
		Methyl mercaptan	Lower than limit of detection	---	0	0	0
		Odor concentration	11--18	0.36—0.60	0	0	0

Note: odor concentration is non-dimensional;

As indicated by the evaluation results, the daily average concentration and hourly concentration of SO2 and NO2 of all monitoring points within the project areas meet the Ambient Air Quality Standard (GB3095-1996), and the secondary standards in the modification list.

The TSP and PM10 of each monitoring point in the project area all exceed standards to varying degrees, and the TSP is seriously exceeding standard in Huainan 14th middle school (Nanchangjie) and Tumor hospital of Huainan Eastern Hospital Group with exceeding standard rates of 85.7% and 85.7%, and the PM10 exceeding standard rate of Tumor hospital of Huainan Eastern Hospital Group is 71.4%.

Around the dumpsite, exceeding standard of TSP in 3# point is the most serious and the maximum multiple of exceeding standard is 2.29; exceeding standard of PM10 in 2# point is the most serious and the maximum multiple of exceeding standard is 1.68. The particular pollutants around the landfill are up to the secondary current standard of Emission Standards for Odor Pollutants (GB14554—93).

As - known from evaluation results: the regional environmental air pollutants of the project are PM10 and TSP, which are mainly caused by the plenty of dusting in urban construction area, dusting caused by heavy truck transportation in road with seriously damaged surface in the project area and part dusting caused by lower vegetation coverage, bared ground and not closed dumpsite.

4.3 Evaluation on present acoustic environment condition

4.3.1 Monitoring of present acoustic environment condition

1. Layout of sampling points

16 point locations of noise monitoring project are set in the project area (for the layout of sampling points, see Table 4.3-1) and daytime and nighttime environmental noise monitoring are carried out according to national regulations.

Monitoring points list of present acoustic environment quality condition

Table 4.3-1

Serial No.	Monitoring point	Serial No.	Monitoring point
1#	Family community of Datong cement plant	9#	Huainan 14th middle school (Nanchangjie)
2#	Huainan Mining Bureau Supply Department Diversified Company	10#	Xinshi Street

3#	Lianghuai courtyard of Kuangnan Village	11#	Jiulonggang Group
4#	Datong garbage disposal plant	12#	Datong Slaughter Hole Education Center
5#	The Third Mining Plant of Datong District	13#	Tumor hospital of Huainan Eastern Hospital Group
6#	Jiulonggang second company of Dongcheng company	14#	Mental Health Department of the First Miners Hospital
7#	Limin Village	15#	Luzhuang
8#	Jiefang Village	16#	Zhongxing Road

2. Monitoring period and frequency

On May 16, 2013 ~ May 17, 2013, Huainan City Environmental Protection Monitoring Station made monitoring at daytime and nighttime, making statistics of equivalent consecutive sound level A.

3. Monitoring method

The monitoring of environmental noise is based on the requirement of the environmental noise monitoring in Environmental Quality Standard for Noise (GB3096-2008). The noise should be monitored twice, -in the day and at night.

4. Monitoring result

For the monitoring result of present environmental noise condition, see Table 4.3-2.

Monitoring result of present environmental noise quality condition

Table 4.3-1 **Unit: Leq Db (A)**

Serial No.	Monitoring point location	May 16, 2013		May 17, 2013	
		Daytime	Nighttime	Daytime	Nighttime
1	Family community of Datong cement plant	49.6	43.7	50.2	43.1
2	Huainan Mining Bureau Supply Department Diversified Company	51.2	42.6	51.7	42.4
3	Lianghuai courtyard of Kuangnan Village	46.2	42.3	46.8	42.7
4	Datong garbage disposal plant	47.1	43.4	47.5	43.1
5	The Third Mining Plant of Datong District	45.6	43	45.3	43.5
6	Jiulonggang second company of Dongcheng company	51.7	45.1	51.3	45.4
7	Limin Village	46	42	46.3	42.3
8	Jiefang Village	45.5	42.1	45.9	42.6
9	Huainan 14th middle school (Nanchangjie)	48.1	41.9	48.6	41.3
10	Xinshi Street	49.3	44.1	49.7	44.5
11	Jiulonggang Group	47.9	43.8	47.5	43.3
12	Datong Slaughter Hole Education Center	43	38.5	42.6	38.1
13	Tumor hospital of Huainan Eastern Hospital Group	54.6	45.3	54.4	45.5
14	Mental Health Department of	53.1	43.2	53.9	43.7

	the First Miners Hospital				
15	Luzhuang	45.1	41.5	45.6	41.3
16	Zhongxing Road	46.4	42.6	46.7	42.1

4.3.2 Evaluation on present acoustic environment quality condition

Evaluation method adopts the comparative method. According to the standard confirmation letter of Huainan Environmental Protection Agency, the evaluation on the planned construction area noise and sensitive point environmental noise adopts the secondary regional standard of Environmental Quality Standard for Noise (GB3096-2008), namely 60dB(A) for daytime and 50dB(A)-nighttime. As indicated by the evaluation results, the monitoring values at daytime and nighttime of each monitoring point environmental noise - all meet the secondary regional standard limit of Environmental Quality Standard for Noise (GB3096-2008), so the regional present situation of acoustic environment is good.

4.4 Evaluation of Sediment Quality

4.4.1 Monitoring of present bottom mud environment condition

1. Layout of sampling points

Five monitoring points are set in the main ditch ponds and ditches of the project areas according to the project characteristics. 0~20cm bottom mud is taken from each monitoring point.

2. Sampling time and frequency

On May 14, 2013, each point is monitored for one day.

3. Monitoring items

The items in this bottom mud monitoring include Ph, As, Pb, Cu, Hg, Cr, Cd, Ni, HCH and DDT, etc. 10 items in total.

4. Monitoring results

For the bottom mud environment monitoring results, see Table 4.4-1.

4.4.2 Evaluation on the present bottom mud environment condition

1. Evaluation method

By using single factor index method, the calculation formula of evaluation on bottom mud environment quality condition is:

$$P_i = \frac{C_i}{C_{si}}$$

Of which: Pi——i pollutant single factor index; Ci ——i measured pollutant concentration, mg/kg;

Csi ——i pollutant evaluation criteria, mg/kg；

2. Evaluation criterion

Evaluation on bottom mud environment quality adopts the secondary standard of Environmental Quality Standard for Soils.

3. Evaluation result

As indicated by the evaluation result, the pollutant content of the bottom mud in each monitoring point of bottom mud in the project area is lower than the secondary standard of Environmental Quality Standard for Soils. So, the soil environmental quality in the project area is good.

Bottom Sludge Environmental Quality Index Calculation Results
Table 4.4-1

Sample No.	Date of monitoring	pH	Hg	As	Pb	Cu	Cr	Cd	Ni
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	2013-5-14	8.04	0.780	4.92	26.8	34.2	45.3	0.107	25.5
2	2013-5-14	7.98	0.540	5.57	26.1	33.6	44.7	0.092	28.4
3	2013-5-14	7.86	0.790	4.53	25.0	37.9	50.1	0.087	43.1
4	2013-5-14	8.13	0.931	9.34	39.3	27.8	57.4	0.078	36.0
5	2013-5-14	8.13	0.624	7.57	20.7	18.7	56.5	0.058	31.1
The secondary standard of the Environmental Quality Standard for Soils		PH＞7.5		25	350	100	250	0.6	60

Sample No.	Date of monitoring	HCH				DDT			
		α-HCH	γ-HCH	β-HCH	δ-HCH	p,p'-DDE	o,p'-DDT	p,p'-DDD	p,p'-DDT
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	2013-5-14	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L
2	2013-5-14	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L
3	2013-5-14	1.14×10-2	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L
4	2013-5-14	1.62×10-2	1.58×10-3	2.45×10-3	1.17×10-3	7.78×10-3	2.72×10-3	8.91×10-3	0.173
5	2013-5-14	1.87×10-3	3.99×10-3	2.84×10-4	1.23×10-4	0.0001L	0.0001L	0.0001L	0.0001L
The secondary standard of the Environmental Quality Standard for Soils		0.5				0.5			

Bottom Sludge Environmental Quality Index Calculation Results List
Table 4.4-2

Sample No.	Date of monitoring	Hg	As	Pb	Cu	Cr	Cd	Ni
1	2013-5-14	0.780	0.1968	0.077	0.342	0.181	0.178	0.425

2	2013-5-14	0.540	0.2228	0.075	0.336	0.179	0.153	0.473
3	2013-5-14	0.790	0.1812	0.071	0.379	0.200	0.145	0.718
4	2013-5-14	0.931	0.3736	0.112	0.278	0.230	0.130	0.600
5	2013-5-14	0.624	0.3028	0.059	0.187	0.226	0.097	0.518

Sample No.	Date of monitoring	HCH				DDT			
		α-HCH	γ-HCH	β-HCH	δ-HCH	p,p'-DDE	o,p'-DDT	p,p'-DDD	p,p'-DDT
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	2013-5-14	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection
2	2013-5-14	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection
3	2013-5-14	2.28×10-2	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection
4	2013-5-14	3.24×10-2	3.16×10-3	4.9×10-3	2.34×10-3	1.56×10-2	5.44×10-3	1.78×10-2	0.346
5	2013-5-14	3.74×10-3	7.98×10-3	5.68×10-4	2.46×10-4	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection	Lower than the limit of detection

4.5 Evaluation on status of underground water quality

4.5.1 Monitoring of status of underground water quality

1. Setting of sampling site

The layout of the monitoring site should be made reference to Technical Code for Environmental Monitoring of Underground Water (HJ/T 164-2004).

DX-1’ to DX-4’ and DX-11’ are 5 long-term observation shafts, in which DX-1’ is 150m away from the west of the stacking body, DX-2’, DX-3’ are 200m away from the lower stream of the filling tank, DX-4’ is 200m away from the east garbage stacking body, DX-5’ and DX-6’ are 200m away from the lower stream, DX-7’ and DX-8 are 500m away from the lower stream, DX-9’ and DX-10’ are 1300m away from the lower stream, DX-11’ is 50m away from the upper stream, DX-1 is 50 away from the lower stream and DX-14 is 50m away from the east garbage stacking body.

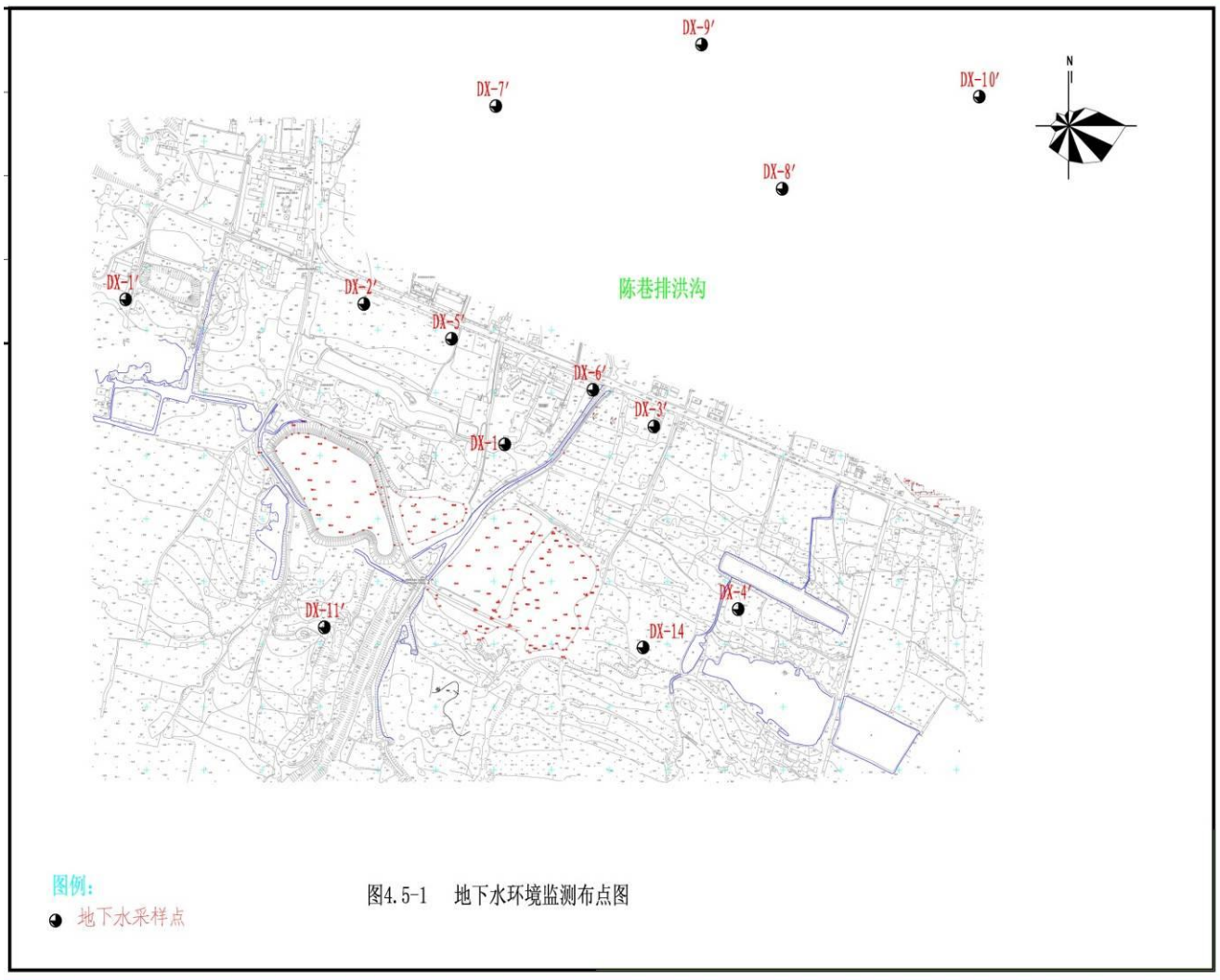


Figure 4.5-1 Environmental Monitoring Point of the Underground Water

图例	Legend：
地下水采样点	Sampling point of the underground water
陈巷排洪沟	Chenxiang - drainage channel

2. Sampling time and frequency

Monitor the whole day of April 27, 2014 and monitor once in each day.

3. Monitoring item

According to relevant requirements of Standard for Environmental Quality of Surface Water (GB/T-14848-93) and in combination with the sewage discharge characteristics and the pollution factors known in the surface water body, the surface water quality monitoring items include water temperature, pH, total hardness, chroma, total soluble solid, ammonia nitrogen, volatile phenols, chloride, Cr (hexavalent), fluorine, sulfate, Nitrate, nitrite, copper, Zn, As, Hg, Pb Se Ni; total bacterial count, total coliform group and permanganate index.

4. Monitoring result

The monitoring result of environmental status of underground water is as shown in Table 4.5-1. During monitoring, no water was taken in DX-3'.

Monitoring result of environmental status of underground water

Table 4.5-1 (1)

Sampling site	Water temperature	pH	Total hardness	Chroma	Total soluble solid	Permanganate index
	℃		mg/L	Times	mg/L	mg/L
DX-1	18.4	7.12	460	5 L	1466	3.87
DX-1'	17.5	7.54	586	20	1216	2.88
DX-2'	18.5	6.64	916	5 L	1668	1.07
DX-4'	18.9	7.19	512	10	1054	2.48
DX-5'	18.7	6.68	335	5 L	863	0.56
DX-6'	18.2	7.06	373	15	1217	0.45
DX-7'	16.1	7.13	394	5 L	810	1.04
DX-8'	17.1	7.06	592	5 L	917	2.00
DX-9'	17.2	6.70	345	5L	686	4.70
DX-10'	17.6	11.23	133	15	667	9.64
DX-11'	18.9	7.13	500	2.5	866	4.82
DX-14	16.3	9.33	1345	100	3426	22.6

Monitoring result of environmental status of underground water

Table 4.5-1 (2)

Sampling site	Ammonia nitrogen	Volatile phenols	Chloride	Cr (hexavalent)	Fluorine	Sulfate	Nitrate	Nitrite
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
DX-1	0.054	0.0003L	332	0.004L	2.2	925	4.44	0.004
DX-1'	0.225	0.0003L	113	0.004L	1.0	376	16.2	0.359
DX-2'	0.317	0.0003L	82.2	0.004L	2.0	709	3.80	0.109
DX-4'	0.065	0.0003L	54.9	0.004L	0.9	351	2.13	0.216
DX-5'	0.214	0.0003L	57.1	0.004L	0.9	169	10.3	0.067
DX-6'	0.568	0.0003L	62.3	0.004L	0.6	26.5	13.0	0.416
DX-7'	0.065	0.0003L	48.7	0.004L	0.6	154	4.50	0.101
DX-8'	0.042	0.0003L	95.9	0.004L	0.9	277	2.72	0.070
DX-9'	0.054	0.0003L	84.2	0.004L	0.8	42.3	0.49	0.032
DX-10'	0.934	0.0003L	51.3	0.004L	1.7	89.4	0.15L	0.005
DX-11'	0.892	0.0003L	44.4	0.004L	0.8	206	0.30	0.539

Monitoring result of environmental status of underground water

Table 4.5-1(3)

Sampling site	Copper	Zn	As	Hg	Pb	Cd	Se	Ni	Total bacterial count	Total coliform group
	mg/L	mg/L	μg/L	μg/L	mg/L	mg/L	μg/L	mg/L	No./mL	No./L

DX-1	0.009L	0.022	0.001L	0.0004	0.0044	0.0005L	0.0006	0.006L	16	79
DX-1’	0.009L	0.024	0.002	0.0010	0.0025L	0.0005L	0.0004L	0.006L	35	2.2×102
DX-2’	0.009L	0.046	0.001L	0.0012	0.0056	0.0005L	0.0014	0.017	14	33
DX-4’	0.009L	0.015	0.001L	0.0013	0.0043	0.0005L	0.0004	0.006L	25	17
DX-5’	0.009L	0.025	0.001L	0.0006	0.0025L	0.0005L	0.0004L	0.006L	49	46
DX-6’	0.006L	0.028	0.001L	0.0005	0.0025L	0.0005L	0.0004L	0.006L	61	32
DX-7’	0.009L	0.034	0.001L	0.0008	0.0025L	0.0005L	0.0004L	0.006L	29	39
DX-8’	0.009L	0.046	0.001L	0.0004	0.0025L	0.0005L	0.0004L	0.006L	15	33
DX-9’	0.009L	0.026	0.001L	0.0048	0.0074	0.0005L	0.0004L	0.020	20	26
DX-10’	0.009L	0.003	0.001L	0.0020	0.0025L	0.0005L	0.0009	0.020	6	7
DX-11’	0.009L	0.025	0.003	0.0014	0.0025L	0.0005L	0.0004L	0.251	110	14
DX-14	0.015	0.097	0.005	0.0019	0.0025L	0.0005L	0.0005	0.032	24	70

4.5.2 Underground water quality evaluation

The evaluation of environmental quality status of the underground water adopts single pollution index method, and its calculation formula is:

$$S_i = \frac{C_i}{C_{si}}$$

Where: Si-sub-index of i pollutants;

Ci-measured value of i pollutants, mg/L;

Csi-evaluation standard value of i pollutants, mg/L.

The pollution index of pH is:

$$S_{pH,j} = \frac{pH_j - 7}{pH_{su} - 7} \qquad pH_j \geq 7.0$$

$$S_{pH,j} = \frac{7 - pH_j}{7 - pH_{sd}} \qquad pH_j \leq 7.0$$

Where: SpH- sub-index of pH value;

pHj- measured value of pH at sampling site i;

pHsd-lower limit value specified in pH value evaluation standard;

pHsu-lower limit specified in pH value evaluation standard

See Table 4.5-2 for the underground water evaluation result.

List of environmental status evaluation of underground water

Table 4.5-2 (1)

Sampling site	pH	Total hardness	Chroma times	Total soluble solid	Permanganate index
DX-1	0.08	1.022	0.333	1.466	1.290
DX-1’	0.36	1.302	1.333	1.216	0.960
DX-2’	0.72	2.036	0.333	1.668	0.357
DX-4’	0.13	1.138	0.667	1.054	0.827
DX-5’	0.64	0.744	0.333	0.863	0.187
DX-6’	0.04	0.829	1.000	1.217	0.150
DX-7’	0.09	0.876	0.333	0.81	0.347
DX-8’	0.04	1.316	0.333	0.917	0.667

DX-9’	0.60	0.767	0.333	0.686	1.567
DX-10’	2.82	0.296	1.000	0.667	3.213
DX-11’	0.09	1.111	0.167	0.866	1.607
DX-14	1.55	2.989	6.667	3.426	7.533

List of environmental status evaluation of underground water
Table 4.5-2 (2)

Sampling site	Ammonia nitrogen	Volatile phenols	Chloride	Cr (hexavalent)	Fluorine	Sulfate	Nitrate	Nitrite
DX-1	0.054	0.15	1.328	0.08	2.2	3.700	0.222	0.20
DX-1’	0.225	0.15	0.452	0.08	1.0	1.504	0.810	17.95
DX-2’	0.317	0.15	0.329	0.08	2.0	2.836	0.190	5.45
DX-4’	0.065	0.15	0.220	0.08	0.9	1.404	0.107	10.80
DX-5’	0.214	0.15	0.228	0.08	0.9	0.676	0.515	3.35
DX-6’	0.568	0.15	0.249	0.08	0.6	0.106	0.650	20.80
DX-7’	0.065	0.15	0.195	0.08	0.6	0.616	0.225	5.05
DX-8’	0.042	0.15	0.384	0.08	0.9	1.108	0.136	3.50
DX-9’	0.054	0.15	0.337	0.08	0.8	0.169	0.025	1.60
DX-10’	0.934	0.15	0.205	0.08	1.7	0.358	0.008	0.25
DX-11’	0.892	0.15	0.178	0.08	0.8	0.824	0.015	26.95
DX-14	125	0.15	6.640	0.08	4.8	2.176	0.008	0.65

List of environmental status evaluation of underground water
Table 4.5-2 (3)

Sampling site	Copper	Zn	As	Hg	Pb	Cd	Se	Ni	Total bacterial count	Total coliform group
DX-1	0.009	0.022	0.02	0.4	0.088	0.05	0.06	0.12	0.16	26.3
DX-1’	0.009	0.024	0.04	1	0.05	0.05	0.04	0.12	0.35	73.3
DX-2’	0.009	0.046	0.02	1.2	0.112	0.05	0.14	0.34	0.14	11.0
DX-4’	0.009	0.015	0.02	1.3	0.086	0.05	0.04	0.12	0.25	5.7
DX-5’	0.009	0.025	0.02	0.6	0.05	0.05	0.04	0.12	0.49	15.3
DX-6’	0.006	0.028	0.02	0.5	0.05	0.05	0.04	0.12	0.61	10.7
DX-7’	0.009	0.034	0.02	0.8	0.05	0.05	0.04	0.12	0.29	13.0
DX-8’	0.009	0.046	0.02	0.4	0.05	0.05	0.04	0.12	0.15	11.0
DX-9’	0.009	0.026	0.02	4.8	0.148	0.05	0.04	0.4	0.2	8.7
DX-10’	0.009	0.003	0.02	2	0.05	0.05	0.09	0.4	0.06	2.3
DX-11’	0.009	0.025	0.06	1.4	0.05	0.05	0.04	5.02	1.1	4.7
DX-14	0.015	0.097	0.1	1.9	0.05	0.05	0.05	0.64	0.24	23.3

4.5.3 Underground water quality evaluation conclusion

According to the above evaluation result, the following evaluation conclusion is made:

(1) There is standard limit exceeding of pollutants in underground water environmental of the project area to different extents, which cannot meet standard Class III in Standard for Underground Water (GB/T14848-93), and the main factors exceeding the standard include total coliform group, sulfate, total soluble solid and total hardness etc.

(2) In the heavy metal indicators of underground water in the project area, except Hg and Ni, the indicators of all other heavy metals can meet standard Class III in Standard for Underground Water (GB/T14848-93), the standard limit exceeding of Ni and Hg is mainly

influenced by the diffusion of percolate on the garbage filling yard, with maximum standard exceeding indicators respectively 4.02 and 3.8.

4.6 Supplementary monitoring

In order to further understand the environmental status of the project area, the project office entrusts Huainan Environmental Monitoring Station for supplementary monitoring to the bottom mud, soil and solid waste hazard in the project area, the monitoring result is as follows:

4.6.1 Evaluation of environmental status of bottom mud

4.6.1.1 Supplementary monitoring

1. Setting of sampling site

12 supplementary monitoring sites are set surrounding 6# and 7# bottom mud monitoring sites in the project area, in which 4 monitoring sites are set at the pond of 6# bottom mud monitoring site (pond at the southeast corner of junction of Linchang Road and South Huaishun Road), 8 monitoring sites are set at the pond of 7# bottom mud monitoring site (pond at the southeast corner of Jiulonggang No.2 Company), and 0-20cm bottom mud is respectively taken in each monitoring site.

2. Sampling time and frequency

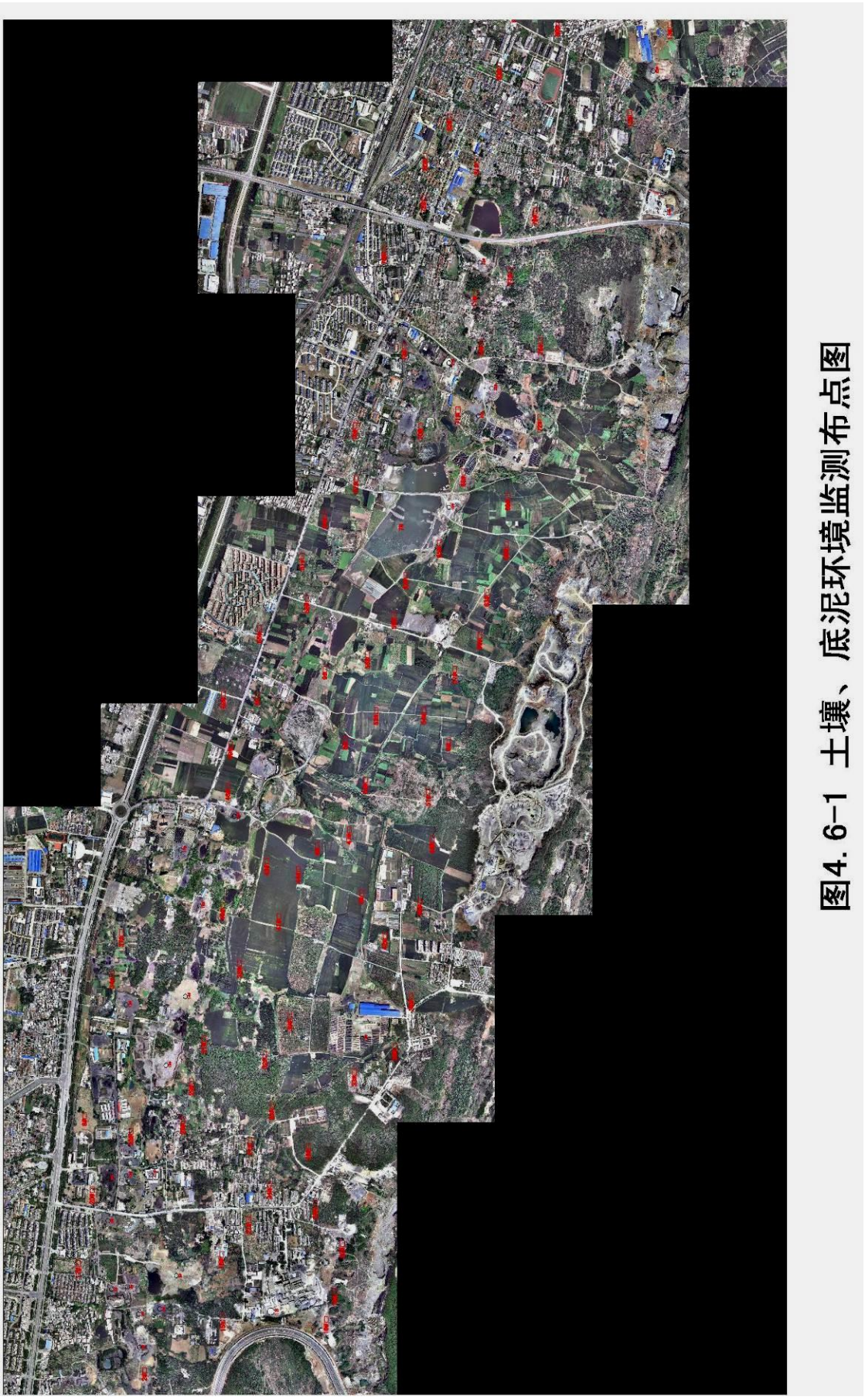


图4. 6–1 土壤、底泥环境监测布点图

Figure 4.6-1 Environmental Monitoring Point of Soil and Bottom Mud

Samples were taken for monitoring on December 13, 2013, each site was monitored for once and mixed sampling was made.

3. Monitoring item

The bottom mud monitoring items include pH, As, Hg, Pb, Cu, Cr, Cd, Ni, TP, ammonia nitrogen, TN, HCH, DDT, sulfide and fluoride etc.

4. Monitoring result

See Table 4.6-1 for the monitoring result of environmental status of bottom mud

Monitoring result of supplementary monitoring for environmental status of bottom mud Table 4.6-1

Item		Unit	Monitoring value range of bottom mud in pond at 6# bottom mud monitoring site	Monitoring value range of bottom mud in pond at 7# bottom mud monitoring site	Compliance condition
Sampling site water depth		m	2	2	---
pH value		Non-dimensional	7.30---7.92	7.59---7.94	---
Hg		mg/kg	0.058—0.322	0.170--0.301	Reach the standard
As		mg/kg	9.29---10.5	5.68---8.40	Reach the standard
Cu		mg/kg	28.2—39.5	24.1—27.4	Reach the standard
Ni		mg/kg	26---31	17.0---21.0	Reach the standard
Pb		mg/kg	22.8---24.7	18.6---27.1	Reach the standard
Cd		mg/kg	0.08---0.16	0.13---0.16	Reach the standard
Cr		mg/kg	56.7---62.4	48.5---56.2	Reach the standard
HCH	α-HCH	mg/kg	0.0001L---2.7×10-3	1.25×10-2---8.9×10-3	Reach the standard
	γ-HCH	mg/kg	0.0001L ---4.5×10-3	0.0001L	Reach the standard
	β-HCH	mg/kg	0.0001L---2.3×10-3	3.0×10-3---8.2×10-3	Reach the standard
	δ-HCH	mg/kg	3×10-4---8×10-4	0.0001L ---3.3×10-3	Reach the standard
DDT	p,p'-DDE	mg/kg	0.0001L	0.0001L	Reach the standard
	o,p'-DDT	mg/kg	0.0001L	0.0001L	Reach the standard
	p,p'-DDD	mg/kg	0.0001L---2.5×10-3	0.0001L	Reach the standard
	p,p'-DDT	mg/kg	0.0001L---3.4×10-3	0.0001L	Reach the standard

5. Evaluation result

The evaluation result shows that the contents of pollutants in the 12 monitoring sites set

at 6# and 7# bottom monitoring sites of the project area are all less than standard Grade II in Standard for Soil Environmental Quality (GB 15618-1995). Therefore, the bottom mud in the project area has a good environmental quality.

4.6.1.2 Deep monitoring

In addition, the -desilting depth of this project is 40cm, in order to understand the status of deep desilting, representative monitoring sites 1# to 5# are selected at 20-40cm to monitor the environmental status of the bottom mud. Samples were taken on April 26, 2014 for monitoring and each site was monitored once.

The bottom mud monitoring items include pH, As, Hg, Pb, Cu, Cr, Cd, Ni, TP, ammonia nitrogen, TN, HCH, DDT, sulfide and fluoride etc. See Table 4.6-2 for the monitoring result of environmental status of bottom mud

Supplementary monitoring result of environmental status of Sediment
Table 4.6-2

Monitoring item		Unit	Monitoring value					Compliance condition
			Bottom mud 1#	Bottom mud 2#	Bottom mud 3#	Bottom mud 4#	Bottom mud 5#	
			Dark grey, slightly smelly	Black, smelly	Black, smelly	Black, smelly	Dark grey, smelly	
Sampling depth		m	0.30	0.25	0.30	0.25	0.30	---
pH		Non-dimensional	8.08	7.25	8.15	8.10	8.02	---
Hg		mg/kg	0.014	0.264	0.016	0.181	0.043	Reach the standard
As		mg/kg	12.5	16.1	9.14	6.96	9.08	Reach the standard
Cu		mg/kg	21.3	48.6	17.7	22.1	21.4	Reach the standard
Ni		mg/kg	34	19	25	17	23	Reach the standard
Pb		mg/kg	14.5	37.4	15.4	18.8	14.5	Reach the standard
Cr		mg/kg	72.9	88.6	67.0	51.1	65.3	Reach the standard
Cd		mg/kg	0.06	0.09	0.04	0.23	0.03	Reach the standard
HCH	α-HCH	mg/kg	0.0001L	0.0001L	0.0001L	7×10-4	0.0001L	Reach the standard
	β-HCH	mg/kg	1.0×10-3	0.0001L	5×10-4	8×10-4	4×10-4	Reach the standard
	γ-HCH	mg/kg	1.1×10-3	2.3×10-3	0.0001L	0.0001L	5×10-4	Reach the standard
	δ-HCH	mg/kg	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	Reach the standard
DDT	p,p'-DDE	mg/kg	0.0001L	1.6×10-3	0.0001L	0.0001L	0.0001L	Reach the standard
	o,p'-DDT	mg/kg	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	Reach the standard

	p,p'-DDD	mg/kg	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	Reach the standard
	p,p'-DDT	mg/kg	0.0001L	1.9×10-3	0.0001L	0.0001L	0.0001L	Reach the standard

The evaluation result shows that the environmental quality of deep bottom mud at the bottom mud monitoring site in the project area all meet Grade II in Standard for Soil Environmental Quality (GB 15618-1995). Therefore, the bottom mud in the project area has a good environmental quality.

4.6.2 Solid waste

1. Setting of sampling site

According to the distribution of various stacking yards in the current project area, and in combination with both the uniform distribution and the type of stacking yard as well as the future ecological project implementation area, 26 stacking yards are selected for stacking yard leaching toxicity test. The monitoring layout is as shown in Table 4.6-1.

2. Sampling time and frequency

Samples were taken for monitoring on December 23, 2013, once every monitoring site.

3. Monitoring item

Totally 17, including total Cr, Cu, Zn, Pb, hexavalent Cr, Cd, Hg, alkyl Hg, Be, Ba, No. total Ag, As, Se, fluoride and cyanide;

4. Monitoring method

Leaching toxicity test is conducted according to sulfo-nitric process and horizontal vibration method in Standard for Identification of Hazardous Waste-Leaching Toxicity Test (GB5085.3-2007) and relevant requirements in Leaching Toxicity Determination Method of Solid Waste (GB/T15555.1-12-1995).

5. Evaluation criteria

The evaluation standard for evaluation of leaching liquid toxic substance should follow relevant limit values in Standard for Identification of Hazardous Waste-Leaching Toxicity Test (GB5085.3-2007) and Integrated Wastewater Discharge Standard (GB8978-1996). See Table 4.6-3 for the evaluation criteria.

6. Monitoring result

See Table 4.6-4 for the monitoring result

Leaching toxicity evaluation standard for solid waste

Table 4.6-3 **Unit: mg/L (except pH)**

Item	Evaluation criteria	
	GB8978-1996 Maximum allowable emission concentration	GB5085.3-2007
pH value (corrosivity)	6-9	/
Total Cr	1.5	15
Hexavalent Cr	0.5	5
Cu	0.5	100
Zn	2.0	100
Pb	1.0	5
Cd	0.1	1
As	0.5	5
Se	0.1	1
Ni	1.0	5

Be	0.005	0.02
Ba	/	100
Ag	0.5	5
Cyanide	0.5	5
Hg	0.05	0.1
Inorganic fluoride	10	100
Alkyl Hg	/	Not allowed

7. Evaluation result

According to Table 4.6-4, the barren rock leaching toxicity test shows that the concentration of leaching agents of various hazardous substances in the stacking yard of this project are lower than relevant limit values in Standard for Identification of Hazardous Waste-Leaching Toxicity Test (GB5085.3-2007). Therefore, the stacking yard of this project does not belong to hazardous waste.

However, the fluoride in 1# stack yard and pH value in stack yards 3#, 6#, 14#, 18#, 22#, 25#, 26# exceed the standard and do not meet the limit of highest concentration in Integrated Wastewater Discharge Standard (GB8978-1996), belonging to general industrial solid waste Class II.

Therefore, the stack yard of this project does not belong to the hazardous waste. However, the fluoride in 1# stack yard and pH value in 3#, 6#, 14#, 18#, 22#, 25#, 26# exceed the standard do not meet the limit of highest concentration in Integrated Wastewater Discharge Standard (GB8978-1996), belonging to general industrial solid waste Class II, and the other stack yards belong to general industrial solid waste Class I.

Barren rock leaching toxicity test result

Table4.6-4(1) **Unit: mg/L (except pH)**

Monitoring item	Stack yard #1 in attached figure	Stack yard #2 in attached figure	Stack yard #3 in attached figure	Stack yard #4 in attached figure	Stack yard #5 in attached figure	Stack yard #6 in attached figure	Stack yard #7 in attached figure	Solid waste 8# in attached figure	Solid waste 9# in attached figure
	Grey, damp, odorless	Black, damp, odorless	Grey brown, damp, odorless	Yellow brown, damp, odorless	Grey brown, damp, odorless	Grey yellow, damp, odorless	Grey, damp, odorless	Black, damp, odorless	Black, damp, odorless
Sampling depth	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling
pH value	7.83	8.53	3.68	6.53	7.73	9.22	8.44	7.94	8.06
Cyanide	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	4.1×10-3	1.33×10-2	0.0001L	0.0001L
Cr (hexavalent)	0.004L	0.004L	0.004L	0.004L	0.004L	0.004L	0.010--0.025	0.004L	0.004L
Hg	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L--8×10-4	0.0002L--2×10-4	0.0002L
As	0.0001L	5×10-4--2×10-4	0.0001L	0.0001L	0.0001L--4×10-4	0.0001L--2×10-4	0.0001L	2×10-4	0.0001L
Be	0.0003L	0.0003L	7.3×10-3--0.0022	0.0003L	0.0003L	0.0003L	0.0003L	0.0003L	0.0003L
Ba	0.012--0.037	0.027--0.049	0.025—0.012	0.02--0.032	0.049--0.069	0.074--0.101	0.640--0.855	0.051--0.061	0.050—0.061
Cu	0.01L	0.01L	0.03	0.01L	0.01L—0.02	0.01L	0.06--0.07	0.01L	0.01L
Zn	0.013--0.046	0.006L --0.018	0.268—0.068	0.016--0.023	0.017---0.033	0.019	0.030---03.041	0.006L--0.024	0.006—0.009
Ni	0.01L --0.04	0.01L	0.04--0.14	0.01L—0.04	0.01L	0.01L	0.01---0.02	0.01L	0.01L
Pb	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L
Cd	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L --0.005	0.003L	0.003L
Cr	0.01L	0.01L	0.01L	0.01L	0.01L--0.01	0.01L	0.03	0.01L	0.01L

Ag		0.03L	0.03L	0.03L	0.03L	0.03L	0.03L	0.03L	0.03L	0.03L
Se		2.08×10-2--1.58×10-2	1.5×10-3--1.2×10-3	0.0002L--4×10-4	0.0002L--4×10-4	0.0002L---6×10-4	0.0002L--4×10-4	7×10-4—1.2×10-3	3×10-4--8×10-4	2.3×10-3—4.1×10-3
Fluoride		16.6--17.2	0.659--0.421	0.279—0.472	0.0148L—0.452	0.451--0.537	0.145	0.372---0.494	0.516--0.726	0.438
Alkyl Hg	Methyl Hg	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L
	Ethyl Hg	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L

Barren rock leaching toxicity test result

Table 4.6-4(2) **Unit: mg/L (except pH)**

Monitoring item	Solid waste 10# in attached figure	Solid waste 11# in attached figure	Solid waste 12# in attached figure	Solid waste 13# in attached figure	Solid waste 14# in attached figure	Solid waste 15# in attached figure	Solid waste 16# in attached figure	Solid waste 17# in attached figure	Solid waste 18# in attached figure
	Black grey, damp, odorless	Black grey, damp, odorless	Black grey, damp, odorless	Black grey, damp, odorless	Black grey, damp, odorless	Black grey, damp, odorless	Black grey, damp, odorless	Black grey, damp, odorless	Black, damp, odorless
Sampling depth	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling
pH value	8.80	8.82	7.93	7.71	4.12	7.96	6.53	6.98	9.14
Cyanide	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L
Cr (hexavalent)	0.004L	0.004L	0.004L	0.004L	0.004L	0.004L	0.004L	0.004L	0.004L
Hg	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L
As	0.0001L	2×10-4--4×10-4	0.0001L--4×10-4	0.0001L	0.0001L	3.9×10-3--8×10-4	0.0001L	0.0001L	0.0001L--2.6×10-3
Be	0.0003L	0.0003L	0.0003L	0.0003L	1.39×10-2--4.9×10-3	4.9×10-4--3.6×10-3	0.0003L	0.0003L	0.0003L
Ba	0.056--0.043	0.062--0.074	0.029--0.04	0.027—0.024	0.024—0.038	0.075--0.546	0.018—0.019	0.028--0.041	0.054--0.139
Cu	0.01L	0.01L	0.01L	0.01L	0.02--0.08	0.02	0.01L	0.01L	0.01L

Zn		0.006L--0.011	0.006L--0.016	0.026--0.050	0.019--0.045	0.209--0.418	0.021--0.073	0.006—0.016	0.006L—0.013	0.006L--0.021
Ni		0.01L	0.01L	0.01L	0.02--0.07	0.11--0.25	0.04	0.01L	0.01L	0.01L
Pb		0.05L	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L
Cd		0.003L	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L
Cr		0.01L	0.01L	0.01L	0.01L	0.01L	0.13—0.02	0.01L	0.01L	0.01L
Ag		0.03L	0.03L	0.03L	0.03L	0.03L	0.03L	0.03L	0.03L	0.03L
Se		3×10-4--9×10-4	9×10-4--2.3×10-3	1.2×10-3--1.4×10-3	0.0002L--5×10-4	0.0002L--5×10-4	0.0002L--1.7×10-3	0.0002L—7.0×10-4	0.0002L—7.0×10-4	5×10-4—4.8×10-3
Fluoride		0.486--0.676	0.607--0.997	0.147--0.547	8.95×10-2—0.269	0.257—0.772	0.145—0.862	8.79×10-2—0.304	0.113—0.331	0.317—0.584
Alkyl Hg	Methyl Hg	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L
	Ethyl Hg	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L

Barren rock leaching toxicity test result

Table 4.6-4(3) **Unit: mg/L (except pH)**

Monitoring item	Solid waste 19# in attached figure	Solid waste 20# in attached figure	Solid waste 21# in attached figure	Solid waste 22# in attached figure	Solid waste 23# in attached figure	Solid waste 24# in attached figure	Solid waste 25# in attached figure	Solid waste 26# in attached figure
	Grey, damp, odorless	Grey, damp, odorless	Black grey, damp, odorless	Black, damp, odorless	Black grey, damp, odorless	Black grey, damp, odorless	Black, damp, odorless, with gravel	Grey, dry, odorless, with debris
Sampling depth	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling	Mixed sampling
pH value	8.58	8.14	8.72	10.03	8.00	8.04	9.47	10.73
Cyanide	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L

Cr (hexavalent)		0.004L	0.004L	0.004L	0.004L	0.004L	0.004L	0.004L -0.008	0.004L
Hg		0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L	0.0002L
As		2.7×10-3	2×10-4	1.6×10-3—2.4×10-3	2.6×10-3—7.0×10-3	0.0001L	3×10-4—4.0×10-4	8.0×10-4--1.6×10-3	8.1×10-3--8.2×10-3
Be		0.0003L	0.0003L	0.0003L-3.0×10-4	0.0003	0.0003L	0.0003L	0.0003L	0.0003L
Ba		0.023—0.186	0.067—0.106	0.062—0.108	0.108--0.130	0.059—0.062	0.121—0.140	0.059—0.141	0.018—0.565
Cu		0.01L	0.01L	0.01L—0.02	0.01L	0.01L	0.01L	0.01L	0.01L
Zn		0.013--0.015	0.006L—0.019	0.006L—0.07	0.006L	0.014--0.017	0.015--0.029	0.006L	0.010
Ni		0.01L	0.01L	0.01L	0.01L	0.01L	0.01L	0.01L	0.01L
Pb		0.05L	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L	0.05L
Cd		0.003L	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L
Cr		0.01	0.01L	0.01L—0.02	0.01L—0.02	0.01L	0.01L	0.01L	0.01L
Ag		0.03L	0.03L	0.03L	0.03L	0.03L	0.03L	0.03L	0.03L
Se		2.3×10-3—7.0×10-4	0.0002L—6.0×10-4	1.1×10-3--1.4×10-3	4.8×10-3—5.7×10-3	7.0×10-4--1.0×10-3	3×10-4--8×10-4	0.0002L—5.5×10-3	0.0002L—9.0×10-4
Fluoride		0.307—0.381	0.340—0.495	0.470—1.0	0.985—1.71	0.440	0.360—0.57	0.102—1.07	0.467--0.557
Alkyl Hg	Methyl Hg	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L	0.00001L
	Ethyl Hg	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L	0.00002L

4.6.3 Evaluation on soil environmental status

1. Setting of sampling site

1 soil site is monitored within 1m surrounding each stacking yard and 4 soil samples are taken from the peripheral farmland of the project area to monitor the background soil quality of the area; the soil environmental quality is monitored at sites 14-18; for the above three types of soil monitoring sites, the surface soil (within 20cm) and deep soil (within 20-50cm) samples are taken in the same site, and mixed samples are taken, in which monitoring sites 14-86 are every 500m from east to west in the project area, and sampling sites are respectively set in the north, middle and south of the area, with 116 soil monitoring sites in total.

2. Sampling time and frequency

December 23 to 31, 2013, once every monitoring site.

3. Monitoring items

The soil monitoring items include pH, Cd, Hg, As, Cu, Pb, Zn, Ni, Cr, HCH, and DDT.

4. Monitoring result

See **Annex 2** for the environmental status monitoring result.

5. Evaluation result

The evaluation result shows that except that Ni exceeds the standard slightly at monitoring site 19, indicators of soil environment in other monitoring sites all meet standard Grade II in Standard for Soil Environmental Quality (GB 15618-1995).

Chapter V Environmental Impact and Mitigation Measures of Subcomponent 1

5.1 Project Overview

5.1.1 Environmental Remediation

The ultimate goal of environmental remediation is to restore the original ecological system and environmental appearance of the ecological system. By comprehensively considering the site terrain, surface condition and drainage smoothness, the whole environmental remediation is divided into seven categories, as shown in Table 5.1-1 in detail, and the distribution of environmental remediation is as shown in Table 5.1-1. The worm quantities of environmental remediation are as shown in Table 5.1-2.

Table 5.1-2 Quantities of Environmental Remediation

Serial no.	Remediation type	Model type	Area (hm2)	Plantation proportion			Remarks
				Arbor	Flowering shrubs	Ground cover	
1	Rocky slope	Model I	12.27	10%	10%	80%	Arbor projection area (3m*3m=9m2, vertical projection unit area 6.3m2 (overlap coefficient 0.7) Shrub projection area 2m*2m=4m2, vertical projection unit area 2.8m2 (overlap coefficient 0.7)
2	Garbage stacking yard	Model I	10.92	20%	30%	50%	
3	Waste stacking yard	Model I	18.13	60%	20%	20%	
		Model I	10.13				
(4	Thick-oil lowland	Model I	21.20	60%	15%	25%	
		Model I	10.75				
5	Thick-soil slope	Model I	100.84	60%	20%	20%	
		Model I	120				
6	Low-efficiency forest land	Model I	42.43	50%	20%	30%	
		Model I	27.30				
7	Ordinary forest land	/	37.94	/	/	/	
8	Total		411.91				

5.1.2 Greenway

In such a landscape with strong artificial interference like subsidence area, the connection between the continuous smoothness of natural ecological process and the natural relict patches needs to be realized through the landscape corridor, i.e. -construct the tree fences on both sides of the road, riverside green landscape corridor etc. to form slight and dense lines, so as to connect - the area with good natural and ecological environment in the mining area (group source) and play the role of species flow and energy flow.

The greenway type of this subcomponent is the country greenway. With the east-west waterfront greenways and greenways along the mountain as the frame, the landscape elements are organically connected and integrated through green channel. With the south-north second-grade greenways as the link, three relatively independent circular greenways network is formed.

The country greenway must be provided with greening protection belt, which is better to be more than 10m. The sub-item forms three green corridor forms, i.e. riverside green corridor, mountainous green corridor and serial connecting green corridor, according to the selection of greenway linear.

The greenway work contents include greenways N.1 to No.5 and post No.1, 4 and 5, as well as the supporting marking system, brightening system, environmental sanitation and

other supporting facilities, see Table 5.1-4 in detail. The distribution of greenway is -shown in Figure 5.1-2, and that of the post is - shown in Figure 5.1-2.

Table 5.1-1 Environmental Remediation Type and Method

No.	Environmental Remediation Type	Remediation Method	Tree Species Selection	Greening Model
1	Rocky slope remediation	Plant climbing ground cover plants in the place where there is soil to cover the exposed surface, and accelerate the self-recovery of ecological system, some shrub plants resisting drought and barrenness can also be considered for local plantation.	Arbors: Robinia pseudoacacia, Albizia kalkora, Melia azedarach, dalbergia hupeana; shrubs: pyracantha fortuneana, pomegranate, winged euonymus; ground covers: Bermuda grass, alfalfa, wintercreeper, euphorbia humifusa, fructus forsythiae, procumbent juniper	Pyracantha fortuneana + photinia serrulata + winged euonymus-wintercreeper + euphorbia humifusa + fructus forsythiae + procumbent juniper + Bermuda grass + alfalfa
2	Landfill remediation	Plant special plants according to the local condition, and create a special plant landscape atmosphere of the site	Arbors: glossy privet, poplar, Robinia pseudoacacia, Platycladus orientalis, holly, Melia azedarach, Photinia davidsoniae; shrubs: pittosporum tobira, winged euonymus, Ligustrum quihoui, pyracantha fortuneana; ground covers: procumbent juniper, Bermuda grass, Radix Ophiopogonis, oxalis rubra, alfalfa	glossy privet+ aspen+ Robinia pseudoacacia + Melia azedarach + holly + Photinia davidsoniae + Platycladus orientalis- winged euonymus + Ligustrum quihoui + pyracantha fortuneana + pittosporum tobira-Radix Ophiopogonis + Bermuda grass + oxalis rubra + procumbent juniper + alfalfa
3	Waste Pile Field Remediation	Clear the surface deposit, trim the land and loosen the soil dressing, and then excavate tree pit for plantation. At present, there are totally 21 waste stacking yards in the project area, the type, clearing amount and orientation of which are - shown in Table 5.1-2.	Arbors: Robinia pseudoacacia, zelkova schneideriana, german oak, pistacia chinensis bunge, goldenrain tree, soapberry, paulownia, southern magnolia, gingko; shrubs: oleander, pittosporum tobira, hibiscus, amorpha fruticosa, sweet-scented osmanthus, pyracantha fortuneana, photinia serrulata; ground covers: procumbent juniper, alfalfa, Bermuda grass, wintercreeper, oxalis rubra	Model I: Robinia pseudoacacia+ goldenrain tree+ paulownia+ german oak+ gingko-hibiscus+ oleander+ amorpha fruticosa+ sweet-scented osmanthus -alfalfa+ procumbent juniper+ wintercreeper; Model II: pistacia chinensis bunge+ soapberry+ zelkova schneideriana+ german oak+ southern magnolia -pittosporum tobira+ pyracantha fortuneana+ amorpha fruticosa+ photinia serrulata-Bermuda grass+ procumbent juniper+ oxalis rubra
4	Thick-soil lowland remediation	Plant vegetations after simply clearing the rock pieces scattered on the surface, in case of local hardened surface soil, and	Arbors: metasequoia, Chinese ash, camptotheca acuminata, Ascendens mucronatum, catalpa bungei, weeping	Model I: metasequoia+ Chinese ash+ Ascendens mucronatum+ weeping willow+ poplar-osier+ amorpha fruticosa+

		plant after loosening the soil	willow, poplar, Ulmus parvifolia, Saliz matsudana, Chinese ash; shrubs: osier, euonymus japonicus, hibiscus, oleander, amorpha fruticosa; ground covers: Iris tectorum, canna, Lysimachia christinae, wintercreeper, trachelospermum jasminoide	euonymus japonicus- wintercreeper+ trachelospermum jasminoide+ canna; Model II: Ulmus parvifolia+ camptotheca acuminata+ catalpa bungei+ poplar+ Saliz matsudana+ Chinese ash-oleander+ amorpha fruticosa+ hibiscus-Iris tectorum+ Lysimachia christinae
5	Thick-soil slope remediation	Plant vegetations after simply clearing the rock pieces scattered on the surface, in case of local hardened surface soil, and plant after loosening the soil	Arbors: bischofia polycarpa, Cinnamomum camphora, german oak, goldenrain tree, soapberry, gingko, zelkova schneideriana, elm, deodar; shrubs: pittosporum tobira, hibiscus, amorpha fruticosa, sweet-scented osmanthus, photinia serrulata; ground covers: Radix Ophiopogonis, oxalis rubra, pink reineckea herb, zephyranthes candida, fatsia japonica	Model I: zelkova schneideriana+ german oak+ soapberry+ bischofia polycarpa+ gingko-pittosporum tobira+ amorpha fruticosa+ sweet-scented osmanthus-Radix Ophiopogonis+ zephyranthes candida+ oxalis rubra; Model II: deodar+ Cinnamomum camphora+ privet+ goldenrain tree+ elm-photinia serrulata+ amorpha fruticosa+ hibiscus-pink reineckea herb+ fatsia japonica+ Radix Ophiopogonis
6	Low-efficiency forestland remediation	First clear the site, remove the dead and falling trees within the site, and supplement new trees according to the specific condition of space under the forest. If needed, loosen the soil.	Arbors:zelkova schneideriana, german oak, soapberry, elm; shrubs: pittosporum tobira, amorpha fruticosa, photinia serrulata, peach tree, pear tree; ground covers: Radix Ophiopogonis, oxalis rubra, fatsia japonica	Model I: zelkova schneideriana+ german oak+ soapberry+ elm-pittosporum tobira+ amorpha fruticosa+ photinia serrulata-Radix Ophiopogonis+ fatsia japonica+ oxalis rubra; Model II: peach tree/pear tree (aimed at the fruit trees in the disadvantageous forestland)
7	General forestland	Such forestland is in good growth, and it is just needed to maintain the current situation.	/	/

Figure 5.1-1 Distribution Diagram of Environmental modification

石质坡地	Rocky slopes
垃圾封场堆地	Garbage yard
废料场堆地	Waste stacking yard
厚土低地	Thick-soil lowland
厚土层坡地	Thick-soil slopes
劣势林地	Disadvantageous forestland
优势林地	Advantageous forestland

保留建筑	Conserved building

List of greenway engineering contents and scale

Table 5.1-4

Serial no.	Item		Engineering contents and scale
1	Greenway engineering	Greenway 1	To arrange a line reasonably along both sides of the water system on the basis of water system connection in combination with the water system treatment works in the region, with a length of 5.7km, width 4.5m and greenway area 25650m2. To select colorized asphalt concrete and anti-corrosion timber to organically combine the water system landscape with the greenway function, and connect the existing wetland park, large water area, flower and tree transaction market, bonsai park and other landscape nodes effectively. It can also be used as the emergency fire fighting access of the forest area.
		Greenway 2	To construct the green land by virtue of the protective green land of the mountainous road, with a length of 6.0km, width 4.5m and green land area 26000m2. To select ecological resin concrete, sand soil and other soft pavement and combine the slow-traffic system with the mountainous landscape. To connect the relics of mass graves, picking garden and Mix City. It can also be used as the emergency fire fighting access of the forest area.
		Greenway 3	To combine the road protection green land system with the slow-traffic system of the greenway in combination with the greenway within the completed Shungeng Mountain Scenic Spot, 3.2km long (existing). It is an important connection to link the west area of No.1 and No.2 Grade 1 greenways.
		Greenway 4	To construct by use of the garden road protection green land and the water system branch protection green land, with a length of 0.7km, width 4.0m and greenway area 28000m2. Combining the road protection green land system, water system branch protection green land system and the greenway slow-traffic system with colorized asphalt concrete and anti-corrosion wood, it is an important connection to link the central area of No.1 to.2 Grade 1 greenways.
		Greenway 5	To construct in combination with the nine-hole road protection green land, with a length of 0.8km, width 3.5m and greenway area 28000m2. Combining the road protection green land system, water system branch protection green land system and the greenway slow-traffic system with colorized asphalt concrete and anti-corrosion wood, it is an important connection line to link the east area of No.1 to .2 Grade 1 greenways.
		Post 1	Level-2 post, constructed in the west road node of of the project, with a floor area of 500m2 and building area 280m2.
		Post 4	Level-3 post, constructed in combination with the broad water area of the project, with a floor area of 200m2 and building area 100m2.
		Post 5	Level-3 post, constructed in combination with the broad water area of the project, with a floor area of 200m2 and building area 100m2.
		Marking system	To construct one set in combination with the greenway marking system of Anhui.

		Lighting	Combine high-pole lamp with landscape lamp
2	Other works	Environmental sanitation and other supporting facilities	To arrange waste bins alternatively on both sides of the greenway at a distance of 50m away from the greenway.

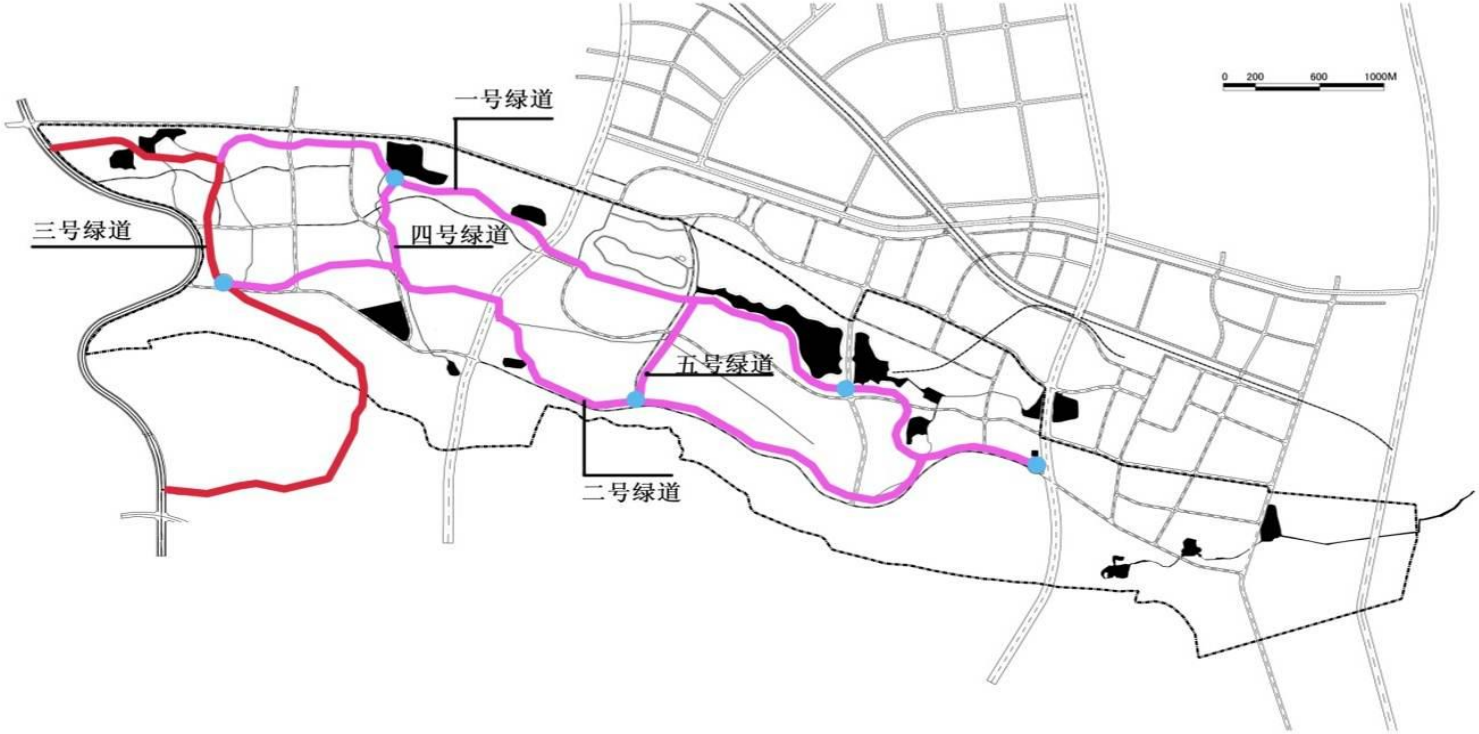


Figure 5.1-2 Greenway distribution diagram

一号绿道	No. 1 greenway
二号绿道	No. 2 greenway
三号绿道	No. 3 greenway
四号绿道	No. 4 greenway
五号绿道	No. 5 greenway

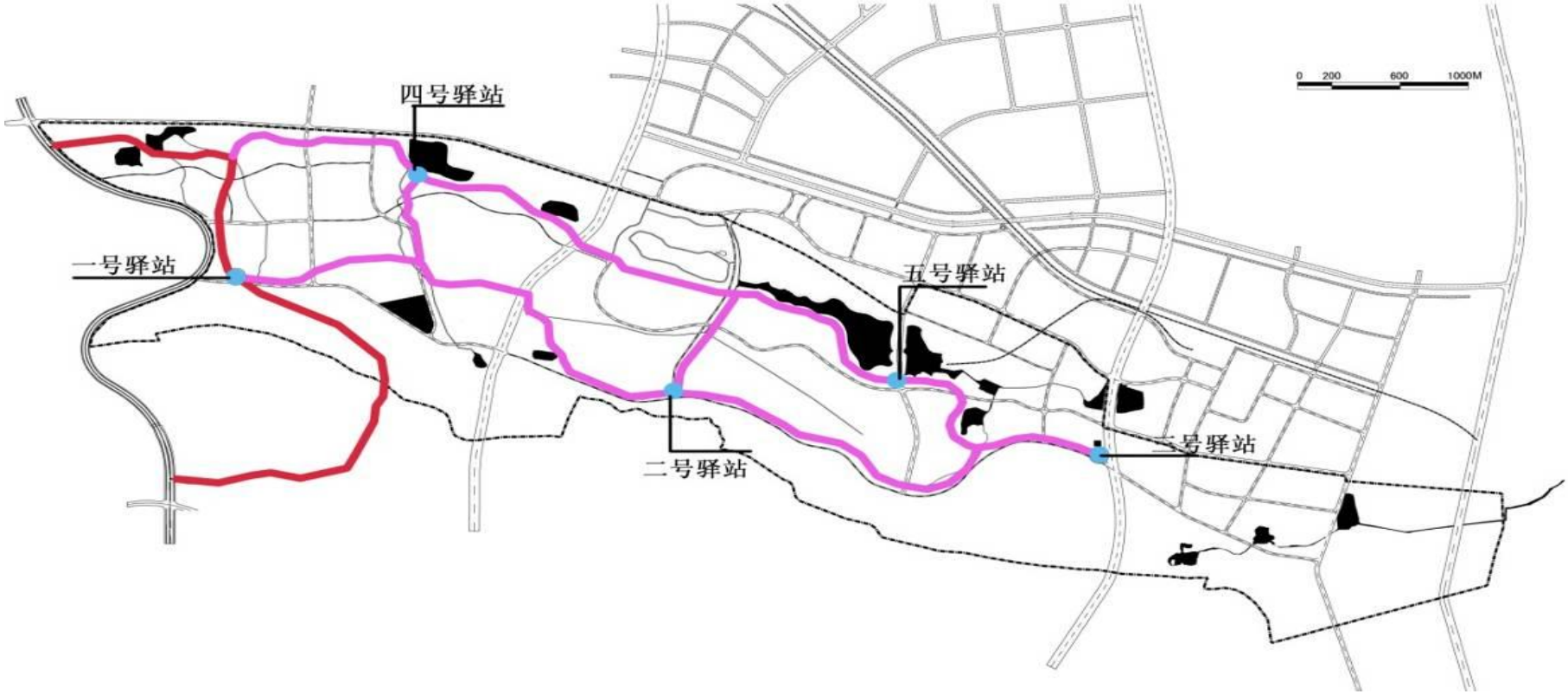


Figure 5.1-3 Post distribution diagram

一号驿站	No.1 post
二号驿站	No.2 post
三号驿站	No.3 post
四号驿站	No.4 post
五号驿站	No.5 post

5.2 Evaluation Degree and Range

5.2.1 Evaluation degree

The comprehensive treatment of the sustainable development project in coal mining subsidence area in the resource based city Huainan,will use the loan belongd to the uncontaminated cities of the World Bank's environment renovation project. It will refer to the Environmental Impact Assessment Technical Guideline for environmental impact assessment work of classification rules and project engineering scale, the pollution characteristics, the characteristics of regional environment, etc., and determine the scope of environmental impact evaluation degree and range.

1. Water environment

During the construction, the water pollution sources mainly come from waste water in the construction area and domestic sewage. The waste water mainly comes from cleaning stone in the construction site, and the pollutant are SS、COD and the petroleum. The domestic sewage mainly comes from SS、BOD、COD and so on.

There are 20 persons for construction. The emission of domestic sewage is about 2.4 m3/d,whose main pollutants are COD and BOD5. of about 200 mg/L and 120 mg/L respectively.

According to the project study report the production waste water mainly includes washing and mixing concrete, and sewage flow is 1.0 m3/d. Waste water does not contain toxic substances, and the main pollutants are suspended solids, and water quality is simple.

So, according to relevant provisions of the Assessment Technical Guideline Impact on Environmental - Water Environment (HJ/T2.3-93), the water environment is rated as level 3.

2. Atmospheric environment

In the construction work, atmospheric pollutants are mainly TSP. Because of the construction site condition, the construction stage, the management level, degree of mechanization, season, soil and weather condition, the difference is very big, especially the soil moisture content and the wind affect huge.

According to the grading and the environment characteristic of the Assessment Technical Guideline Impact on Environmental - Atmospheric Environment (HJ2.2--2008), the atmospheric environment is rated as level 3.

3. Environmental noise

The noise during construction mainly comes from machinery,transporting vehicles and so on. The main noise sources includes bulldozer, excavator, pave, roller, loader, bituminous concrete truck mixer and so on, and intensity of the noise source is 80~95 db (A).

The acoustic environment functional area is 2 class area in the The Standards of Acoustic Environmental Quality (GB3096-2008), and according to related rules of Assessment Technical Guideline Impact on Environmental- Sound Environment (HJ2.4-2009), this evaluation determines that sound level on environmental is rated as level

4. The ecological environment

The ecological impact assessment of the project is in table 5.2 1.

Grade table for assessing the ecological impact Table 5.2-1

Affecting regional ecological sensitivity	covering range of engineer		
	area≥20km2 or length≥100km	area 2km2-20km2 or length 50km-100km	area≤2km2 or length≤50km
Special biome	Class 1	Class 1	Class 1
Important biome	Class 1	Class 2	Class 3
General area	Class 2	Class 3	Class 3

The environmental restoration area in subitem composition is 3.98km2 , the area < 20 km2, the total length of the greenway is about 13.8 km, the length ≤50 km, and the ecological sensitivity of project area belongs to general area. According to the related rules of Assessment Technical Guideline Impact on Environment Ecological Environmental (HJ19-2011), the ecological environmental is rated as level 3.

5.2.2The evaluation range

Evaluation degree and range for each environmental factors are in table 5.2-2; Shun plow mountain is not affected by the project, and this project does not disturb landscape, water, vegetation of Shungeng Mountain Scenic Area.

Evaluation degree and range of environmental influence Table 5.2-2

Environmental elements	Degree	Range
Surface water	Calss3	In the area, the four having grooves are Datong having groove, Chenxiang having groove, Jiulonggang having groove, Sundian having groove；
Air	Calss3	the 200 m range on both sides of the greenway red line ；
Acoustic	Calss2	Green engineering the red line of road 200 m range，Service station shall be outside the range of 200 m;
Ecological	Calss3	In the project boundary outward expansion 200 m range；
Social	---	Jiugang town and Datong street of Jiudatong District in Huainan City; Jiugang town include Huaishun community, Chonghua community, Xinjian community, Hongqi community, Chenxiang village, Jiulonggang village, Datong street include Zhanhou community and Kuangnan community；

5.3 The environmental protection goal

There is no natural reserves、water source reserves、scenic areas and other special sensitive area and important sensitive area in the evalution range. The cultural relic in this area mainly includes three protection spots mass graves、secret reservoir、bunker dungeon and a remnants of a bunker of National Key Cultural Relics Protection Unitsof the ruins evidence of the Japanese invaders in Huainan. This project belongs to the ecological restoration project, and there is a large area of green belt isolation around the above mensoned cultural relics. In construction, the construction camps are far away from the cultural relics, and the construction process will not impact the cultural relics. The south of Shungeng Mountain in this area, belongs to the leisure tourist area of Huainan, and does not belong to nature reserves or scenic spot. The project does not affect Shungeng Mountain. Based on field investigation, environmental protection goal are shown in table 5.3 1, figure 5.3 1.

Environmental protection goal list
Table 5.3-1

NO.	Environmental elements	Environmental protection goal	Relative direction	Relative distance (m)	Scale(person)	Environment function target

1	Surface water environment	multiple subsidence pool, Datong having groove, Chenxiang having groove, Jiulonggang having groove, Sundian having groove；	---	---	Small ditches	The Environment Quality Standards on the Surface Water (GB3838-2002)Ⅴ standard；
2	Acoustic and air environment	Datong Social welfare institute（inside）	W	153(429)	410	class 2 district inSound Environment Quality Standards（GB3096-2008）; Ambient Air Quality Standards(GB3095-1996) and modified class 2 standard；
		Housing projects（inside）	E	12（110）	504	
		Funeral home（inside）	S	233（373）	57	
		Kuangbei village（inside）	N	132（502）	212	
		Wannan village（inside）	N	54（616）	120	
		The Christian church in Nanshan	N	47（90）	400	
		Sanyou village（inside）	NW	168（259）	30	
		Chongwen village（inside）	NW	244（260）	60	
		Xinjian community(outside)	N	236（723）	252	
		Chenxiang village(outside)	N	269（614）	3250	
		The occupational disease prevention Hospital in Mining group (outside)	W	247（796）	240 beds	
		Controlling disease center in Huainan (outside)	w	194（325）	130 人	
		Tumor hospital of Eastern hospital group (outside)	N	185（498）	710 beds	

Note: 1, The "sensitive targets in the acoustic environment, atmospheric environment protection targets, 200 m within the scope of the acoustic environment protection target, all of the environmental protection goal" to the atmosphere. 2, the relative distance outside the brackets is the nearest distance to the construction area of restoration, the data in bracket is the sensitive spot and is the nearest distance to the greenway construction.

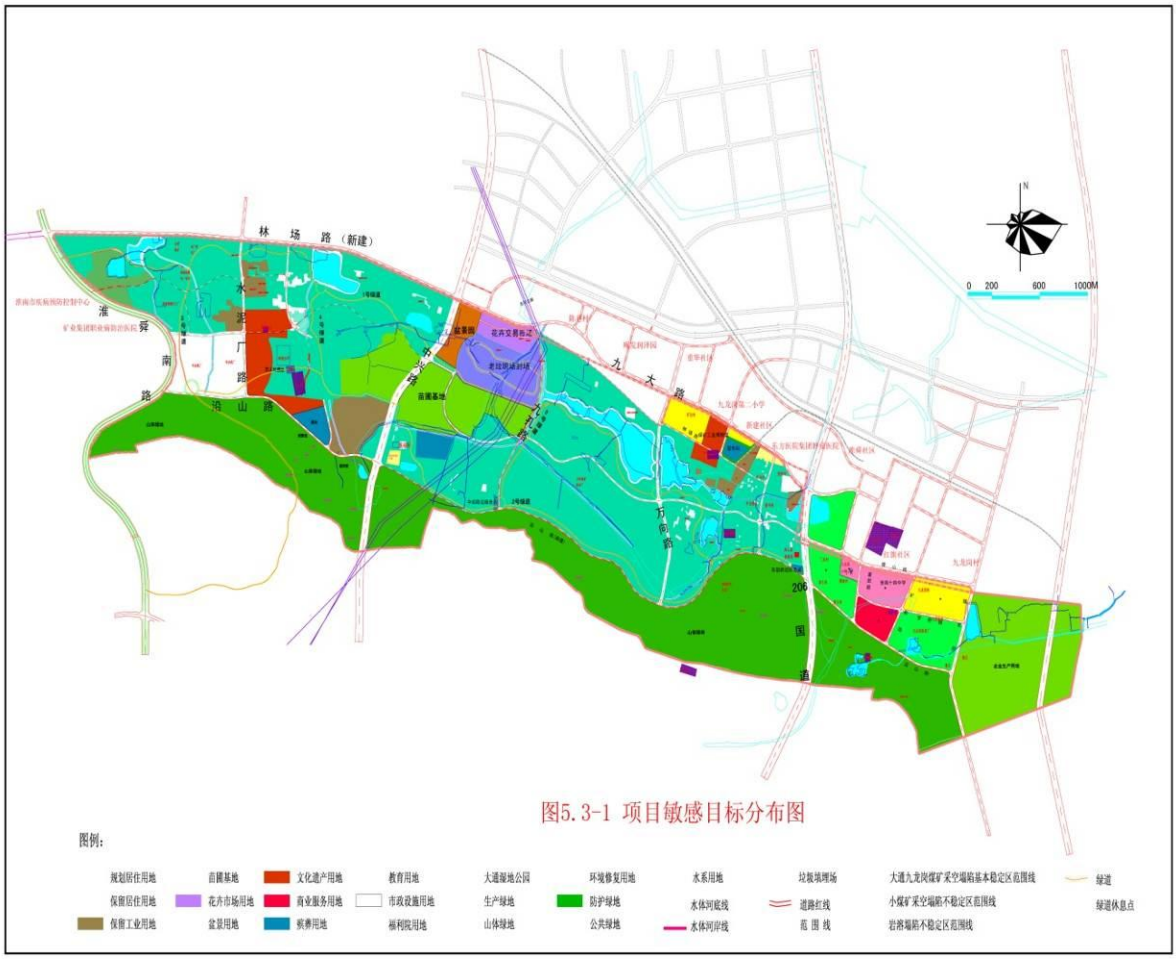


Figure5.3-1 Sensitive Target Distribution

图例	Key
计划居住用地	Planning residential land
保留居住用地	Reserved residential land
保留工业用地	Reserved industrial land
苗圃用地	Nursery land
花卉市场用地	Flower market land
盆景用地	Bonsai land
文化遗产用地	Cultural heritage land
商业服务用地	Commercial service land
殡葬用地	Funeral land
教育用地	Education land
市政设施用地	Municipal utilities

福利院用地	Welfare land
大通湿地公园	Datong wetland park
生产绿地	Production green space
山体绿地	Mountain green space
环境修复用地	Environmental remediation land
防护绿地	Green buffer
公共绿地	Public green space
水系用地	Water land
水体河底线	Bottom line
水体河岸线	Bank line
垃圾填埋场	landfill
道路红线	Boundary lines of roads
范围线	Range line
大通九龙岗采空塌陷基本稳定区范围线	Range line of Datong Jiulonggang coal mining subsidence basic stable region
小煤矿采空塌陷不稳定区范围线	Range line of small coal mining subsidence non-stable region
岩溶塌陷不稳定区范围线	Range line of karst subsidence non-stable region
绿道	Greenway
绿道休息点	Greenway rest points

5.4 Engineering analysis

5.4.1 Construction period

During the construction period of the sub-item, the site clearing, plantation and tree transportation in the environmental remediation, the greenway and post construction and material transportation in greenway building, will bring varying degrees of influence to the regional environment within certain period and to some extent. Such influence is short-term, and will disappear after the construction period.

During the construction period of the sub-item, to set up construction camps only for accommodation of the construction workers, and they shall have dinner outside.

5.4.1.1 Water pollution source

The waste water in the construction period includes construction waste water, and sanitary sewage of construction workers.

1. Construction waste water

Construction waste water refers to the flushing water with grease produced by various construction machinery and equipment, and the main pollutants include SS, COD and petroleum. This sub-item just flushes the transport vehicle, and water consumption quota is 100L/vehicle time, 10 times/d (the annual construction period is 300 days). The waste water

pollutants produced by vehicle flushing is shown in table 5.4-1.

Table of Waste Water Pollutants Produced by Vehicle Flushing
Table 5.4-1

Type	Item name	COD	SS	Petroleum
Vehicle flushing waste water (300m3/a)	Concentration (mg/L)	100	300	10
	Quantity (t/a)	0.030	0.090	0.003

2. Sanitary sewage

Sanitary sewage includes detergent wastewater and manure wastewater during the construction period. Since the construction workers do not have meal in the site, there is very little domestic water consumption.

There are 20 construction workers in the construction period of the sub-item, and the water consumption quota is 150L/ (cap·d), the pollution discharging coefficient is 0.8. Sanitary sewage discharge quantity is 2.4m3/d, 720m3/a. The concentration and quantity of main pollutants are shown in table 5.4-2

Main Sanitary Sewage List Table 5.4-2

Type	Item name	COD	BOD5	NH3-N	SS
Sanitary sewage (720m3/a)	Concentration (mg/L)	200	120	30	100
	Quantity (t/a)	0.144	0.0864	0.0216	0.072

3. Surface run-off

In construction, if there is heavy rainfall, the surface run-off may forms, and the main pollutant is SS. The volume of run-off and pollutant is related to rainfall intensity, sate of ground, etc., and is difficult to estimate.

5.4.1.2 Air pollution source

Air pollution sources in the subitem construction, include construction dust and tail gas of construction vehicles.

Construction dust mainly comes from the wind erosion dust of bare ground and bulk material storage yard, and dust of the transportation vehicle road. If the dust is not controlled, air pollution may occur. Therefore, the production and discharge of dust shall be effectively controlled.

1. Wind erosion dust

In the subitem construction, the bare ground and bulk material storage yard at site clearing can produce dust, particularly in dry and windy days.

When the grain size is 250um, the setline rate is 1.005m/s, and the main influence scope is within the close range of the down wind direction of dust source, while it is tiny dust particles that influence the external environment. In addition, the influence scopes will vary according to different site climates.

2. Dust of the transportation vehicle road

The vehicles used in the construction of subitem mainly include trees, stones, sands and other materials.

According to analogy survey, the dust caused by construction and transportation vehicles has large influence on the 30m of the road, and form linear pollution. The roadside TSP can reach over 10 mg/m3, and the general density is between 1.5-30mg/m3. Dust

caused by land grading mainly influence the scope within 50m.

3. Tail gas of construction machinery and vehicles

In the construction process, tail gas exhausted by various engineering machines and transport vehicles due to combustion of gasoline and diesel oil contains air pollutants, such as THC, particulate matter, CO, NOx, etc. and has certain influence on the construction site. According to related statistics, quantity of pollutant discharged by generally large engineering vehicles is CO, 5.25g/ (vehicle· km), HC, 2.08g/ (vehicle· km), and NO2, 10.44g/ (vehicle· km). In this project, only a few machines and vehicles are operated at the same time, and vehicles only exhaust a few tails gas, belonging to fugitive emission.

5.4.1.3 Source of noise pollution

In the subitem construction, noises are mainly generated by machinery equipment and transport vehicles, and the main noise sources including bulldozer, excavator, paver, road roller, loader, and commercial concrete mixer, etc. Refer to Table A2, Noise Source Intensity (Sound Pressure Level) of Common Construction Equipment, in Attachment A of Guideline on Environmental Noise and Vibration Control Engineering (HJ2034-2013), and see table 5.4-3 for the noise level of equipment generating noises.

Noise Source Intensity of Common Equipment Table 5.4-3

Equipment generating noises	Sound level/ distance [dB(A)/m]	Equipment generating noises	Sound level/ distance [dB(A)/m]
Bulldozer	83~88/5	Paver	80~90/5
Hydraulic excavator	82~90/5	Wheel loader	90~95/5
Various road rollers	80~90/5	Heavy vehicle	82~90/5
Concrete vibrator	85~90/5		

5.4.1 Solid waste

In the construction of this subproject, the solid wastes areconstruction wastes and domestic wastes produced by constructors.

1. Construction wastes

Construction wastes are mainly crushed bricks, stones, and yellow sands generated in the construction, together with packing boxes and bags, etc. of various building materials. Their quantity varies with the work amount of construction and thus cannot be quantified and estimated.

2. Domestic wastes

In this subitem, construction camps are established on the construction site (without a mass hall). There are 20 constructors and the quantity of their domestic wastes is 10kg/d,3.3t/a if it is calculated as 0.5kg/person ·d. The construction of this subject lasts for three years and seven months, so the total quantity of domestic wastes is 12.0t during the construction period.

5.4.2 Operation period

This subitem belongs to an ecologic project and the main pollution source in the operation period results from the use of insecticide and garbage discharged by tourists on the greenway. Based on the project design, garbage cans are set to collect garbage from tourists at an interval on both sides of the greenway.

5.5 Environmental Impact and Mitigation Measures during Construction

5.5.1 Water Environment

5.5.1.1 Water environmental impact analysis

In the construction period, wastewater mainly includes construction wastewater and domestic sewage discharged by constructors, etc.

1. Construction wastewater

Construction waste water generated in construction includes: oily cooling water and wash water, etc. generated by various construction machines and equipment. Key pollutants in the wastewater generated by machinery equipment include COD, SS, and petroleum pollutants. If oily wastewater is directly discharged by construction machinery into the water, it will be easy to form an oil slick on the water surface, causing difficult recovery of dissolved oxygen in the water and influencing the water quality; if it is arbitrarily discharge to the land, it will reduce soil fertility and change soil structure. Therefore, construction wastewater cannot be discharged directly without any innocent treatment. The construction unit shall strengthen maintenance and management of construction machinery and vehicles to prevent oil accidents.

In this project, transport vehicles are only washed to produce construction wastewater of 10m3/d, and the concentration of key pollutants is COD, 100 mg/L, SS, 300 mg/L, and petroleum, 10 mg/L respectively, with respective quantity of pollutants being COD, 0.030 t/a, SS, 0.090 t/a, and petroleum, 0.003 t/a.

Wastewater from vehicle washing is not discharged but recycled after treated in the cycle and treatment system (oil removal + precipitation) which is provided for the service rack at the site entrance.

2. Domestic sewage

According to the feasibility report, average number of constructors is 20 during the subproject construction , with water consumption per capita being 0.15m3/d, so the total water consumption on the construction site is about 3m3/d. The volume of domestic sewage discharged is about 2.4m3/d, and key pollutants in the domestic sewage include organic matter and pathogenic micro-organisms, with COD being 200mg/L, BOD5 120mg/L.

5.5.1.2 Water pollution protection measures

1. The field operation wastewater

In the construction process, key pollutant in the oily wastewater is petroleum. To construct a catch drain in the construction machinery or vehicle repair and maintenance place to collect wash sewage from the overhaul, and at the same time, set an oil separator for oily wastewater treatment. The wastewater shall be recycled without outward discharge. It is strictly prohibited to directly discharge the wastewater generated during the construction period to nearby river or pond, which shall be isolated from the construction area by taking certain measures.

2. Domestic sewage from construction workers

To establish construction camps, where constructors get accommodation only and have meals outside the camp. The latrine pit shall be constructed on the site and faeces wastewater will be used as agricultural fertilizer by residents in the area. Wash wastewater from constructors shall not be discharged, and instead it shall be used for watering and dust prevention after precipitation (by using the same treatment facility with wastewater from car washing). The above measures will have very little influence to the water environment.

5.5.2 Ambient Air Environment

5.5.2.1 Air environmental impact analysis

1. Air environmental impact analysis of environmental remediation

Environmental remediation mainly refers to rocky slopes remediation, remediation of thick soil layer lowland and thick soil layer sloping field, remediation of inferior woodland, and remediation of superior woodland. The remediation of thick soil layer lowland, thick soil layer

sloping field, and inferior woodland only refer to the partial cleaning of stones and loosing of the soil, and the planting of trees; it is mainly the manual operation, so it only has a small atmospheric environmental impact. The main construction equipments for the remediation of rocky slopes are excavators and a few transport vehicles. In dry weather, the raise dust may be caused in the construction process; owing to the small disturbance to the earth's surface by the construction, and the timely forestation, so the raise dust in the construction site has little effect on the atmospheric environment.

2. Environmental impact analysis of greenway construction in the construction period

(1) Impact of raise dust on the construction roads

In the greenway construction process, all the ground vegetation will be cleared, and the area within the red line scope of the road design will be exposed; so the raise dust will appear on the bare surface when the weather is dry and the wind speed is large. During the construction phase of the project, the construction activities such as the excavation and filling earthwork will produce the raise dust. According to the raise dust monitoring results at the construction sites of the same type of road construction, in dry weather without sprinkling water, the TSP concentration at 100m and 200m away from the construction site is respectively 0.53 mg/m3 and 0.30 mg/m3; therefore, the impact of the raise dust in the construction site on the atmospheric environment mainly concentrates within the scope of 200m on both sides of the construction road, so the impact of construction dust on the atmospheric environment must be reduced by taking several methods.

(2) Raise dust on the road for transportation

There are many factors causing the raise dust on the road for transportation, and they are mainly related to the vehicle speed, wind speed, the amount of road dust, road dust humidity, and the thickness of ground dust; the wind speed and road dust humidity directly impact the yield of raise dust and the transmission distance. According to the relevant analogy survey, the dust concentration being close to the ground at the construction site can reach 1.5-30mg/m3. The adopting of measures such as sprinkling water can greatly reduce the impact of raise dust of the roads and the waste soil area on the environment. See the test results of sprinkling water for reducing dust on construction road in Table 5.5-1.

Test results of sprinkling water for reducing dust on construction road Table 5.5-1

Distance from the side of the road (m)		0	20	50	100	200
TSP (mg/m3)	No sprinkling	11.03	2.89	1.15	0.86	0.56
	Sprinkling	2.11	1.40	0.68	0.60	0.29

(3) Automobile exhaust

The exhaust discharged by large construction vehicles and construction equipment will has a certain influence on the ambient air quality around the construction area; however, because of the small traffic flow, the exhaust quantity of vehicles is quite limited, so the exhaust only has very little impact on the atmospheric environment.

(4) Asphalt fume

In this project, fumes which mainly contain THC, TSP and BaP will generate during the fusing, mixing and paving of asphalt on each road, of which, THC and BaP are hazardous substances, and will cause pollution to the air, and hurt the human body. However, in this project, the construction process evaluation requires to use commercial asphalt for the asphalt concrete, and not to set up asphalt mix plant; therefore, little asphalt fume will generate during the paving process, in the meantime, the asphalt paving adopts totally closed asphalt pavement vehicle for operating, which avoid the open-type work mode in the past, and fundamentally solve the problem of open-type paving vehicle pollution; on the road

surface of asphalt pavement, the asphalt fume discharging time is very short. Based on the domestic analogy analysis survey of the same type of constructions, during the asphalt paving process in the road construction period, (for the pollutant concentration) the benzopyrene concentration is generally lower than 0.00001mg/m3 50m away in the downwind direction, and the THC concentration is lower than 0.16 mg/m3 60m away in the downwind direction. BaP can satisfy the maximum acceptable emission concentration of the asphalt fume in the Comprehensive Emission Standard for Atmospheric Pollution (GB16297-1996), and has small influence on the ambient environment.

(5) Influence of roadbed materials mixing dust

Aggregates and concrete are easy to raise dust when mixing; based on the materials mixing analogy survey data, the influence scope of mixing dust is mainly places within 50m from the mixing site; the distance between greenway construction site and environment sensitive spot is 200m~500m, so that the construction dust has small influence on the sensitive spots. Despite of such small influence, necessary measures of dust prevention must be taken during the construction stage, so as to mitigate the influences of materials mixing on the ambient air.

3. Environmental impact analysis during post house construction period

(1) Exposed dust raising influence in the field

When constructing the post house, level the ground first, clear away the weed on the ground to expose the earth's surface; wind erosion and dust raising will occur in dry weather; due to small floor area of the post house, the dust raised is relatively limited, but measures still need to be taken to reduce the dust raising quantity.

(2) Building construction

When stacking the aggregates which need to be packed in bulk during the building construction period, take necessary protective measures to reduce the influence of the wind erosion and dust rising of the materials in bulk on the environment.

5.5.2.2 Prevention measures of atmospheric pollution

1.Mitigation measures of atmospheric pollution for environmental restoration

(1) Partitioning implementation

Evaluation requirements: When environmental restoration is carried out in stony sloping field, firstly there should be a design organization to draft detailed designs for partitioning implementation. For implementation in a certain field, its vegetation should be recovered to reduce the exposion time of bare surface, prevent the appearance of massive bare land and decrease the generation of deflation and fugitive dust on the bare land. In dry weather or strong wind, water will be sprinkled on the bare land in due time to keep a certain humility on its surface. After relevant measures are taken, the evaluation holds that fugitive dust on bare land imposes little impact on regional atmospheric environment, nor will it impose polluting impact on the atmosphere of sensitive environmental spots.

(2) Measures of dust prevention for vehicle transport

When vehicles deliver muck, measures of coverage should be taken to prevent dust flying and muck scattering with wind. Water should be sprinkled on transport roads at due time to reduce fugitive dust in the transport process. When flattening and clearing up are carried out in sections of mining pollution and bare stone, vehicles should be washed when they leave the construction site. Vehicle cleaning area should be necessarily set up and hardening should be done for the ground of cleaning area to avoid the situation where vehicles pollute the transported roads in cities with sediments entrained in wheels after cleaning.

2.Mitigation measures of air pollution in greenway construction

（1）Optimize construction plans and take measures of coverage

The construction plan is optimized to ensure construction excavation and muck can be backfilled on the spot or timely transported outwardly, and reduce the accumulation of muck and the appearance of fugitive dust. Temporary mounding yards should be covered with plastic sheeting or dust screen to decrease fugitive dust in the courts. Road materials in loose packing should not be piled in large amounts, and they should be covered with be covered with plastic sheeting or dust screen if necessary.

（2）Compaction and watering for dust suppression

As for greenway construction, firstly partitioning construction should be carried out. Compaction should be carried out with road rollers for soft land except pipe ditches. One section will be compacted before another one is constructed. Compaction measures should be carried out to decrease the amount of fugitive dust to the utmost. Sprinklers should be equipped before greenway construction and water is sprinkled on the bare land of the construction site and certain humidity should be kept to reduce fugitive dust.

（3）Vehicle cleaning

Because it's easy for transport vehicles to carry a lot of sediment, especially on muddy roads in rainy days after compaction of construction roads, the evaluation holds that vehicles should be cleaned when leaving the construction site. Equipment for vehicle cleaning should be set at the place where vehicles are leaving. Sprinklers can be used to clean vehicles to leave the construction site. Hardening should be done for the ground of cleaning area to avoid the situation where vehicles pollute the transported roads in cities with sediments entrained in wheels after cleaning.

（4）Take covering measures for muck vehicles

When muck is delivered outwards by vehicles, the first thing is to ensure of no scattering from vehicles. Coverage measures should be taken for musk vehicles to prevent fugitive dust from polluting the surrounding atmospheric environment through wind

（5）Prevention measures for pollution from pavement material production

As for construction materials for pavements of greenway, i.e. bituminous concrete or concrete, commercial bituminous concrete or concrete must be adopted. No bituminous concrete or concrete is allowed to be made or produced on the road under construction to erase the impact on atmospheric environment in the process of production and manufacture of pavement materials.

（6）Mixing operation of roadbed materials

As for mixing operations of roadbed materials, firstly humidifying treatment should be carried out for materials to be mixed to the extent when no dust is raised from mixing. It's forbidden to directly mix loose and dry roadbed materials to reduce the impact of dust on atmospheric environment when mixing materials.

3.Mitigation measure of atmospheric pollution from construction of courier stations

（1）In order to prevent possible impacts of fugitive dust from bare land on the atmospheric environment, after field formation of courier station's ground, compact measures should be timely taken. In dry weather, water should be sprinkled on bared land to reduce the amount of fugitive dust from the ground.

（2）Coverage measures should be taken for materials in bulks, or measures of water sprinkling should be taken in due time to the amount of fugitive dust from materials in bulk.

（3）Concrete from construction

Commercial concrete should be used for construction of courier stations with no mixing plant set up at the construction site.

5.5.3 Acoustic environment

5.5.3.1 Analysis of effect from noise environment

Environmental restoration is mainly about clearing off storage yards of wastes, greenway construction and construction of three courier stations. In the environmental restoration, the construction machinery mainly refers to excavators, bulldozers and transport vehicles with mainly construction with machinery. See Table 5.5.2. Because there are no sensitive environmental spots within 200m of the three courier stations, mechanical noises will not impose impact of noise pollution on sensitive environmental spots in the process of environmental restoration, greenway construction and courier station construction.

Impact distance of main machinery in construction period Table 5.5-2

Equipment for noise making	Noise level [dB(A)]	Distance (m)	GB12523—2011Standards	
			In the daytime	In the nights
			70 dB(A)	55 dB(A)
excavator	82～90	5	60～100	135～175
bulldozer	83～88	5	65～90	140～165
concrete vibrator	85～90	5	75～100	150～175
Camion	82～90	5	60～-100	135～175
Road roller	80～90	5	50～100	126～175
Loading machine	90～95	5	100～125	175～199
Pavers	80～90	5	50～100	126～175

5.5.3.2 Mitigation measures for noise environment effects

Because there are no environmental sensitive sites around places of environmental restoration, construction noise doesn't have an effect on the environmental sensitive sites. In the period of project construction, high noise equipment, like pavers, and concrete vibrators should be avoided from operation in the night. The construction unit should strictly implement Emission standards for environmental noise in construction field GB12523—2011Standards (GB12523—2011), i.e. Daily 70 dB (A)

5.5.4 Solid wastes

5.5.4.1 Analysis of solid waste on environmental impact

This subitem consist of solid waste mainly produced in the construction period, specifically household garbage, construction waste and muck brought about by constructors, etc.

(1) Household waste

It's estimated that the average number of constructors in the construction period is 20. On the basis that each person dispose of 0.5kg waste daily, the output of household waste is 10kg/d, and the construction lasts for 3 years and 7 months, totally 12t of household waste. Without proper disposal, household waste will impair environmental health and beauty. If abandoned in water, they will pollute air, so measures should be taken for timely clearing.

(2) Construction waste and muck

In the transport process, construction waste and muck will be sprinkled on both sides of road, which influences the environment of transport roads. So relevant measures should be taken to decrease construction waste and the adverse effects of transporting muck.

（3）Earthwork balance

See Table 5.5-3 for earthwork balance and flow direction in the construction period of this subitem.

Table 5.5-3 Earthwork Balance and Disposal Approach Unit: 10,000 m3

Project sections	Excavation	Filling	Call-in		Call-out		Borrow		Discard	
			Amount	Source	Amount	Usage	Amount	Source	Amount	Usage
Environmental restoration	61.54				4.12	Datong Old Dumpsite			57.42	1. Huainan Jingke Renewable Utilization Co. Ltd. will dispose of the construction waste in the project region; 2. Huainan Angrui New Walling Co., Ltd. will dispose of coal ash and gangue in the project region;
Renovation of water system	59.16	42.91			16.25	Datong Old Dumpsite, Project of road and pipe network				
Renovation of dumpsites	3.59	16.92	13.33	Renovating area of water system and environmental restoration						
Road and pipe network	14.00	20.06	6.06	Renovation of water system						
Land development and utilization	2.38	5.30	2.92	Environmental restoration						
In total	140.67	85.19	22.31		20.37				57.42	

As an independent construction part, the clearing work of wastes in the storage yards in the construction period of this project is completed with the organization of the People's Government of Datong District with costs paid with supporting funds of the project. According to site survey, there are 21 places to store solid waste with total storage around 615, 393m3. And the stored wastes mainly include gangue, coal ash and construction waste, etc. Besides,

there is also scattered storage of household wastes with storage amount about 4,120 m3.

Household wastes will be delivered to Datong Old Dumpsite. The clearing and digestion work of coal ash and gangue will be completed by Huainan Angrui New Walling Co., Ltd. as raw materials for production. The reception unit has already provided the commitment letter for reception. And the clearing and digestion work of construction waste will be completed by Huainan Jingke Renewable Utilization Co. Ltd. as raw materials for production. The reception unit has already provided the commitment letter for reception.

5.5.4.2 Measures for pollution control of solid waste

Household wastes shouldn't be disposed randomly, and the construction unit should reinforce its management of household wastes in the working areas with different dustbins set along. The unit should also entrust the local department of environmental sanitation to transport wastes to the landfill for sanitary landfilling. Medical liquids like Miehailing should be constantly spread around the dustbins in the construction site to prevent propagation of flies and other pests, and mitigate the adverse effects of household wastes on the water environment of the construction area and household sanitation of constructors.

The construction unit plans to recycle leftovers of construction materials, broken or incomplete rebars, broken steel tubes, packing strings, and wasted equipment; the wastes like soil and stony sand will be used as raw materials for road building in nearby villages; and construction wastes should be piled centralized and used for filling materials of foundation after timely collection. Packing cases and bags from various construction materials should be stored respectively by persons assigned specifically, and transported to salvage station for recycle. The disposal plan for removed construction waste should be implemented after reporting to relevant administrative department of Huainan, and then carried away from the construction site timely. In the construction period, measures of containment and coverage should be taken for muck by strictly following relevant stipulations to avoid or reduce effects of earthwork scattering on the environment in the delivery process. In addition, main roads in urban areas should be avoided to select secondary roads for transport.

After completion of the project, the temporary facilities in the construction site will be removed, and clearing work will be carried out timely in parking lots of construction machinery, make-up area of rock blocks, integrated warehouse as well as offices and living areas. The construction waste and various sundries should be cleared, Household wastes, outdoor houses, sinkholes must be flattened after clearing, and sterilization should be done with carbolic acids and calcined lime for good recovery of construction areas.

5.6 Environmental impact and mitigation measures in operating period

5.6.1 Water environment

To ensure survival of plants, sufficient water irrigation should be guaranteed for vegetation for environmental recovery with in one year from planting. According to researchable reports, the area in need of human-induced restoration amounts to 373.97hm2. By the annual construction plan, the restoration area to be implemented in 2017, 2018, and 2019 is respectively 124.97 hm2 and 136 hm2 and 113 hm2.

The formula for annual water demand of vegetation for environmental restoration: Water demand=water consumption in forest land – effective precipitation

According to relevant research literature, water consumption of composite phytocenosis of arbor is 3.57L/㎡/d, i.e. the annual water consumption in every cube is 1.3m³. The coverage degree of composite phytocenosis of arbor is about 85%～90%. The vegetation restoration model in environmental restorage generally adopts the modal of composite phytocenosis of arbor. This is also in consideration of the ecology of restoration. Besides, the

annual precipitation in Huainan is 928mm.

Therefore, it can be examined that the annual water consumption in a single year for implementation of subitem of environmental restoration

2017：1.3m³/㎡/a×1249700 ㎡×0.85-1249700 ㎡×0.928m×85%=398342 m³

2018：1.3m³/㎡/a×1360000 ㎡×0.85-1360000 ㎡×0.928m×85%=433500m³。

2019：1.3m³/㎡/a×1130000 ㎡×0.85-1130000 ㎡×0.928m×85%=360188m³。

As for restoring trees planted in the restoration area to be completed annual, manual water is provided to guarantee survival only in the year of planting, and no extra manual irrigation is needed from the second year from survival unless in extremely dry weather.

According to researchable reports of the project, water resources of usable surface water in the environmental water system of the project areas in the median water year account for 1,148,000m³, while its actual annually usable water storage is 1,148,000m³ after deduction of evaporation and leakage for 165,000m³ and reserved storage in the project area for 229,600m³. Seen from the bar chart of the scheduled plan for implementation of project construction, the time sequence of construction for nursery base is 2017-2018. As of the end of 2018 and the beginning of 2019, after acceptance of the project team of the World Bank, leasing will be carried out before entering the production phase of nursery.

Therefore, the annual water storage in the environmental water system in 2017 and 2018 will be used for environmental restoration of the year and can satisfy water consumption for environmental restoration. In 2019, with the premise of holding guarantee water of productive use for nursery as priority, there is still 504,300m³ to be used for environmental restoration in the environmental water system, which also can satisfy the water demand for environmental restoration of the year.

5.6.2 The atmospheric environment

Environmental restoration will impose no impact on the atmospheric environment in the operation period. Road for walking will be designed in the greenway project with no emission of vehicle exhaust, and road cleaning and keeping will be managed unified by the department of environmental sanitation at the municipal administration.

5.6.3 Acoustic environment

After environmental restoration, there are no noise sources in the operation period. Therefore, the evaluation holds that subitem formation of environmental restoration impose no adverse effect on the acoustic environment.

5.6.4 Solid waste

Dustbins are set every 50m on both sides of the greenway, which will be displayed alternately on both sides of the greenway to collect garbage from travelers. The department of environmental sanitation will come for scheduled clearing and delivery.

5.6.5 Ecology

This subitem is part of the ecological project and its pollution source mainly refers to usage of pesticide in the operating period.

According to researches into plant diseases and insect pests in the region, common plant diseases and insect pests in the region are: leaf spot of euonymus japonicas, stem rot and blackblight on euonymus japonicas, leaf spot, slug moth and lepidosaphes ulmi on photinia serrulata, powdery mildew, aphis and Ceroplastes on pyracantha fortuneana, Tinocallis kahawaluokalani on lagerstroemia indica, Histia rhodope Cramer on bischofia polycarpa, and Corythucha ciliate on Corythucha ciliate, etc. These pests generally have multiple generations in a year with severity of generating overlapping, complicated eating habits, danger to plentiful of plants, low requirements to the living environment, repeated

occurrence and other features. These diseased trees are mainly ones manually planted, so attentions should be paid to pest control and protection of these plants.

According to relevant requirements, pesticide with little impact on surrounding environment is adopted for pest control and protection. Refer to the chapters about evaluation of ecological impact for detailed information.

Chapter VI Environmental impact and mitigation measures of Subcomponent 2

6.1 Project overview

As a whole, the terrain of the project areas goes as high in the south and low in the north, and high in the west and low in the east with terrain conditions for connection of water systems. According to current terrain and features of water systems in the project area, it's determined to use partial connection based on the urban comprehensive plan. Mainly with each drainage ditch as the drainage unit to draft the water system of the project, there ultimately comes the system of water network with "five verticals, three horizontals and three lakes".

After completion of this subitem, the water system and the downstream discharge trend will be connected in the project area. According to the design plan, inundated area of the water system in this project is quite small, so it will not impose impacts on Chenxiang Drainage channel, Jiulonggang Drainage channel and Sundian Drainage channel, and water-fast trees and grass will be planted in the inundated area.

Water in the project area currently has a total area of 0.508km2 with the ratio of water surface at 4.3%. Relevant adjustments are made to the original plan of water system to increase some water surface to a certain extent. Among them, Chenxiang Drainage channel goes across the dumpsite and get close to 4 of the 6 coal mines of No.3 Area in Datong District. In order to avoid adverse impact on drainage channeles on mines and other mining facility and coal layers close to surface, the design averts Chenxiang Drainage channel from crossing Datong Old Dumpsite to going along the eastern side of the old dumpsite and downstream f along with Jiukong Road.

The ratio of water surface in the project area is 5.0% after implementation, i.e. the water covers an area of 56.03ha in the project area. See figure 6.1-1 for the layout of water system after planning.

The project in this subitem mainly includes dredging of water system, ecological slope protection and water storage structures.

6.1.1 Dredging of water system

1. Dredging plan

In consideration of all river way, dry water dredging method is recommended for dredging drainage channeles.

The dry water dredging method is suitable to unnavigable riverway with shallow water, narrow riverbed, which can be carried out by manual dredging, excavator dredging or dredging of hydraulicking units, etc. It can be dredged in layers so that it's easy to control the accuracy of dredging and have thorough effects with little water content in dredged sludge.

2. Sediment treatment and storage yards

In combination with the actual conditions of this project, the sludge cleared from riverway will be directly delivered to low-lying land near the water system within the areas of environmental restoration to improve soil, save applying quantity of fertilizers and increase the crop output. The sludge accounts for 7,680 m3.

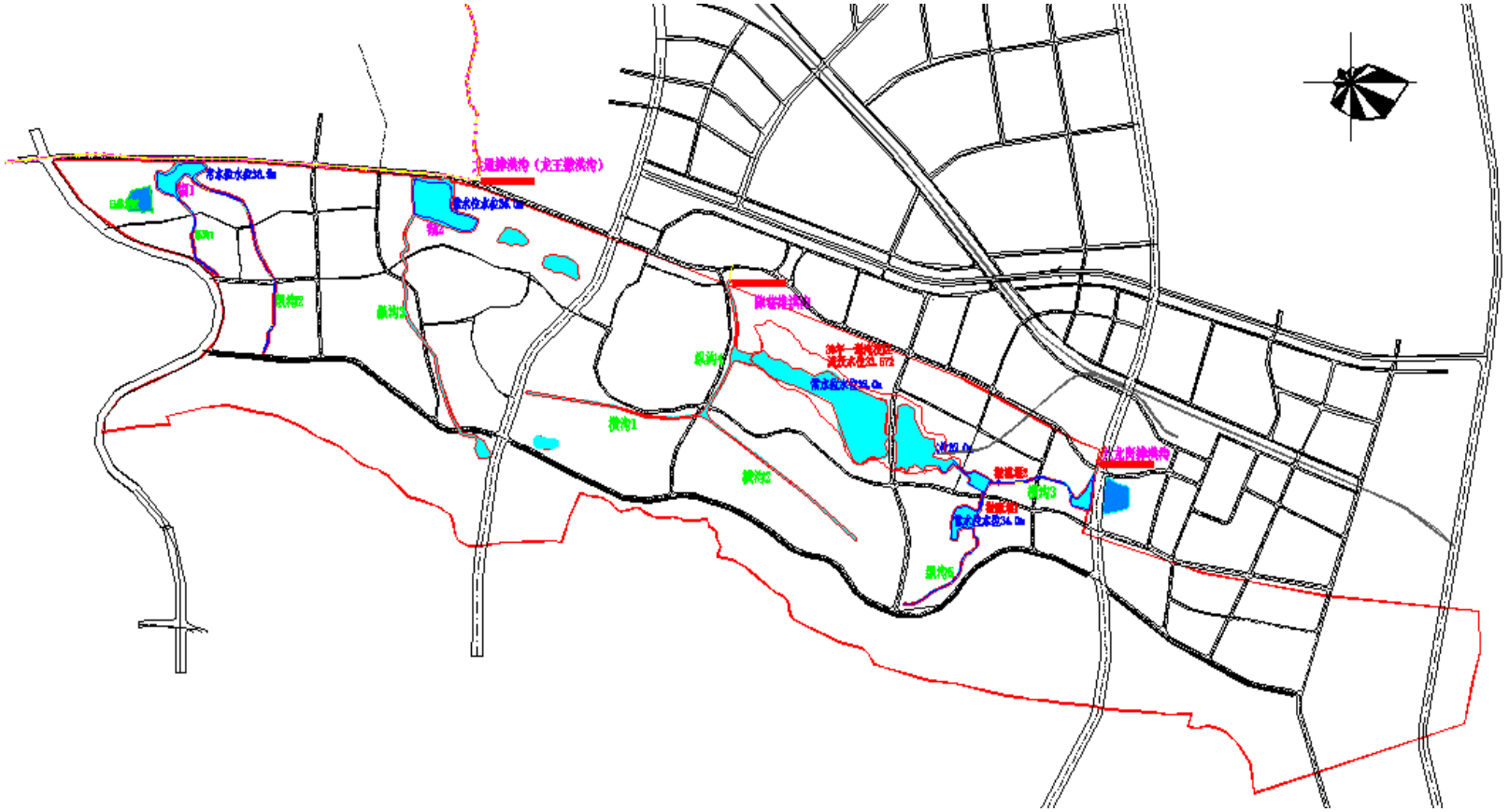


Figure 6.1-1 Layout for comprehensive treatment and planning of the project's water system

3. Quantities of Stream Dredging

See table 6.1-1 for the list of project quantity of water system dredging.

Table 6.1-1 Quantity of Water System Dredging

Channel Name	Sub-Channel	Length(m)	Dredging Amount (10,000m3)	Excavation Amount (10,000m3)	Filling Amount (10,000 m3)	Remarks
Datong Drainage channel	Vertical Furrow 1	580	0.088	1.22	0.21	Widening, dredging
	Vertical Furrow 2	1255	—	2.63	0.33	Widening
	Vertical Furrow 3	1613	—	3.55	0.35	Widening
Chengxiang Drainage channel	Transverse Furrow 1	1070	0.128	2.35	1.58	Widening, dredging
	Transverse Furrow 1	1164	0.136	2.68	1.95	Widening, dredging
	Vertical Furrow 4	833	—	3.18	0.65	Widening
Jiulonggang Drainage channel	Vertical Furrow 5	714	—	1.64	0.32	Widening
	Transverse Furrow 1	511	—	1.07	0.25	Widening
Water system of horizontal connection	Lake 1	—	—	7.36	5.32	Waters to the west of Cement Plant Road
	Lake 2	—	—	12.58	9.65	Waters to the east of Cement Plant Road and to the west of Zhongxing Road
	Lake 3	—s	0.416	24.62	22.30	Waters to the east of Zhongxing Road
In total		7740	0.768	62.88	42.91	

6.1.2 Ecological Embankment

In overall consideration of the subsidence area’s terrain, geology, currents, project costs, construction conditions, general layout of the water system planning and other factors, upstream lateral revetment structure adopts gabion mesh barricade, sod revetment, ecological block revetment and other revetment structures with good ecological features.

1. Revetment of gabion mesh barricade

Gabion mesh barricade is a kind of gravity-type barricade with the size of gabion mesh at 1.0m×1.0m×1.0m (length×width×height), and the barricade top is 1.5m away from the river bottom. There are totally two floors, with total width of the ground floor at 2m and the total width of the top floor at 1.0m. A layer of geotextile of 250g/m2 is laid behind the barricade.

2. Sod revetment

Sod revetment is the cheapest in costs with convenience in construction.

3. Ecological block revetment

The surfacing precast revetment bricks with design of unique buckles are adopted. With

the effect of currents, the surfacing will have good overall stability. The surfacing with high aperture ratio and flexible seepage structure can reduce the flow rate, decrease the fluid pressure and increase the drainability. Part of open pores can have the effect of seepage and drainage, and the effect of increasing vegetation area and beautifying the environment.

4. Project quantity of ecological slope

See table 6.1-2 for the list of project quantity of ecological slope

Table 6.1-2 Quantity of water system rehabilitation

Channel name	Sub-Channel	Length（m）	Revetment quantities（㎡）	Revetment form
Datong Drainage channel	Vertical Furrow 1	580	6960	1:2 ecological block revetment
	Vertical Furrow 2	1255	15060	1:2 ecological block revetment
	Vertical Furrow 3	1613	19356	1:2 ecological block revetment
Chenxiang Drainage channel	Transverse Furrow 1	1070	12840	1:2 ecological block revetment
	Transverse Furrow 2	1164	13968	1:2 ecological block revetment
	Vertical Furrow 4	833	9996	Revetment of gabion mesh barricade
Jiulonggang Drainage channel	Vertical Furrow 5	714	8568	1:2 ecological block revetment
	Transverse Furrow 3	511	6132	Revetment of gabion mesh barricade
Regulating surface	Lake 1	796	4776	Sod revetment
	Lake 2	1230	7380	Sod revetment
	Lake 3	5431	32586	Sod revetment

6.1.3 Water retention structures

The standard height for the ordinary level of Lake 1 is designed at 36.5m, and 35.0m for Lake 2 and 32m for Lake 3. In order to keep normal pool level where there is surface dispersion, facilities for water blocking and storing is required to be set at suitable places. Meanwhile, as the vertical slope of drainage channel is quite big, in drought periods, channel surface will be very low and channel bottom will break the water surface, thus severely imfluencing the overall ecological effects of channels. In order to reach the hydrophilic effects and ecologically natural revetment form, facilities for water blocking and storing is required to be set at suitable places to ensure the lowest water level will not be lower than 0.3m in drought periods.

In combination with planning in the project area, common water elevation, positioning of project functional zones, 2 tumbling bays are designed. See figure 6.1-2 for details. Inside the tumbling bay, there is a 500×500mm paddle to faciliate water supply to downstream arears and maintenance after excavatioin.

Table 6.1-3 parameters of overflow weirs

Overflow weir	Upstream weir height（m）	Elevation of upstream weir bottom（m）	Elevation of downstream weir bottom（m）	Elevation of weir top（m）	Length（m）	Width（m）
Overflo	2.2	30.0	29.5	32.0	15.0	10

w weir 1						
Overflow weir 2	2.0	32.0	30.0	34.0	16.0	10.5

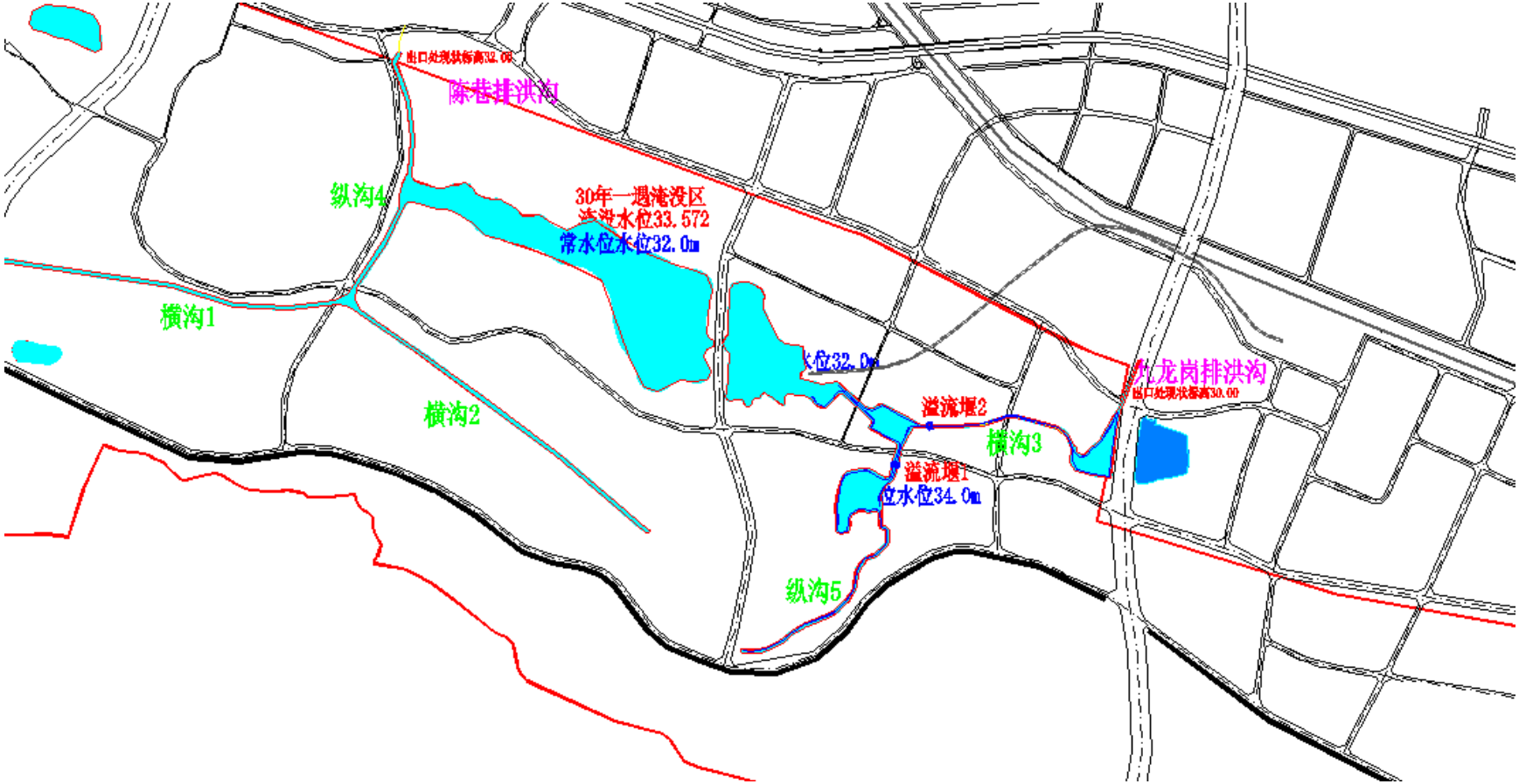


Figure 6.1-2 Layout of water retention structures

6.2 Comparison of Alternatives

6.2.1 Dredging Method

Currently there are mainly two methods for sediment dredging in riverway at home and abroad, one is the dry-water dredging method after draining water, and the other is water dredging with sediment directly excavated underwater.

The dry-water dredging method is suitable for unnavigable riverway with shallow water and narrow riverbed which can be carried out by manual dredging, excavator dredging or dredging of hydraulicking units, etc. Its advantages lie in: dredging in layers, ease for control of dredging accuracy, thorough dredging, and visual control, examination and acceptance of construction quality. Besides, dredged sludge will be low in water content and residual water will be little when sludge is stored with little perturbance into water quality of regional water systems. In terms of environmental protection, it can help protect the water quality in the system. Its disadvantages lie in: construction must be carried out in non-flood seasons and it costs more to build cofferdam and drain water.

It can be dredged in layers so that it's easy to control the accuracy of dredging and have thorough effects with little water content in dredged sludge.

The water dredging method is suitable for riverway with navigable requirements, deep water and wide riverbed. Common dredgers, environmental suction dredger and underwater sediment remover can be used.

The project area belongs to subsidence region with water quality of big V type of low quality. Large dredging perbutances in the construction period will impose great influence on the water environment along with no navigable functions, narrow riverbed and shallow water. So in consideration of the features of this project riverway, the dry-water dredging method is recommended for dredging of drainage channeles.

6.2.2 Type of Embankment

Revetment of drain ditches is made up of vertical type and slope type. The design adopts vertical revetment in narrow segments, and vertical barricade +slope revetment in wide segments.

6.2.2.1 Revetment of vertical barricade

Scheme One: sludge-constructed gravity-type barricade is built manually with stone blocks, so its cost little; but its construction period is long with no guarantee of quality, hardening façade of barricade and poor ecological effects.

Scheme Two: Ecological block barricades are mostly solid block ones with no space for vegetation on the barricade or small holes formed with combination of blocks, so the survival rate and coverage rate of plants are not high, and the stability of too small blocks is quite poor.

Scheme Three: Stake revetment refers to the act with which to infiltrate pin stakes with diameter around 0.5m into the bankets of foundation to block soil. The depth for stakes to be infiltrated into the foundation is not smaller than 2m. Pebbles and geotextile will be filled between pine stakes and backfilled soil on the slop as the refiltering layer. When water flows, aquatic plants will grow out of cracks of pebbles to purify water.

Scheme Four: Revetment of gabion barricade is built with metal net cages as the retaining wall and stuffing as loose materials, which form quite a number of holes to facilitate water discharge from holes in refilled soils of brickwork and revetment solum. Once water immerses into the solum, it will be drained out quickly with brickwork to effectively reduce the underwater level and decrease underwater pressure behind the barricade and under slopes. Compared with barricades of other types, gabion barricade has the advantages of possibility to grow aquatic plants in holes of barricade, good ecological features, low costs and

resistance from destruction for large transformation.

Scheme Five: Revetment of piled rocks refers to the one formed by piling up large stones or pebbles on the basis of casting sludge stones at the banket of riverway. Gravels will be filled into the space between stones, making it the growing place of aquatic animals and plants and help exchange and circulation between soil and steam. Revetment of piled rocks is formed by laying geotextile at the banket, and then randomly piles up numerous blocks with margins curved and natural. Afterwards, a layer of planting soil is scattered over it to fill the gap between stones. After water becomes dry, it's easy for plenty of aquatic plants to appearance.

Scheme One is the traditional barricade, and its wall materials are sludge blocks with no vegetation on vertical hardened walls and poor ecological effects; Scheme Two's ecological barricade can achieve part greening and high speed of construction; Scheme Three use stake revetment to block soil with raw stakes. The space between raw stakes and soil behind walls can be used to plant aquatic plants, thus help it totally blend it into ecological water environment; in Scheme Four, gabion revetment quite suit differential settlement of the foundation, and the multiple-core structures provides good planting base for growth of plants; In Scheme Five, revetment of piled rocks uses the weight of rocks to block soil, and the multiple-pore structure on walls can be used to plant aquatic plants, thus achieving natural revetment structures.

By combining the above analysis, because the project lies in subsidy region with potential for differential settlement of ground, the design adopts respectively barricade structures of Schemes Three, Four and Five according to different locations.

6.2.2.2 Slope revetments

Sod revetment has the lowest construction cost, but is liable to the human and animal damages and biological impact, and is of poor anti-erosion property.

Scheme One: Sod revetment costs the least, but it's easy to be destroyed by human and livestock with biological influence and poor erosion resistibility.

Scheme Two: Stone pitching includes dry stone pitching and sludge stone pitching. Stone pitching can usually make full use of local materials. Rough and uneven surface make great friction with water, thus imposing certain effects of wave easing. Meanwhile, stone pitching can well resist scours of waves and currents with strong adaptability. However, mechanized operations are forbidden and the pitching thickness is hard to guarantee with effects of local materials and stone dimensions.

Scheme Three: Ecological block revetment costs quite much, but with good integrity high intension and few effects from waves and currents, mechanized operation is possible with short construction duration and strong deformability.

Scheme Four: Ecological sack revetment

Ecological sacks are materials with strong intensity and stable surface made with needles from a kind of non-woven geotextile fabrics (its main constituents are high-molecular polymer produced with special formula--- polypropylene) into nets. Ecological sacks become a unified stress structure linked through joining shackles, thus providing reliable protection to slopes. Meanwhile, as a soft structure, it can tolerate certain distortion and settlement. After ecological sacks are filled with soil, they will be tied with ribbons or strings, and form an ecological retaining wall with sequential placing. This can, on one hand, green and beautify the environment through vegetation, and on the other hand, protect slopes by providing effective slope protection, and acting as revetment for river banks, mines, expressways and ecological banks.

Scheme One is a traditional form of revetment. Though it costs little, but it has poor protective properties, unable to completely resist the washing of currents; Scheme Two has poor ecological effects. With no vegetation planted on the surface, the revetment does not

coordinate with the surroundings; Schemes Three and Four are both ecological revetments. Plenty of space in the revetment provides suitable conditions for the growth of aquatic animals and plants, and actually blending the revetment and surrounding natural environment, which is consistent with our goal of river control.

With synthesis of the analysis above, As for the water system in this design, the area above the vertical barricade has weak washing capacity; though ecological sack revetment has strong erosion resistibility, it costs much and the construction is rather complicated; vegetation blanket revetment and the revetment of three-dimension vegetation net cost low with high speed of construction, thus satisfying requirements for erosion resistance with good coordination of its soft structure and slope plants. It's planned to adopt Schemes One and Three.

A revetment of drain ditches is made up of vertical type and slope type. The design adopts vertical revetment in narrow segments, and vertical barricade +slope revetment in wide segments.

6.3 Evaluation Rating and Evaluation Scope

6.3.1 Evaluation Rating

Resource-based city (Huainan city) sustainable development engineering coal mining subsidence area comprehensive treatment using world bank loan project belongs to nonpolluting urban ecological environment renovation project. Referring to the factors: the relevant regulations about environment affecting evaluation grading in " Environment Influence Evaluation Technique Guide Rule" , project scale, pollution characteristics and the environmental characteristics of the area, we determine the evaluation rating and evaluation scope of the environmental impact.

1. water environment

The main water pollution sources during the construction time are the construction wastewater and domestic sewage in the construction area, and the remained water caused by the ooze heaping. Desilting and downflow weir construction will disturb the water body. However, it will turn better with the completion of the construction.

The construction wastewater mainly comes from the stone cleaning in the construction site. The pollutants are SS, COD, petroleum, etc. The main pollutants of domestic sewage are SS, BOD, and COD etc. The remained water of the silt yard will be discharged into the near ditches. Referring to the design documents, if the remained water volume is calculated by the 50% of the yard volume, the total remained water volume is about 4,800 m3.

There are 20 construction workers. The discharge amount of domestic sewage is about 2.4m3/d. The main pollutant of the domestic sewage, COD, is about 200mg/L, and BOD5 is about 120mg/L. According to the researching report of the project, the production wastewater mainly includes ballast washing and concrete mixing. Sewage discharge amount is 1.2m3/d. The construction wastewater of this project doesn't contain toxic substances. The main pollutants are suspended solids. The water quality is simple. The bottom sludge of the water system in the project area hasn't been polluted. The main pollutant of the remained water is SS. The remained water after precipitation is discharged to the near water and produces minor influences.

Therefore, according to the relevant regulations of "Environment Influence Evaluation Technique Guide Rule- Water Environment" (HJ/T2.3-93), the evaluation rating of water environment is level 3.

2. Atmospheric environment

In the process of the construction, main atmospheric pollutant is TSP. The pollutants

varies greatly in different working conditions at construction site, the construction phase, management level, degree of mechanization and the construction season, soil, weather conditions. Among these factors, soil moisture content and wind power have the greatest impact.

The odor pollution will be inevitable in the process of dredging. According to analogy analysis, the intensity of odor is about grade 2 ~ 3, whose main components are NH3 and H2S. In the dredging process, odor will be obviously smelt on both sides of the river and river coast. The intensity of odor will reach grade 2 beyond 30 meters with a slight odor, which is below the limit standard for odor intensity (grade 2.5 ~ 3.5). There is almost no smell beyond 50 meters. In the silt yard designed as the landscape greenbelt, odor may be produced before the implementation of earth backing and greening and its influence scope is about 50 meters.

Atmospheric environmental assessment level is level 3 on the basis of the division of assessment levels in Guidelines for Environmental Impact Assessment Atmospheric Environment (HJ2.2--2008) and the environmental characteristics (relatively flat open terrain) of project location.

3. Environmental noise

During construction period, the noise mainly comes from mechanical equipments for construction and transport vehicles, etc. The main noise sources include bulldozers, excavators, loaders, water pumps, concrete mixer trucks, self-discharging trucks, etc. The intensity of noise source is 80 ~ 95 db (A).

The functional area for acoustic environment where the project construction is located belongs to area of class 2 according to Environmental quality standard for noise (GB3096-2008). Moreover, in the light of Guidelines for Environmental Impact Assessment Acoustic Environment (HJ2.4--2009), assessment levels of acoustic environmental impact belongs to level 2.

4. Ecological environment

Division of ecological impact assessment levels are shown in the table 6.3-1

Table for Division of Ecological Impact Assessment Levels Table 6.3-1

Region affected by Ecological sensitivity	An area of (water) range covered by the project		
	area≥20km2 or length≥100km	area 2km2-20km2 or length 50km-100km	area≤2km2 or length≤50km
Special ecological region	Level 1	Level 1	Level 1
Important ecological region	Level 1	Level 2	Level 3
General region	Level 2	Level 3	Level 3

The length of dredging river in sub-project is 7.740 km, length of the 50 km or less. Ecological sensitivity of the project area belongs to the general region. According Guidelines for Environmental Impact Assessment Ecological Environment (HJ19--2011), the ecological environment evaluation level is level 3.

6.3.2 The evaluation scope

The evaluation levels and scopes of environmental factors are shown in the table 6.3-2;

Evaluation Levels and Scopes of Environmental Impact

Table 6.3-2

Environmental	Evaluation	

factors	levels	The scope of impact
Surface water environment	Level 3	Datong flood drainage channel, Chengang flood drainage channel, Jiulong flood drainage channel, Sundian flood drainage channel, these four channels for draining off floodwater and water systems that have been improved in the project area.
Atmospheric environment	Level 3	Range of 200m on both sides of the dredged river course
Acoustic environment	Level 2	Range of 200m on both sides of the dredged river course
Ecological environment	Level 3	Outward expansion for 200m at the boundary of the project area.
Social environment	---	The town of Jiulonggang and Datong subdistrict office in Datong district of Huainan City; In the town of Jiulonggang, there are Huaishun Community, Chonghua Community, Xinjian Community, Hongqi Community, Chenxiang Village, and Jiulonggang Village. In Datong subdistrict office, there are Zhanhou Community and Kuangnan Community.

6.4 The objectives of environmental protection

There are no natural reserves, water protection areas, scenic areas and other special sensitive areas and sensitive areas within the scope of an evaluation. The cultural relics of project area including the national key units of cultural relics protection against Japanese criminal evidence ruins in Huainan, three protected places of mass graves, secret water reservoir and a water dungeon blockhouse and remnants of a bunker, this project belongs to the ecological restoration project, the cultural relics units surrounding had large green belt separation, when the project under construction, the camp will be far from the cultural relics units, no impact will be involved on the cultural relics in the construction process. The project area south is Shungeng mountain, belongs to the regional tourism and leisure in Huainan City, does not belong to the natural protection areas or scenic areas, the project will not produce adverse effects on Shungeng mountain. On the basis of field investigation, two sub projects of environmental protection objectives shown in table 6.4-1.

The environmental protection target list

Table 6.4-1

No.	Environmental factors	The environmental protection target	Relative Position	Relative Distance (m)	Scale (person)	Environmental functional target
1	Surface water environment	Many subsidence area reservoirs and four channels of Datong flood drainage channel, Chenxiang drainage channel, Jiulonggang drainage channel, Sundian drainage channel	---	---	Small ditches	"Surface water environment quality standard" (GB3838-2002) grade v;
		Gaotang Lake	W	5300	Large lakes	GB3838-2002 "Surface Water Environment Quality Standard "category Ⅲ of water body;
		The Huaihe River	N	8000	Large rivers	
2	Acoustic environment, atmospheric environment	Datong Social Welfare Institute (in the region)	W	43	410	"Grade 2 Area" in "Sound environmental quality standards" (GB3096-2008); "Ambient Air Quality Standards" (GB3095-1996)
		Horticultural Farm housing project (in the region)	E	360	504	
		Funeral home (in the region)	W	240	57	

		Kuangbei Village(in the region)	N	288	212	and standards II in its amendments ;
		Yuannan Village(in the region)	N	209	120	
		Nanshan Christian Church(in the region)	N	208	400	
		Chongwen village(in the region)	NW	463	60	
		Jiulonggang elementary school(in the region)	NW	481	600	
		Huaishun community (outside the region)	N	393	234	
		New community (outside the district)	N	339	252	
		Zhonghua community (outside the region)	N	394	274	
		Chenxiang Village (outside the region)	N	236	3250	

Note: The sensitive targets in the "acoustic environment, atmospheric environmental protection objectives within 200m range are objectives for sound environmental protection, and all are atmospheric environmental goals."

6.5 Project Analysis

6.5.1 Construction Period

During construction dredging, construction of ecological slope protection and water storage structures such process, resulting in some degree of impact on the environment, but this effect is transient, and disappeared with the end of construction.

During the construction of this sub-project, will set construction camps, construction workers will eat out, accommodation only within the camp.

6.5.1.1 The source of water pollution

Wastewater during construction period mainly is construction waste water, sewage, construction workers clearing, dredging and water disturbance on overflow weir construction.

1. The wastewater from construction

Construction waste generated during construction for a variety of construction machinery and equipment wash water produced with the oil, the main pollutants are SS, COD, and petroleum.

This sub-project is only rinse transport vehicles, quota for 100L / trips, 12 trips / d (the number of days in the construction is 300). Car wash wastewater pollutants are shown in Table 6.5-1.

Table 6.5-1 Car washing wastewater pollutants

Category	Project Name	COD	SS	Petroleum
Car washing wastewater (360m3/a)	Concentration (mg/L)	100	300	10
	Resulting amount (t / a)	0.036	0.108	0.0036

2. Domestic sewage

Sewage of construction includes wastewater and faucal waste washing water. Due to the construction workers eating out, Water consumption is small.

Construction of this sub-project entries with a total number of 20 people, fixed water 150L / (cap • d), emission factor of 0.8, sewage emissions 2.4m3/d, 720m3/a. Generation and emission of major pollutants and emissions concentration and produced as Table 6.5-2.

List of sewage pollutants situation

Table 6.5-2

Category	Project Name	COD	BOD5	NH3-N	SS
Domestic sewage (720m3/a)	Concentration (mg/L)	200	120	30	100
	Resulting amount (t / a)	0.144	0.0864	0.0216	0.072

3. Sediment Storage Site Effluent

The silt storage yard residual water of this sub-project will be discharged into the nearby ditches, reference design files, expected water volume meter by 50% of the yard, then the storage yard residual water volume of about 3840 m3.

Analogy Chaohu Lake first-stage dredging project and Dianchi Lake grass sea dredging project engineering practice results, SS content of about 280-380mg / l, TP content of about 0.28 mg / l, TN content of about 4.5-5.5 mg / l. Most dredging sediments enriched in suspended particles of pollutants, as long as strict control of the amount discharged into the receiving water body suspended particles, and the majority of pollutants can be trapped in the yard, the yard over water after appropriate treatment emissions, there will be less impact on surface water bodies.

6.5.1.2 The source of air pollution

The source of air pollution of this sub-project is mainly construction dust, vehicle exhaust emissions of construction machinery, odor and dredging process during the construction.

Construction dust is mainly from wind erosion dust of earth yard, bulk materials yard, concrete mixing station dust, road dust and other transport vehicles. Dust if unchecked can cause air pollution, so need to effectively control dust generation and emissions.

1. Wind erosion dust

Earthworks and bulk materials piled up process will produce dust; the concrete mixing plant operation will produce dust, especially in the dry and windy weather conditions.

When the particle size is 250um, the settling velocity is 1.005m/s. When the excavation of waste dust particles is greater than 250um, the main impact point range is down the wind dust within close range, but the real impact on the external environment are some tiny dust particles. Furthermore, different climatic conditions according to the site of its sphere of influence are different.

2. Vehicle transport road dust

This sub-item is a construction process of vehicle transportation mainly for earth, stone, sand and other materials transportation.

Many factors that cause road dust, primary related to vehicle speed, wind speed, the amount of road dust, road dust and humidity and dust to the thickness of the floor, where the wind speed is also directly affect the transmission distance of dust. According to survey data related to construction projects, the construction site dust concentrations near the ground up to 1.5 ~ 30mg / m3. According analogy survey, taken after the construction site watering and other measures, can greatly slow down the road and Waste slag area dust impact on the environment, road construction watering and lowering dust test results are shown in Table 6.5-3.

Test result of watering and lowering dust in the construction section Table 6.5-3

The distance from the side of the	0	20	50	100	200

road (m)						
TSP（mg/m3）	No watering	11.03	2.89	1.15	0.86	0.56
	Watering	2.11	1.40	0.68	0.60	0.29

3. Construction machinery vehicle exhaust

The engineering machinery and transport vehicles in the combustion of gasoline, diesel will produce exhaust containing THC, particles CO, NOX, and other atmospheric pollutants in the construction process, emissions will have a certain impact on the construction site. According to relevant statistics, the general large engineering vehicle pollutant emissions are CO 5.25g/ (a, KM), HC 2.08g/ (a, KM), NO2 10.44g/ (a, KM). Fewer the engineering and construction machinery vehicles used, less vehicle exhaust emissions, belonging to the unorganized emissions.

4. Sludge odor

During dredging process, the sludge will emit odors, cannot be quantified estimates. With the end of construction activities, will also disappear.

6.5.1.3 The noise pollution source

Construction noise, mainly from construction machinery, equipment and transport vehicles noise, the main noise sources, including bulldozers, excavators, loaders, pumps, concrete mixers, dump trucks. Refer to Environmental Noise and Vibration Control Engineering Guidelines (HJ2034-2013) Appendix tables A2 a common construction equipment noise source intensity (SPL), noise producing equipment noise level are shown in Table 6.5-4.

Table 6.5-4 The main equipment noise source intensity

Noise producing equipment	Sound Level / Distance [dB(A)/m]	Noise producing equipment	Sound Level / Distance [dB(A)/m]
Bulldozer	83～88/5	Truck	82～90/5
Excavators	82～90/5	Wheel loader	90～95/5

6.5.1.4 Solid Waste

During the construction the solid waste is mainly floating garbage in the water when river dredging cleanup, dredging sludge generated, Waste slag, construction waste and construction workers garbage.

1. Floating garbage

According to the analogy of a Huainan ADB project, the Bagong mountain gully, Xiejiaji gully, Laolongwang gully, Longwangpie ditch, long Wang Gou River, Donghua flood intercepting trench, 6 rivers dredging is about 29.6km long, living garbage floating on the water for 58t.

The river dredge length is 15197m of this sub-project, and therefore the amount of garbage floating on the water up to 29.8t.

2. Silt

Produce a total capacity of 7,680 m3 of silt during the construction of this sub-project.

3. Waste slag

During the construction of this subitem, 621,600 m3 were excavated, fill 429,100 m3, the remaining earthwork of 192,500 m3.

4. Construction waste

Construction waste is mainly produced in construction of brick, stone, sand, and packing box, bag, all kinds of building materials.

5. Domestic garbage

For this subitem workers camp at the construction site with facility (no canteen), construction personnel 20 people, according to the amount of garbage produced 0.5kg / person • d, the amount of garbage generated is 10kg / d, 3.3t / a. It's a three-year long construction period and will produce a total of 9.9t of domestic waste.

6.5.2 Operation period

This sub-project is an ecological projects, will not produce pollution in operation. Ecological environmental effect in operating area is mainly the lake 3 in storm may form a flooded area, inundated influence short-term impact, its environmental impact and mitigation measures in section ecological impact assessment.

6.6 The environmental impact and mitigation measures in construction period

6.6.1 Water Environment

6.6.1.1 Water environmental impact analysis

1. Analysis of pollution sources

Water pollution sources during construction of the project are mainly construction production wastewater in the construction areas, sewage and storage yard residual water. Production wastewater include: dredging the Pit River water seepage, construction site construction machinery cleaning and a small amount of oil leaking oily wastewater.

Construction waste water produced in the construction period for all kinds of mechanical equipment generating flushing wastewater containing oil, the main pollutants are COD, SS, and petroleum. The car washing wastewater quantity is 360m3/a in this sub-project, the main pollutant concentrations were COD100mg/L, SS300 mg/L, oil 10mg/L.

The main pollutants in domestic sewage is BOD5, COD, BOD5, COD concentrations were 120 mg/l and 200mg/l. The average number of people is 20 for construction period, calculated of capita daily consumption of 0.15m3/d, the daily construction site total water pollution coefficient is 3m3/d, fold in 0.8, sewage emissions of is 2.4m3/d.

First and middle stage of storage reclamation, the main pollutants in water than natural precipitation can be obtained after the removal of certain; late stage at Reclamation, and more than the water discharge of non-compliance should be considered on the basis of natural precipitation, impose dosing (BBL, PAC) promoting sink assisted purification measures, left water produced is about 03,840 m3.

2. Environmental impact analysis of wastewater discharge

(1) Production wastewater

If construction machinery oily wastewater discharged into water bodies, forming a film on the water surface, causing dissolved oxygen in water is not easy to recover, affect water quality; indiscriminate discharge of oily wastewater land, will reduce soil fertility, soil structure changes, is not conducive to the construction slash recovery. Construction units should strengthen the construction machinery and vehicle maintenance and management, prevention of oil spills occur.

(2) Sediment storage site effluent

Dredging intends to use staging, the canals, the river, then using excavators digging drainage, soil contains some moisture; the main pollutant is SS, TP, TN. This works yard in sediment than water will be discharged into the nearest ditch near the reference design files, is expected by 50 percent more than the amount of yard water volume meter, the yard more than the total amount of water of about 03,840 m3. Reach for the dredging of sediment from the monitoring results, heavy metals in sediment arsenic, copper, zinc, lead, cadmium, chromium content of soil environmental quality standards in line to meet the protected area

of natural ecology, maintain the natural background soil environmental quality requirements, while the monitoring of factors are met, "agricultural sludge pollution control standards" (GB4284-84), sediment is a general waste, hazardous waste do not belong to satisfy agricultural sludge application standards. Pollution to a lesser extent, therefore, the process of sediment piled yard without causing significant heavy metal contamination of soil and groundwater.

Analogy Chaohu Lake first-stage project and Dianchi Lake grass sea dredging project engineering practice results, yard water pollutants SS content is about 280-380mg / l, TP content is about 0.28 mg / l, TN content is about 4.5-5.5 mg / l. Most dredging sediments enriched in suspended particles of pollutants, as long as strict control of the amount discharged into the receiving water body suspended particles, and the majority of pollutants can be trapped in the yard, the yard over water after appropriate treatment emissions, impact on surface water bodies will be smaller.

(3) Construction camp sewage

During the construction the Sewage includes washing wastewater and fecal waste water. Because of the construction personnel are not dining on site, small amount of sewage water can be produced.

The main pollutants in sewage are COD, BOD5, SS, ammonia nitrogen. According to the analogy investigation on COD200mg/l, BOD5 is about 120mg/l. In the relative concentration site of the construction workers, field area using the toilets, fecal waste from residents of the region is used to make agricultural fertilizer and timely removal. After washing wastewater construction workers precipitation (and shared washing wastewater treatment facilities) for dust suppression sprinklers, no excretion.

(4) Environmental impact analysis of surface water disturbance

Due to mechanical agitation when dredging, will inevitably generated sediment disturbance caused by deposition of sediments in particular the proliferation of fine particles suspended solids, resulting in reduced water clarity, suspended solids content increases lead to deterioration of water quality.

As the project river intends to dredging is narrow, normally arrange dredging construction to be conducted in the dry season, generally combined with artificial excavator digging manner, a relatively small area of the dredging operation range, this adverse effect is temporary and relatively small, and will be terminated with the end of construction.

6.6.1.2 Water pollution prevention and control measures

The main water environmental impact during engineering construction include: construction machinery's running, exuding, dripping, leaking of oil and oily sewage washed off from outdoor machine by the rain; sewage sludge from yard construction camp; sludge storage yard produced water; need to take measures to prevent the waste, sewage, impact on nearby waters.

1. Water pollution control measures of excavation

Sediment dredging excavation should avoid raining days, as a result of the project needs to be excavated in the rain, the working surface should not be too large, piece should be completed by segmented in phases. Earth excavation should be top-down hierarchical segmentation in turn, ready to make a certain slope potential to facilitate draining, and shall not affect the water within the range of slope stability.

Smooth ground surface slope should comply with the design requirements, if there is no design requirement, generally a slope should be made to drain the direction of no less than 0.2%. The site should be smooth surface after the point by point check, check points spacing should no greater than 20m.

2. Oily wastewater treatment

Set gullies on sites for the construction machinery or vehicle repair and maintenance, collect rinse maintenance wastewater, grease traps were also set for oily wastewater treatment. Construction site waste water washing after settler re-uses no excretion.

3. Construction personnel living sewage treatment

Construction camps usually adopt pit toilet, use fecal waste from residents of the region to make agricultural fertilizer and timely removal. No fecal sewage discharged.

4. Storage yard residual water

Yard sediment residual water contaminants mainly from the construction area ,where contained contaminants and sediment particles enriched N, P and heavy metal pollutants, therefore, the construction of more than just control the SS emission concentrations in water, it can effectively control emissions of other pollutants. Analogy Environmental Engineering work of flood dike of the north Hefei Binhu Lake District, the initial sediment the yard water after a multi-stage precipitation can remove 90% SS, so that the N, P also be removed. The late 10% water remains, then SS value exceeded, may be appropriate dosing flocculants in sediment mud spoil disposal mouth to promote sinking to control over water quality, after taking the above expected measures, SS concentration will be less than 60mg / L, the main pollutant emission concentration can meet the "integrated Wastewater Discharge Standard" in an emission standards.

Therefore, the evaluation found that, in order to protect surface water quality in the project area, it is recommended to select a drain in the early wet period, the wastewater discharged into the ditch before dosing flocculation need to reduce the impact of pollutants on surface water quality, and at the same time dredging of canals to take segmented construction, after the above measures, the project initially less affected by drainage ditches nearby. And with the completion of construction, the sources will also disappear. Therefore, construction of wastewater does not affect the surface water environment function which allows it to maintain water environmental function zoning objectives.

6.6.2 The atmospheric environment

6.6.2.1 Analysis of the environmental impact of atmospheric

（1）TSP

River comprehensive improvement is mainly river excavation, earth backfill, dust and road transport earthwork embankment slope and lake weed removal bare surface erosion dust generated after so near the site of the construction, will produce a certain atmosphere, the main factors of pollution, causing bare ground dust loose surface soil, surface water content at the end, dry weather, wind speed larger prone to dust. Analogy analysis method using atmospheric pollution TSP concentration increased localized within the construction zone caused analyzed. During the construction phase of the project, excavation, transportation and filling of earth and other construction activities will generate dust, ambient air quality in the construction area will decline. From a practical point of view of the construction of other similar projects, is generally higher due to earth excavation, earthwork promptly when backfilling, construction of the scope of the impact of atmospheric pollutants emission is limited to the vicinity of sources of pollution, and the degree of influence is extremely limited, there is less environmental impact on the outside of the construction zone.

Many factors that cause road dust, primary and vehicle speed, wind speed, the amount of road dust, road dust and humidity and dust to the thickness of the floor, where the wind speed is also directly affect the transmission distance of dust. According to survey data related to construction projects, the construction site dust concentrations near the ground up to 1.5 ~ 30mg / m3. According analogy survey, taken after the construction site watering and other measures, can greatly slow down the road and Waste slag area dust impact on the environment, road construction sprinkler dust test results are shown in Table 6.6-1.

Test result of watering and lowering dust in the construction section Table 6.6-1

The distance from the side of the road (m)		0	20	50	100	200
TSP（mg/m3）	No watering	11.03	2.89	1.15	0.86	0.56
	Watering	2.11	1.40	0.68	0.60	0.29

（2）Vehicle or equipment exhaust

Large construction vehicles, construction equipment emissions vehicle or equipment exhaust emissions, due to less vehicles on the construction site, exhaust emissions, diffusion dilution by ambient air, does not produce pollution on the construction site and the surrounding atmosphere.

（3）The impact of material mixing dust

Sand and gravel, concrete and other materials in the mixing process are easy dusting, according to survey data analog mixing station, mixing concrete dust sphere of influence within the main mixer at a distance of 50m, due to the scope of 50m with fewer settlements near the project, so only construction area affected by material mixing dust.

（4）River comprehensive renovation dust may affect environmentally sensitive points

①Relatively comprehensive management of the construction site from the river and environmental sensitive points

Lake 1- distance of 280 meters north of the Levying village, no environmentally sensitive point within a range of 500 meters on east, west, south, around 400 meters of Lake 2- no environmentally sensitive point, there is no environmentally sensitive points around the lake 3-within a range of 400 meters, no environmentally sensitive point around longitudinal groove 1- within the scope of 400 meters, around 350 meters vertical groove 2- no environmentally sensitive points, longitudinal groove 3- passed through Datong social welfare in the north and east side ,the closest distance is 20 meters ~ 50 meters to orphanage through a length of about 200 meters, 500 meters range of other ditch segment no environmentally sensitive points. No longitudinal groove 4- within 300 meters north of the range of environmentally sensitive point, east, west, south to within 500 meters no environmentally sensitive points, longitudinal groove 5, the transverse groove a cross range of 300 meters around the ditch 3- no sensitive environments point.

②Analysis of construction dust impacts on the environment sensitive points

According to the water system arrangement of construction sites and environment sensitive points relative distance analysis, Datong Social Welfare Institute, clear the channel closer, but because the water cut water management in the high rate of water, take measures in the dry weather, the bank maintain a certain degree of humidity moisture content, channel cleaning up has smaller atmospheric environment impact on Datong society welfare institute.

6.6.2.2 Air pollution control measures

（1）Road dust prevention measures

Evaluation required that in the comprehensive management of water, all of the haul road shall take measures to compare the compaction, long transport distance of the road should be appropriate to increase the sand bedding, prevent road on a rainy day, sunny dust muddy pavement condition, reduce dust emission Road, to prevent the impact of road dust on atmospheric environment.

（2）Watering and lowering dust

In the comprehensive management of water process should be equipped with sprinkler, timely watering on road transport, and sprinkling of bare ground and embankment, reduce road dust, bare surface and backfill the dust.

（3）Revetment slope protection pile for dust prevention

In the river comprehensive treatment process needs protection and bank revetment, requirement evaluation requires the use of sand and other bulk materials, construction site, piled up in the sand and other bulk materials, should be taken to cover measures, shall not be piled up in the open air.

（4）Dust prevention measures of exposed surface and the fills

Due to the high moisture content of earthwork excavation river management, engineering dust control measures to be taken as follows: excavation should be backfilled; backfill compaction shall take the necessary measures in a timely manner compacted backfill; weeding for the slope, in a timely manner bare surface compaction measures taken; larger when the weather is dry and the wind speed on the bare surface and timely backfill venues watering. After taking these measures, River comprehensive management of environmental impact on the surrounding atmosphere can be reduced to a minimum, a small impact on the construction site and the surrounding atmosphere will not cause pollution effects on environmentally sensitive point and construction site surrounding atmosphere.

（5）Construction camps air pollution control measures

The design requirements in order to reduce environmental impact, construction site, and construction camp comprehensive water treatment may not be cooking and heating, therefore, the construction camp without discharge of atmospheric pollutants.

（6）Odor in dredging

In the process of dredging, silt will send out a small amount of odor whose intensity can reach Level 2 beyond 30m with slight odor which is lower than the limit standard for the odor intensity (Level 2.5~3.5). Beyond 50m, there is mostly no odor. In the process of dredging, the odor of the bottom mud will exert impact on the residents around. This ordinance proposes the way in which the silt is transported immediately after it is dredged, which can reduce the impact on the residents around the project area to the greatest degree. If the odor is apparently found in the construction, dam-board must be established on the both bank and reduce the number of residents affected by the odor to the minimum number. There are few sensitive points in the project area. The period of the construction is short. The impact will gradually disappear with the end of the construction. So the odor will have less impact on the environment.

6.6.3 Acoustic environment

6.6.3.1 Noise Impact Analysis

The main noise source of construction period is the channel excavation and transportation vehicle noise etc. Construction of evaluation standard acoustic environment enforces the "construction site environmental noise emission standards" (GB12523-2011), the calculation of main construction equipment, noise during construction to construction field threshold distance is shown in table 6.6-2.

The main mechanical equipment and noise from the construction period Table 6.6-2

Noise producing equipment	Noise level [dB(A)]	Distance (m)	GB12523—2011 Standard	
			Daytime	Night
			70 dB(A)	55 dB(A)

			Construction machinery noise influence distance（m	
Excavators	82～90	5	60～100	135～175
Bulldozers	83～88	5	65～90	140～165
Loaders	90～95	5	100～125	175～199
Trucks	82～90	5	60～-100	135～175

Results calculated from Table 6.6-2, daytime construction noise value exceeds the range of construction machinery field boundary value is 16.8 ~ 56.2m; nighttime noise value of construction machinery at a distance of 84.6 ~ 199.1m construction field boundaries to reach beyond the noise limits. That daytime scope is 16.8 ~ 56.2mm, and night scope is 184.6 ~ 199.1m.

In the actual construction process, a variety of mechanical work is often taken place in the same time, various noise sources of radiation are superimposed, the noise level will increase, but more than two simultaneous operation of construction machinery, have maintained a certain distance, through distance attenuation, multiple effect of increasing distance from the device is very limited. River comprehensive management of construction noise is mainly of three parts ditch section longitudinal groove construction on Chase social welfare, the cross section construction ditch a part of the city labor camps and lateral grooves 3 construction noise impact on sensitive points ore Village 3 environment, construction of other longitudinal groove and the lake does not have an impact on environmentally sensitive points.

6.6.3.2 Noise pollution control measures

River comprehensive management project, the impact on environmentally sensitive point is mainly longitudinal groove 3 part ditch sections, cross sections and ditch a part of the ditch cross section ditch three segments have an impact on three environmentally sensitive points, daytime construction of environmentally sensitive points small noise impact assessment requirements in these three segments ditch near environmentally sensitive point, prohibiting night work, as long as no construction at night, River comprehensive management of environmentally sensitive little impact.

6.6.4 Solid Waste

6.6.4.1 Effects of solid waste in construction period

Solid waste is mainly in the abandoned earthworks square (dredging square), debris and water surface floating garbage, construction workers produced a small amount of household waste and construction debris.

1. Analysis of the influence of sediment transport on the environment

The sediments dredging project is expected to be about 0.768 × 104 m3. Because of the silt content is very high, dredging landed shipment immediately easily occurs along the drip phenomenon, which has great effect on urban roads and city landscape, causing adverse effects on the surrounding water, gas, sound environment will. Therefore, measures should be taken to prevent leakage occurs, silt transport process.

2. Analysis of the influence of sediment on Soil Environment

The project intends to set up seven silt yard for dredging sediment accumulation. Yard dredging project volume amounts to meet the requirements. Set in Table 6.6--3 silt yard.

Setting table of silt yard construction Table 6.6-3

Yard	Parameters	The discharged water
1	S=400m2	Longitudinal groove 1
	V=400m3	

2	S=400m2	Longitudinal groove 1
	V=400m3	
3	S=400m2	Transverse groove 1
	V=400m3	
4	S=400m2	transverse groove 2
	V=400m3	
5	S=400m2	Transverse groove 2
	V=400m3	
6	S=400m2	Lake1
	V=400m3	
7	S=400m2	Lake2
	V=400m3	

From the monitoring results of dredging sediment content of view, the main pollutants in sediment are in line with the soil Environmental Quality Standard (GB15618-1995) in the two standards, to meet the protection of regional natural ecology, maintain the natural background of soil environmental quality requirements, at the same time, the monitoring factors can meet the "control standards for pollutants in sludge" (GB4284-84), sediment of general waste, do not belong to hazardous waste, to meet the requirements of agricultural sludge application standard. So the soil environmental dredging sediment on the silt yard will not cause pollution.

3. The surrounding environment impact analysis of sediment stacking

This project silt yard for depression, does not have a direct impact on the surrounding landscape, but the failure to take any action directly stacked mud, can easily cause secondary pollution, over water, and the stench of mud piled up around the surface water will be generated environment, atmosphere environmental cause serious adverse effects, therefore, sludge-related environmental protection measures to be taken before stacking yard to prevent silt abandoned after the pile cause secondary pollution to the environment.

4. Waste slag

The construction excavation is 591,600 m3, fill 429,100 m3a nd produces (recall) 162 500 m3waste earthwork. In order to avoid prolonged stacked, these above will be used in the sub-item composition of environmental remediation and closure of Datong old dumpsites. Earthwork balance is shown in details in the table 5.5-3.

5. Floating garbage

Designed estimates of floating garbage about 29.8t, should be removed in time to Huainan City garbage disposal site for disposal.

6. Garbage generated by construction workers

According to the construction schedule, the number of people is 20 in the construction of the project, count that 0.5kg of garbage per person per day emissions, the construction phase of the project plan, the construction period is three years long, will produce 9.0t total garbage. Without proper disposal of garbage would be detrimental environmental health and beauty, if spilled into the river, will pollute the water, garbage handling measures should be taken promptly.

7. Construction waste

Construction waste comprehensive disposal process, if there are scattered and discarded, will have an adverse impact on the surrounding environment.

6.6.4.2 Solid waste pollution prevention and control measures during construction

1. After dredging silt transported out in time

Silt dredged using a closed truck to prevent spills along the way. Construction units should consult in advance with the sanitation department, during construction, road transportation in the mud additional sanitation workers, the timely removal of silt drip, drip to reduce the impact on the landscape of sludge.

2. Silt yard environmental measures

Before the sediment pile, silt yard seepage need to take certain measures, use clay compacted bottom, and the construction of cofferdam around, when the cofferdam design and construction, as well as the recommendations set skid pile cofferdam construction materials using different methods such as improve the overall stability of the cofferdam. Timely reclaim and plant grass or landscaping after yard. Afforest yard, prevention and control of soil erosion.

3. Garbage control measures

The process of spoil heap abandon should pay attention to environmental issues, and do not affect the surrounding landscape and transportation. Timely leveling and compaction, late after construction should be shipped to the residue field of plant-related measures, the environmental impact of spoil and vegetation to restore the damage caused to shorten the time exposed residue field, reducing soil erosion.

4. Solid waste prevention and control measures

Construction units strengthen the management of the construction work area garbage, trash classification, set and regularly commissioned by the local sanitation department for removal to landfill sanitary landfill.

5. Other solid waste pollution prevention and control measures

According to "People's Republic of China Solid Waste Pollution Prevention Law", solid waste generated during the construction process of the project construction unit should be timely removal, and use or disposal in accordance with the provisions of the administrative department of environmental health.

Construction waste should focus stacking and timely collecting as the foundation of filling materials; various types of building materials, boxes, bags, etc. should be sent to the person responsible for classified storage, unified shipped to scrap yards for recycling. Removal of construction waste disposal program should declare to Huainan concrete implementation of the relevant authorities, transport out of the construction site in a timely manner as soon as possible.

After the end of the project, clean up the demolition of temporary construction facilities construction area, parking field of construction machinery, stone preparation courses, integrated warehouse and office space living area promptly, remove construction waste and all kinds of debris, garbage around their lives, latrines, cesspools must clean smooth and disinfected with carbolic acid, lime, resume construction site ready to work.

6.7 Environmental Influence and Mitigating Measures during the Operating Period

6.7.1 Water environment

The project is of non-ecological impact type. There is none of the three wastes emitted during the operating period, which means the negative impact on environment is relatively low.

6.7.2 Atmospheric environment

No atmospheric pollutants are emitted during the operating period of the water system comprehensive treatment. Thus, the treatment has no negative influence on the atmospheric

environment in the evaluated district.

6.7.3 Acoustic environment

No source of noise pollution is found during the operating period of the water system comprehensive treatment. Therefore, the acoustic environment will not be affected during the period.

6.7.4 Solid waste

The subproject is of ecology, which means there will be no environmental influence from solid wastes or relative pollution prevention measures.

Chapter Ⅶ Environmental Impact and Mitigating Measures of Subcomponent 3

7.1 Project Overview

Huainan Datong Old Dumpsite locates in the north of the project area, to the west of Chengang village and 50m south from Jiuda Road. The current waste pile totally covers an area of 98,542 ㎡ and these are all household refuse without hazardous wastes. According to Construction Standards of the Municipal Solid Waste Landfilling Project, the colsure construction scale of this project has been classified as Class Ⅲ.

The closure treatment technology is to seal on the site. According to Technical Regulations on Domestic Refuse Sanitary Landfill Colsure, the main works are the waste pile shaping and treatment, the refuse embankment project, the project of intercepting seepage in landfill areas, the collecting and disposal system of leachate, the landfill gas collecting and exhausting system, the surface rainwater runoff diversion system, the surface artificial material covering project, the green covering project and the installment of monitoring wells; the ancillary works are the maintenance, water supply and drainage as well as power supply for management rooms.

7.1.1 The waste pile shaping and treatment

The former waste pile, which has not been operated in accordance with the sanitary landfilling standards, should be graded to meet the side slope controlling value of 1:3.5~1:4, so as to prevent water and soil loss aroused by rainwater,wind, ice and snow eroding the covering soil as well as the further impact on stability of the pile.

After the diversion of Chen Lane flood drainage channel in the project of water system comprehensive improvement, the east and west areas of Datong Old Dumpsite are integrated into one waste pile.

The highest elevation of the current waste pile's top surface is 50.5m, when the lowest is around 37.99m. The east and the west waste piles are intergrated after reconditioning. The elevation of the west pile top is 47m, when that of the east one is 41m. Terraced style is taken to close the west pile side slope, with a height difference of 7m between the terrace and the embankment as well as a width of 3m. Drainage ditches are installed on the terrace.

General layout after closure (Figure 7.1-1), standard section of closure (Figure 7.1-2)

Figure 7.1-1 General Layout of Datong Old Dumpsite Closure

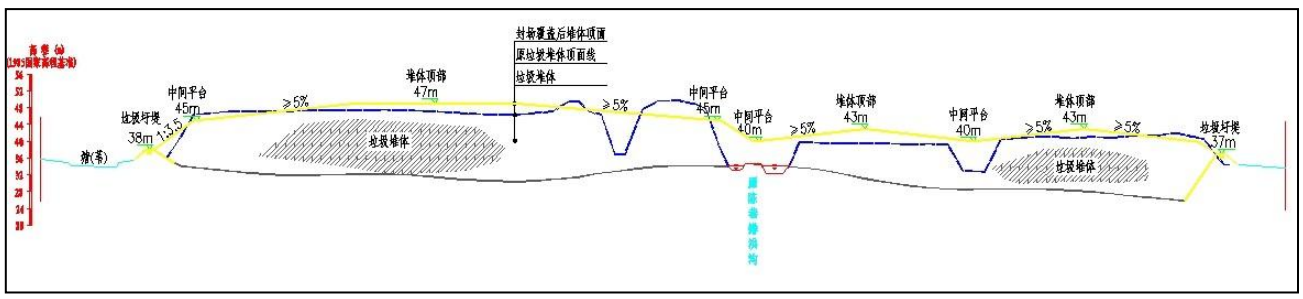
图例	Key
规划道路	Planning road
垃圾堆体边界线	Landfill boundary line
垃圾堆体侧面线	Landfill side line

Explanation:

The figure is drawn according to the 1:1000 electronic topographic map provided by owner.

The total area of the old landfill is 110,000 ㎡, in which the pile area is 98542 ㎡. After closure regulation, the landfill area is 90344 ㎡.

Roof elevation of Leachate regulation pool is 36m, and the bottom elevation is 34m and the effective capacity is 500 m3



7.1.2 Solid Waste Retaining Wall

After the diversion of Chen Lane flood drainage channel, an embankment is constructed around the east and west waste piles, so that the piles can be integrated as well as a reservoir will be posed by use of the embankment to contain the waste of slope cutting

during the pile renovation process. The main function of the refuse embankment is to effectively segregate the pile with surroundings, to keep the pile from outside rainwater, and to prevent slippage of the pile to ensure its stability as well as be taken as a channel for orderly diverting the leachate and linking the regulating reservoirs.

In line with the actual landform elevation of the current site, the refuse embankment is determined to be built around the waste pile, with the west embankment top elevation of 38m and the east of 37m. The width of the embankment top is 6m. The maximum height is around 3m. The lenth of the embankment centre line is 1470m. The outer slope is 1:2 and the inter slope is 1:3. Rolling earth-rock embankment is adopted.

Given the top surface drainage of the pile, the ancorage of the pile covering system as well as the maintanence and control after closure, the inter slope of the refuse embankment has been designed as both anchorage and drainage ditch. Moreover, a levee crown road, whose surface is 4m in width and shoulders are 1m of each, is paved on the outboard of the embankment. HDPE geomembrane-bentonite composite walls are designed on the embankment as a vertical seepage-proofing barrier to prevent the seepage of leachate from the old wasteyard to lower position. Standard section of the refuse embankment (Figure 7.1-3)

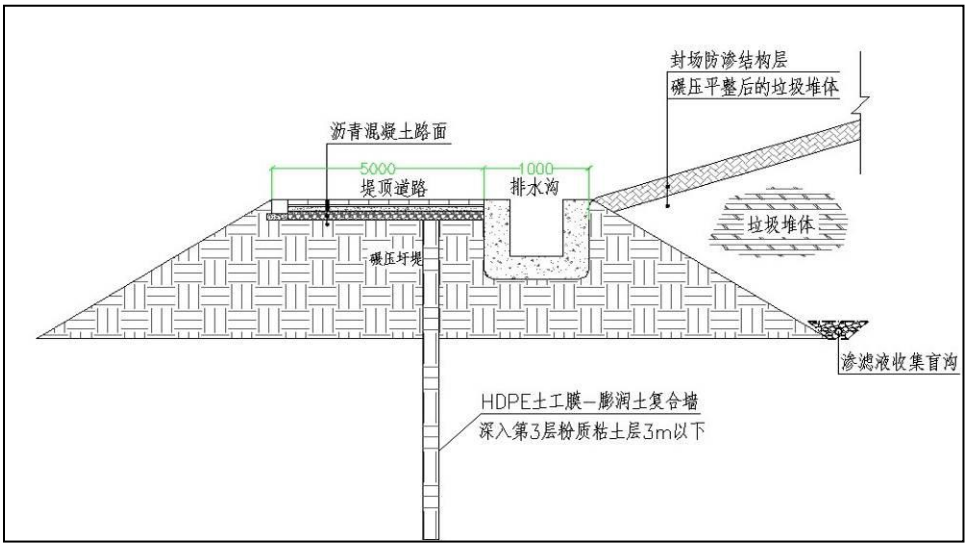


Figure 7.1-3 Standard Section of the Refuse Embankment

沥青混凝土路面	Asphalt concrete pavement
堤顶道路	Road on the levee crown
垃圾堆体	Waste dump pile
排水沟	Drainage channel
碾压圩堤	Rolling compaction of the levee
封场防渗结构层	Structural layer of the closed field against leakage
碾压平整后的垃圾堆体	Waste pile after being rolled flat
渗滤液收集盲沟	Blind ditch of leachate collection
HDPE 土工膜－膨润复合墙	HDPE geomembrane - bentonite composite wall
深入第 3 层粉质粘土层 3m 以下	Deepening under the third layer of silty clay 3 meters

7.1.3 Seepage Interception in landfill areas

In order to cut off the seepage passageway of leachate from outside to inside of the

reservoir, prevent underground water penetrating into the landfill areas as well as reduce the leachate generating capacity, seepage-proofing craft of HDPE geomembrane-bentonite composite walls is applied on the base of the refuse embankment, whose average depth appears 13m, with a permeability coefficient less than 1×10-7cm/s. The diaphragm walls are no less than 600mm thick and the area covers 19,110 m2.

7.1.4 Leachate Collection

As to the full-covering landfill, its leachate capacity primarily depends on the atmosphetic rainfall capacity, the catchment area and the completeness of clear-waste water diversion system. According to researchable documents, the catchment area of Datong Old Dumpsite after closure covers 90,344 m2, when the leachate is generated 23.34m³ per day.

To enhance the efficiency of leachate collection and decrease the height of leachate head, a leachate collecting system, which mainly consist of leachate collecting pipelines, leachate connecting wells, leachate collecting wells and running pipelines, leachate regulating tank and leachate disposal system, has been installed in the old wasteyard. Leachate collecting system layout (Figure 7.1-4)

Leachate collecting pipelines

Built on the inner side of the refuse embankment, the blind drains are located below the dyke foot so as to avoid erosion from leachate. The total length of the collecting pipelines is 1413m.

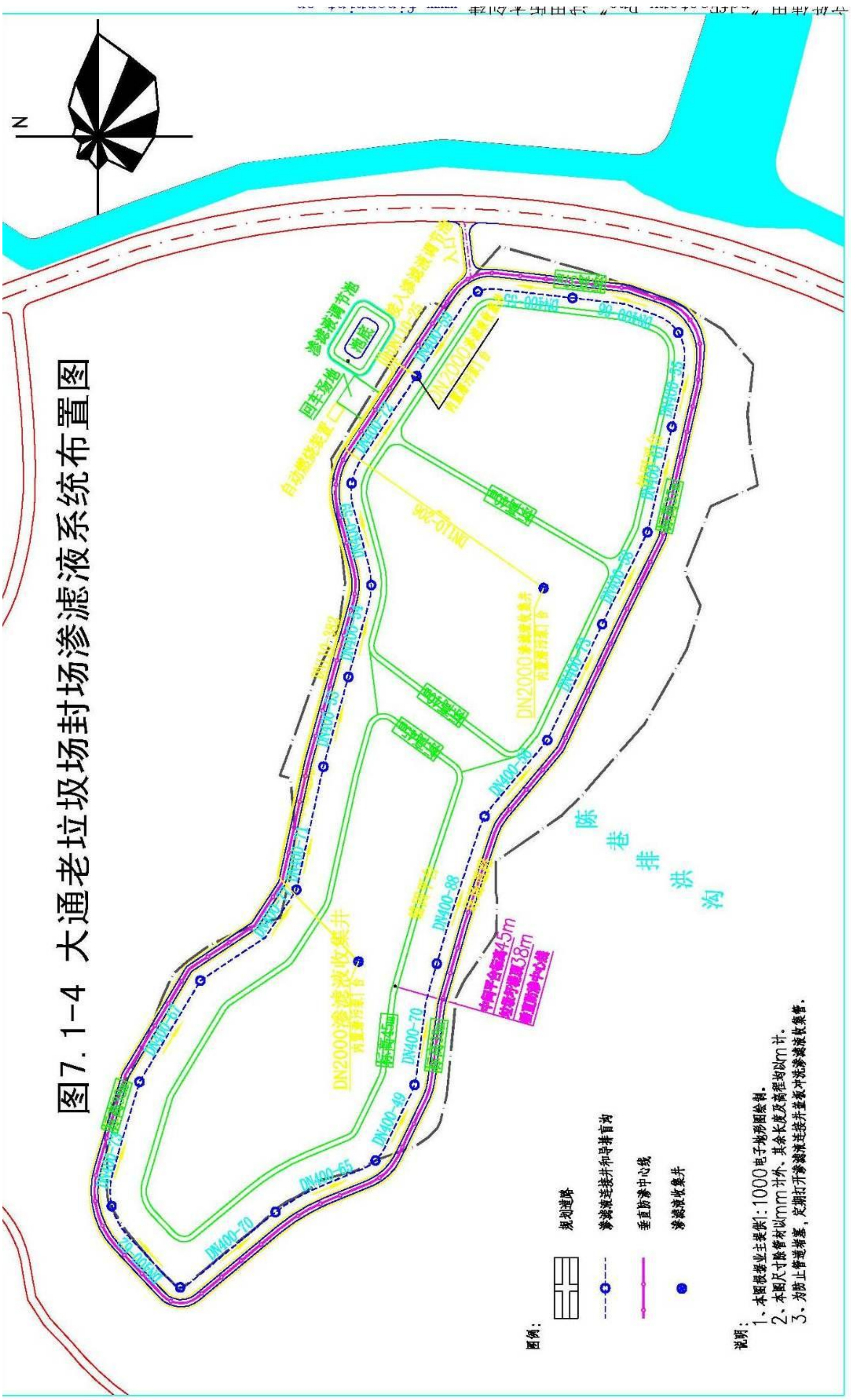


Figure 7.1-4 Datong Old Dumpsite Closure Leachate System Layout

图例	Legend
规划道路	Planning road
渗滤液连接进和导排盲沟	Leachate connected well and blind ditch
垂直防渗中心线	Center line of vertical anti-seepage
渗滤液井	Leachate collecting well
Explanation: 1. The figure is drawn according to the 1:1000 electronic topographic map provided by owner. The length and distance unit are m except pipe with mm. 2. Open the well lid of leachate connected well to wash leachate collecting pipe at regular intervals to prevent blockage.	

Leachate connecting wells

The leachate connecting well is DN 800 HDPF vertical shaft (with flange), namely the leachate collecting pipeline inspection well. The function is to help regularly cleaning and controlling the leachate collecting pipelines. A connecting well is installed at intervals of a certain length and every flexure of the pipelines. There are 21 leachate connecting wells installed in total.

Leachate collecting wells and running pipelines

The leachate collecting well, with leachate lift pump internally installed, is DN 2000 HDPE vertical shaft. Leachate gathered through pipelines enters into the collecting wells, and then into the leachate regulating tank through DN 110 HDPE running pipelines after elevated by the lift pump. Three leachate collecting wells are built in total: one is near the refuse embankment for collecting the leachate in the blind drains; the other two are respectively laid at the lowest section of the west and east waste piles for thoroughly drawing out the leachate inside the piles and then decrease the inner water head. The total length of running pipelines is 613m.

Leachate regulating tank

The leachate regulating tank is located to the east of Chen Lane flood drainage channel. The form of half-excaving and half-filling is adopted in building the tank, whose effective volume turns out 400m^3. The regulating tank covering film uses HDPE slick film with the thickness of 2.0mm. Gas gathering and diverting pipes are installed on the tank sides, when a set of gas emmition holes are reserved and the gas will be led into a methane auto-combustion apparatus.

The seepage-proofing barrier of the regulating tank adopts the design of double-deck seepage-proofing structure. The structural details are seen in table 7.1-1.

Structure of the regulating tank seepage-proofing barrier (from top to bottom)
Table 7.1-1

Seepage-proofing structure of the tank bottom	Seepage-proofing structure of the tank side-slope
①1.5mm thick HDPE slick film	①1.5mm thick HDPE matte film
②Earthwork composite drainage network	②Earthwork composite drainage network
③1.5mm thick HDPE slick film	③1.5mm thick HDPE matte film

④750mm thick soil-compacting protective layer	④Reconditioned regulating tank side-slope
⑤400g/㎡ woven earthwork fabric	
⑥35cm thick gravel diverting layer (with collecting pipes installed inside)	
⑦200g/㎡ woven earthwork fabric	
⑧Level and compacted tank bottom	

Leachate disposal system

In Huainan City, currently, there is one leachate treatment station of the east domestic refuse sanitary landfill, whose daily disposal scale is 200m³/d. The station adopts the treatment technology of “coagulating sedimentation + MBR membrane bioreactor + nanofiltration (NF) + reverse osmosis (RO)”, and executes Pollution Control Standards of Domestic Dumpsite (GB 16889-2008). Table 2 shows the quality and density limit of the water pollutants emission from current and newly-built domestic dumpsites. The current daily disposal capacity is about 80~110m³/d.

Given the mature reliable technology and the stable operation of the current leachate treatment station as well as a proper haul distance of only 6.5 km from the old wasteyard, Datong Dumpsite transports the leachate with two 8-ton leachate suction-type sewer scavengers to the treatment station at the east domestic refuse sanitary landfill for disposal. Meanwhile, the operation managing department of Huainan east domestic sanitary landfill has agreed to accept the leachate from Datong Dumpsite.

7.1.5 Landfill Gas Collection System

Landfill gas (LFG) is one of the primary products of refuse degradation. On stage of aerogenesis, the main components of LFG are methane and carbon dioxide. In accordance with researchable documents, the landfill gas output peaked with 1,302,600 m³/a in the year 2010. As the peak season of aerogenesis has passed by for a long time and the oringinal landfilling work has not been strictly taken on the basis of standard sanitary landfilling technology, which led to the leakage of LFG, therefore 25% of theoretical overall gas output, which is 6.9×106m³, is temperarily taken as retained landfill gas. LFG reserves in the dumpsite area is suggested to be further verified by committing to monitoring department before the project is set.

The project will install a LFG diversion and combustion system, so as to prevent explosion and fire disaster caused by gas discharging difficulty and gas gathering. Industrial utilization has not been considered at the moment. 53 LFG collecting wells, 6 gas-gathering stations, DN 90 HDPE gas transporting branch pipe of 1457m, DN 110 HDPE gas transporting branch pipe of 853m and DN 200 HDPE gas transporting main pipe of 630 need installing, when a set of air exhausting and torch combusting system, with the treating capacity of 300Nm³/h, is built at the same time. LFG collection and exhaustion after closure (see figure 7.1-5).

Figure 7.1-5 Landfill Gas Collection Drainage System Layout of Datong Old Dumpsite Closure

图例	Legend
规划道路	Planning road
DN90 输气支管	DN90 gas branch pipe
DN110 输气支管	DN110 gas branch pipe
DN200 输气干管	DN200 gas main pipe
导气竖井	Air shaft
集气站	Gas-gathering station
Explanation: 1. The figure is drawn according to the 1:1000 electronic topographic map provided by owner. 2. Gas collection uses vertical gas collection well and after collecting it is burned together. 3. The distance between the vertical gas collection well and the landfill bottom is 2m. 4. Vertical gas collection well is divided into 6 districts and it can be regulated by valve to extract respectively.	

The diameter of a LFG collecting well is Φ0.6m. Well depth to the landfill bottom is no less than 2m. The interval between wells is 40m, when the wells are laid out by quincunx with one landfill area unit. The collecting wells rise above the ultimate coverage by 1m in height. Automatic buring equipement is located in the west of leachate regualating tank and north of the waste dump pile, which covers an area of over 54m2.

7.1.6 Runoff diversion system

In order to divert rainwater out of the dumpsite quickly and smoothly, to decrease the water volume and waste leachate output getting into the dumpsite area, and moreover to reduce the operating costs of leachate disposal, rainwater diversion system has to be installed in and around the landfill. The system will help sensibly and effevtively divert the atmosphetic rainfall within landfill drainage area, and then branch the unpolluted runoff (clear water) and

the runoff flowing through the waste pile (waste water), and decrease the sewage quantity to the greatest extent.

The surface rainwater runoff diversion system consists of drainage ditches on the anchoring platform, drainage facilities on the pile surface and leachate collecting facilities.

The drainage ditch on the achoring platform employs rectangular cross-section, with the length of 1456m, size of 0.6m×0.8m and designed superelevation of 0.2m. It is co-constructed with the anchoring ditch of seepage-proofing system. The drainage ditch outside the landfill is with the length of 109m, size of 1m×1m and superelevation of 0.2m. The mode of disperse emission has been applied in the diversion system, when two water outlets are installed in total and both are located to the east of the waste pile. Rainwater from the anchoring platform, after flowing through the drainage ditches, finally enters into the reconditioned Chen Lane flood drainage channel by the water outlets.

For the closed area, drainage ditches are arranged along the halfpace of the waste pile and separately switched into vertical suspended ditches in accordance with practical situation and then discharge into the anchoring platform drainage ditch. The drainage ditch on the pile surface is composed of DN 400 HDPE semicanals, with the size of 0.4m×0.2m and length of 1575m.

7.1.7 The surface artificial material covering project

The colsure covering system is to construct a barrier on the top of the waste pile by engineering measures. Its primary functions are controlling pollution of the wasteyard, preventing distruction of the ecological environment, isolating the waste pile from the outside environment, keeping off the external surface water getting into the pile, effectively reducing the leachate output and making for the leachate collection and exhaustion. Meanwhile, the system will help prevent the leakage of LFG (methane) as well as collect and make use of the gas.

A composite seepage-proofing barrier consisting of geomembrane and compacted clay is taken as the closure covering layer in the project. The top gradient turns out 5%. The controled highest closure covering layer top elevation is 49m for the west area and 41m of the east. The aggregate thickness of the covering structural layer is 120m. Details can be seen in Figure 7.1-6.

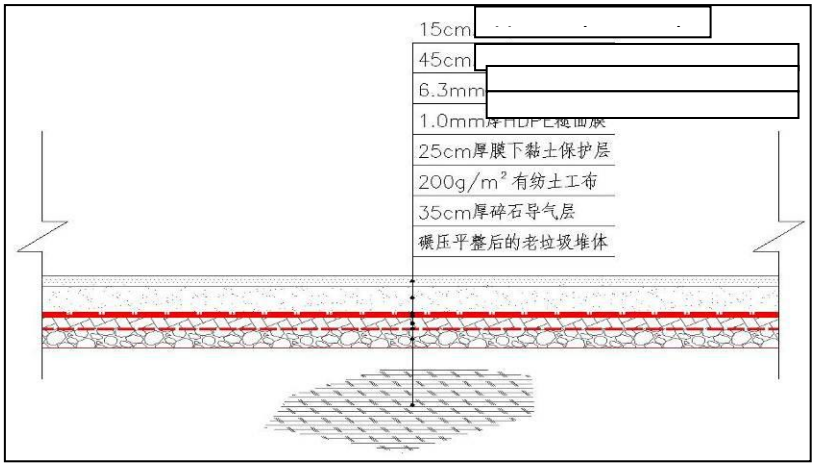


Figure 7.1-6 Closure Covering Structural Layer

The entire closure covering project totally demands vegetation-nutriting soil of 13,034m³, covering-sustaining soil of 39,101m³, earthwork composite drainage network of 105,678m2, 1.0 thick HDPE film of 104,672m2, compacted clay of 21,723m³, 200g/ m2 woven earthwork fabric 91,235 m2 and air-exhausting layer gravels of 30,412m³. The earth volume excavated in the drainage training project can be used as the soil resource of the closure covering project.

7.1.8 Greening

After the closure covering of Datong Old Dumpsite, ecological restoration should be gradually implemented and hamonized with the surrounding environment. Bushes and herbaceous plants are optimum selection so as to protect the seepage-proofing film from being damaged. Also, the plant types should be appropriate for the circumstance of landfill and resemble with the surrounding plants.

In line with different using functions of the wasteyards, various measures of afforestation and beatification can be taken to develop a diversified open senic greening network system. A 10-meter sanitary protection and isolation strip should be built around the refuse lanfill, in which tree species with strong resistance to pollution are suggested to be planted to improve the landscape as well as reduce the impact of exhaust gas and foul smell on surrounding environment. A fire-barrier belt of 8m should also be set up over the landfill area. So as to prevent the mulching soil and refuse, general afforestation with timely grass and bushes planting is demanded on the finally formed platform and side slopes of the dumpsite by connecting the environment around. Vegetations should be planted along the road leading to the landfill on both sides. Details can be viewed in the chapter of environmental remediation.

7.1.9 Setting of monitoring wells

According to Geological Investigation Report on Resource-Based City (Huainan City) Sustainable Developing Project Coal Mining Subsidence Area Comprehensive Treatment of Datong Old Dumpsite Project with Loan from World Bank, five long-term underground water observational wells have been installed in Datong Old Dumpsite.

In line with Domestic Refuse Sanitary Landfill Environment Monitoring Technical Requirements (GB/T18772-2008) and Pollution Control Standards of Domestic Dumpsite (GB 16889-2008), DX-1’ (pollution dispersal well), DX-2’ (pollution monitoring well), DX-1 (pollution monitoring well), DX-14 (pollution dispersal well) and DX-11’ (background well) will be taken as long-term observational wells.

7.1.10 Maintenance for existing management rooms

The original management room of the old Datong waste yard covers an area of 229.8m2. The buildings have been partly damaged due to geological subsidence and settlement. After repaired, the original management rooms serve as the production management and life services centre of the old dumpsite closure.

7.1.11 Water supply and drainage and fire provention

Domestic water for administrative staff’s life is supplied by multiple water supply network, when water consumption for production such as afforestion in the landfill area, which is relatively smaller, is supplied by surrounding water bodies.

Rainwater outside the landfill directly enters into surface drainage nearby through the drainage ditches. The leachate is transported by leachate suction-type sewer scavenger to the leachate treatment station at the east domestic refuse sanitary landfill, and then discharge to Huainan First Sewage Treatment Plant after reaching the disposal standard.

The principal resource of fire outbreaking within the landfilling work zone is LFG, so that the fire, accordingly, cannot be put out with water. Thus an 8-meter-broad fire-barrier belt is built around the landfill area. A certain number of fire-fighting sands and two watering carts have been outfitted for emergent use.

7.1.12 Power supply and distribution

The power of one leachate lift pump is 3kW. Due to the small use of gross power, three-phrase four-wire commercial power is connected nearby.

7.1.13 Manpower quota

According to Construction Standards of Domestic Refuse Sanitary Landfilling Treatment Project (GB 124-2009), 8 people are employed as administrative staff of the project.

Manpower quota of Huanan Datong Old Dumpsite after Closure Table 7.1-2

Position	Number	Remark
Administrator	2	In charge of remediation of ditches, management of LFG exhaustion and overall administration
Technicist	1	In charge of technical work in different processes
Leachate management	1	Operating and managing work on LFG exhaustion and treatment
Driver	3	Drivers of leachate suction-type sewer scavengers and watering carts
Environmental monitor	1	Environmental monitoring report and record
Total	8	

7.1.14 Main quantities

Main quantities of Datong Old Dumpsite Closure project is seen in table 7.1-3

Table of main quantities of Datong Dumpsite Closure project

Table 7.1-3

No.	Project or Cost	Unit	Quantity	Remark
Ⅰ	General drawing			
1	Carriage return site	m2	324	Site hardening
2	Levee-crown roads	m2	9006	1501m in length, 4m in width, 1m for each road shoulder, asphalt concrete pavements
Ⅱ	Waste piles reconditioning	m3	137846	Refuse searching and transporting
Ⅲ	Refuse embankment construction			
1	Excavation	m3	34545	
2	Embankment	m3	94080	
Ⅳ	Seepage-proofing curtain	m2	19110	HDPE geomembrane-bentonite composite walls, average depth by 13m，thickness by 600mm
Ⅴ	Leachate collection, exhaustion and disposal			
1	Leachate collecting blind ditches, DN400HDPE perforated pipe	M	1413	

2	Leachate connecting well DN800		21	
3	Leachate collecting well DN2000		3	
4	Leachate running pipe DN110	M	613	
5	Leachate lift pump		4	
6	Leachate regulating tank	m3	400	
7	Leachate suction-type sewer scavenger		2	Loading 8 ton
Ⅵ	LFG collection, exhaustion and disposal			
1	Gas-guide gabion		53	
2	Gas transporting branch pipe	M	2310	DN90 of 1457m，DN110 of 853m
3	Gas transporting main pipe DN200	M	630	
4	Gas-gathering station		6	
5	Air exhausting and combusting flare system	Set	1	Containing a management room of 6m×9m
6	Shift methane-monitoring equipment	set	1	
Ⅶ	Surface water drainage			
1	Drainage ditches 1m×1m	M	109	C20 plain concrete
2	Levee-crown drainage ditch 0.6m×0.8m	M	1456	C20 plain concrete
3	Drainage ditch on pile surface	M	1575	DN400 HDPE semicanal
4	Cover board	M	1456	
5	Water exit		2	
Ⅷ	Coverage after closure			
1	Vegetation-nutrition layer	m3	13034	
2	Covering sustaining soil layer	m3	39101	
3	Earthwork composite network	m2	105678	
4	HDPE film	m2	104672	1.0mm
5	Compacted clay	m3	21723	
6	Geotechnical fabric	m2	91235	200g/㎡
7	Sands and gravels	m3	30412	
Ⅸ	Maintenance of current management rooms		1	
Ⅹ	Ancillary works			
1	Watering carts		2	
2	Project-patrolling cars		2	
3	Water supply and		1	

	drainage			
4	Power supply system		1	

7.2 Comparison of Alternatives

The environmental impact from the project primarily focuses on the closure construction of the dumpsite. Therefore, zero-scheme and multi-scheme comparison and selection on the permission and mode of the landfill closure will be taken for the evaluation on its environmental impact.

7.2.1 Comparison of "With" and "Without" Project Scenarioes

The old Huainan waste yard was started using in 1984. Due to the limited technological level at that time, no effective environment protecting measure was taken then. Leachate entered into surface and underground water, when waste gas was emitted unsystematically, which has seriously polluted the surrounding environment.

In accordance with Huainan Urban Comprehensive Planning, the area where the dumpsite locates is identified as an ecological restoration region. The lack of administration and treatment of the dumpsite will not only bring about severer pollution and destruction to the surrounding environment by leachate and LFG, but make other ecological restoration measures no more than empty talks. Only on the basis of renovating the old waste yard after closure as well as reducing the pollutants emission, the effect of other ecological restoration measures can emerge gradually.

7.2.2 Comparison of Alternatives

According to the current practical situation of the old Huainan Datong Dumpsite, following closure technologies are selected for the old dumpsite:

7.2.2.1 In-situ Closure

According to relative standards of the country, the current waste yard should be closed for further renovation. The project includes laying seepage-proofing barrier to prevent leachate permeating outside and reduce the leachate output, and meanwhile reconditioning and treating the waste piles, collecting and disposing the leachate, gathering and exhausting the LFG, etc. Closure covering system will be laid on the pile top to protect the landfill area from surface water and rainwater. The waste pile and surroundings are to be afforested after stable operation of the dumpsite, which will make the area a scenery landscape. The technology requires a short constructing period as well as simple execution of works, which can greatly reduce the leachate output and environmental pollution from the waste piles.

7.2.2.2 Outward refuse transportation + landfilling/incineration disposal

All the current domestic refuse are excavated and then transported to Huainan domestic refuse sanitary landfill or domestic refuse incinerating power station for further disposal. The technology, with simple operation and thorough disposal, will not leave potential environmental problems. However, the technology puts forward severe test on the capacity of the landfill and the disposal scale of the incinerating station. Meantime, due to the long distance between the old waste yard and the two disposing sites, great investment will be required for outward transportation, when negative impact can be brought about on villages along the transit line.

7.2.2.3 Reclamation of Solid Waste

In the refuse lanfill, degradable substance of the refuse has been basically degraded after a stable phrase for over 6 years. The peak releasing period of LFG and leachate has passed, when the refuse is with a relatively stable nature. At this time, the refuse turns out to be minoralized refuse. After exploited, the minoralized refuse, on the one hand, can bring new capacity to the landfill; on the other hand, useful constituent can be recycled during its

exploition, which realises the resource recycling and reclamation.

According to the theory above, the technology mainly focuses on refuse separation. Minoralized refuse will be recycled immediately, when unrecoverable refuse will be transported to sanitary landfill or incinerating station for further disposal. In China, the urben domestic refuse are mainly disposed by landfilling, which has taken a great amount of land, especially for the landfills within or near the unban zones, where the potential appreciation of land value is quite considerable. Directly recycling the minoralized refuse can help decrease the floor area of waste piles and then regain the land value in use, which can bring about impressive social and economic benefits.

7.2.2.4 Comparison of different treatment technologies

The comparison of treatment technologies is as follow：

Table 7.2-1 Comparative of different landfill closure technologies

Project	In-situ Closure	Refuse outward transporting + incinerating disposal	Retexture of waste piles
Refuse bio-safety disposal	In strict accordance with the national standards, with high safety degree	No water and soil pollution in the incinerating process, with controllable air pollution	With high bio-safety degree
Refuse reduction	Low	Supreme	medium
Refuse reclamation	Recycling generated methane or using it for electricity generation	Generating electricity through refuse incineration	Realizing the resource recycling by refuse separation
Technological features	1. Discharging leachate after standard-attaining on-site disposal can be realized by building leachate treatment system. 2. The landfill, with impressive potential benefits, can be taken as park greenbelt to provide good rest areas to the residents.	1. with advanced technology of pre-treatment and simple operation; 2. A daily disposal scale of 100t/d is designed for the refuse incinerating station, which can hardly meet the demand of the vast domestic refuse from the old waste yard.	The prediction of market of the separated and recycled fertilizer is hardly optimistic. There are problems on the smooth sale of the fertilizer.
Difficulty of implementation	The difficulty degree of engineering construction is medium, when the projects of underwater protection, leachate collection and methane recycling, etc. ask for high requirements.	A great amount of refuse needs excavating, which means a big project amount. Unpredictable risks exist in the excavation process. Serious problems such as treatment of LFG and leachate can be found during the construction period of the project.	A great amount of refuse needs excavating, which means a big project amount. Unpredictable risks exist in the excavation process. 20%~30% of the refuse still needs landfilling in the disposal process. Serious problems such as treatment of LFG and

			leachate can be found during the construction period of the project.
Impact on surrounding environment	Impact on surroundings can arouse in the construction process, but will be limited in a small area around the landfill. No impact can be found after closure.	Surroundings and environment along the transit line will be polluted in the process of excavation and transportation. Impact will be on a large scale.	Surroundings and environment along the transit line will be polluted in the process of excavation and transportation. Impact will be on a large scale.
Construction cycle	Short period	Long period	Long period
Investment costs	Low construction costs, low operation and maintenance costs	High transport costs, high refuse treatment costs	Medium total investment costs

7.2.2.5 Determination of the final closure scheme

By introducing and comparing the colsure technologies of the project, comprehensively considering the investment costs, degree of construction difficulty, the later operation and management difficulties and the ultimate impact on environment, etc., the scheme of on-site closure is finally taken as the closure treatment technology for the old Huainan Datong Dumpsite. In accordance with Technical Regulations on Domestic Refuse Sanitary Landfill (CJJ 112-2007), the principal works of the project are: the waste pile shaping and treatment, the refuse embankment project, the project of intercepting seepage in landfill areas, the collecting and disposal system of leachate, the landfill gas collecting and exhausting system, the surface rainwater runoff diversion system, the surface artificial material covering project, the green covering project and the installment of monitoring wells, etc.

7.2.3 Comparison of leachate treatment options

As the project is on the closure of old waste yard, the daily output of refuse leachate is relatively small and will decrease gradually afterwards. Aiming at the actuality of the leachate output generated in the project, the following schemes are put forward for comparison:

Scheme Ⅰ: Recharging the leachate to landfill area

Scheme Ⅱ: Purchasing leachate-treatment cars (pre-treatment + two-stage reverse osmosis) to disposing the leachate

Scheme Ⅲ: Transporting the leachate to leachate treatment station in sanitary landfill by suction-type sewer scavengers

Scheme I: Recharging the leachate to landfill area

The principle of recharging leachate treatment technology is the agrarian method of leachate treatment. By recharging technology, accordingly, the refuse degration rate can be accelerated, when the stabilization progress of dumpsite will be shortened. Leachate, after collection and diversion, enters into the regulating tank, where it will be homogenized, and then gets elevated to the landfill area by lift pumps. Afterwards, the leachate will be sprayed back to the waste pile by intercepting pit or effuse, and be treated by taking use of adsorption and interception of the refuse layer as well as microbial reaction within the pile.

The features of the leachate recharging technology are being able to adapt to the change of quality and quantity of leachate, accelerating the stabilization progress, saving costs of investment and operation.

Scheme Ⅱ: Purchasing leachate-treatment cars (pre-treatment + two-stage reverse osmosis) to disposing the leachate

Purchase leachate-treatment cars and settle them in the landfill area for leachate treatment. Leachate is elevated from the regulating tank into the original jug, where acid regulation can be completed and the PH of reverse osmosis should be controled under 6.5, and then enters into the reverse osmosis system through sand-bed filter and core filter. The reverse osmosis system consists of two-stage systems: the first stage is DTRO film and the second is roll-to-roll RO system. Flowing through the two stages, leachted is emitted after reaching the standard, when concenrated liquor in the second-stage RO system reflows into the first-stage DTRO. The concentrated liquor is discharged into a storage tank through the TRO system.

The technology takes route of combining DTRO and roll-to roll anti-osmosis film, which can save one-time investment costs and meantime guarantee the effluent quality. At the same time, method of internal recycling and concentrated-liquor backflowing is designed in the Ro system, which increase the recovery rate of the system to a certain extent.

Scheme Ⅲ: Transporting the leachate to leachate treatment station in sanitary landfill by suction-type sewer scavengers

Leachate is discharged into the regulating tank after collection and diversion, and then gets transported to the leachate treatment station in sanitary landfill for further disposal by suction-type sewer scavengers. The daily treatment scale of the station is designed as 200m³/d. The treatment technology employs the mode of “coagulating sedimentation + MBR membrane bioreactor + nanofiltration (NF) + reverse osmosis (RO)”. The effluent executes Pollution Control Standards of Domestic Dumpsite (GB 16889-2008). The limitation of quality and density of water pollutants from current and newly-built domestic dumpsite can be seen in table2.

The comparison and analysis of the leachate treatment technologies above are as follows:

The waste yard was originally a simple dump of domestic refuse, with no effective seepage-proofing measure is taken within and around the area. The technology of leachate recharging will not help reduce the leachate head in the waste pile, which means the leachate will keep spreading outwards, when the expected effect of closure renovation can hardly be achieved. The scheme of purchasing leachate-treatment cars will lead to high costs of investment as well as operation and maintenance. The incapable treatment of concentrated liquor and scaling of RO film are possible probable problems as well. To transport leachate to the existing leachate treatment station for disposal can not only dispose the leachate to reach the relative national standards, but reduce the leachate head in the waste pile as well as avoid ex-osmosis.

In conclusion, given the maturity, reliability and stable operation of the technology of the existing treatment station, as well as a proper transit distance with only 6.5km, the scheme of transporting the leachate to leachate treatment station in sanitary landfill by suction-type sewer scavengers is finally taken. Meanwhile, the operation managing unit of Huainan Domestic Dumpsite has agreed to receive leachate from the old waste yard.

7.3 Environmental Impact Assessment Level and Scope

7.3.1 Assessment Level

1. The Surface Water Environment

The influence of surface water mainly is landfill leachate and a small amount of management personnel’s domestic sewage. After Datong Old Dumpsite closed, the production of landfill leachate is 23.34m3/d，8519.1m3/a. Water quality of landfill leachate is

pH 6 ~ 9，COD5000mg/L，BOD52000mg/L，NH3-N3000mg/L，SS1000mg/L.

Leachate is taken to the east of the Huainan city's domestic waste sanitary landfill site by suction sewage truck for centralized processing and after processing the leachate satisfies Municipal Solid Waste Landfill Pollution Control Standards (GB 16889-2008) Table 2 "the Limited Value of Water Pollutant Concentration at the Existing and Newly Built Domestic Dumpsite". Leachate discharges into the municipal sewage pipe network after its treatment meet the requirements, and enters the first sewage treatment plant of Huainan city. The water quality in the first sewage treatment plant satisfies *Urban Sewage Treatment Plant Pollutant Discharge Standard* (GB18918-2002) level of A standardand then discharges into Huaihe River.

During operating period, the staffing at the landfill site comprises 8 management members. Domestic sewage missions is 1.28 m3/d. Canteen oily wastewaterdischarges into the municipal sewage pipe network.with other domestic sewage treated by septic tanks after oil tank insulation treatment.

Therefore, according to the relevant provision of Environmental Impact Assessment Technical Guideline - Water Environment (HJ/T2.3-93), water environment evaluation level is level 3.

2. The Atmospheric Environment

Landfill gas is produced when organic waste decomposes under anaerobic conditions. The atmospheric pollution source is operating period's foul gas, and the major pollutant is H2S, NH3. The calculation method of the maximum ground level concentration of pollutant is given by:

$$P_i = \frac{C_i}{C_{0i}} \times 100\%$$

Where:

Pi——the first i pollutants' maximum ground level concentration rate, %;

Ci——Using estimation model calculated the first i pollutants' maximum ground level concentration，mg/m3;

C0i—— the first i pollutants' ambient air quality standards，mg/m3.

When the torch of the project don't burn, the maximum ground level concentration of H2S, NH3 and methyl mercaptan are respectively 5.6×10-5mg/Nm3, 1.2×10-3mg/Nm3 and 3.1×10-5 mg/Nm3, the rate respectively is 0.56%, 0.6% and 4.43%, the maximum ground level concentration rate is lower and less than 10%.

According to rating system of the evaluation work and engineering home environment characteristics conditions in the Environmental Impact Assessment Technical Guideline - Atmospheric Environment (HJ2.2—2008), atmospheric environment evaluation level is level 3.

3. Acoustic Environment

The acoustic environment functional area of the construction project is 2 class area stipulated by GB 3096-2008. According to evaluation hierarchies of Environmental Impact Assessment Technical Guideline – Sound Guideline (HJ2.4-2009) the acoustic environment evaluation level of this project is level 2.

4. Underground Water

（1）Construction Project Classification

This construction project may cause the problems of the groundwater water quality in the process of landfill closure. According to the construction project's classification standard of Environmental Impact Assessment Technical Guideline – Underground Water Environment (HJ610-2011) this construction project is intended as Ⅰ class construction project.

（2）Construction Projects Classification Basis

According to the project Ⅰ class features, antifouling performance of the the vadose zone of comprehensive construction project , aquifer easy pollution characteristics, groundwater environmental sensitivity, wastewater emission load and water quality complex of sewage water etc. aspects, the levels of the groundwater environmental impact assessment work are classified. And the evaluation work is carried out based on the defined highest workding level.

Vadose zone antifouling performance According to Resource City (Huainan City) Sustainable Development Engineering in Coal Mining Subsidence Areas Comprehensive Treatment Project Geological Geo-hazard Appraisal Report, the main soil layers are miscellaneous fill and landfill waste within the scope of the investigation depth. Rock (soil) single layer thickness Mb≥1.0m; according to the test results, surface layer soil permeability coefficient is 10-7cm/s<K≤10-3cm/s, with the characteristics of discontinuous distribution and basical stableness, and the level of the vadose zone antifouling performance is 'weak'.

Aquifer easily pollution characteristic Evaluation District's unconsolidated rock pore water, carbonate rocks fissure karst water and clastic rock fissure water are closely linked, which constitute a unified water system. Because of the high strength of the northern coal mine water drainage, the channels of the karstic water and the fissure water are dredged and a unified groundwater migration network is formed. The karst groundwater alternation and migration condition is good. Based on the vadose zone antifouling performance level, the level of the aquifer easily pollution characteristic is 'easy'.

Environmental Sensitivity After investigation, construction project does not involve the living water supply water source protection zone, distinctively groundwater resources protection zone, and the living water supply water source region recharge runoff area. However the north of the project area has distributed resident drinking water wells from superficial layer to deep layer, such as Chenxiang village and Qian Yingzi village etc., the environmental sensitive degree is 'sensitive'.

Quantity of Wastewater Effluent The wastewater of construction projects mainly is landfill leachate, emissions generally less than 1000 m3/d, therefore, the wastewater discharge scale of construction projects is 'small'.

The Complexity of Wastewater's Water Quality Datong old dumpsite is mainly household garbage, the generated wastewater in the area is mainly garbage leachate. The pollutants are mainly chloride, COD and ammonia nitrogen etc., the number of the pollutant type ≥2, the demand forecasting water quality index number < 6, therefore, the complexity of water quality is 'medium'.

Indicators and its divided level process, see table 7.3-1.

Class construction Project Evaluation Rating Scale Table Table 7.3-1

Evaluation Level	Construction Project Site Vadose zone Antifouling Properties	Aquifer of Construction Project Site Easily Polluted Characteristics	Sensitive Degree of the Groundwater Environment of the Construction	Construction Project Wastewater Emission Load	Construction Project Water Quality Complexity

			Project Site		
Level One	Weak-Strong	Easy- Difficult	Sensitive	Large-Small	Complex - Simple
	Weak	Easy	More Sensitive	Large-Small	Complex -Simple
			Insensitive	Large	Complex - Simple
				Middle	Complex-Medium
				Small	Complex
		Middle	More Sensitive	Large-Middle	Complex- Simple
				Small	Complex-Medium
			Insensitive	Complex-Medium	
				Middle	Complex
		Difficult	More Sensitive	Large	Complex-Medium
				Middle	Complex
	Middle	Easy	More Sensitive	Large	Complex - Simple
				Middle	Complex-Medium
				Small	Complex
			Insensitive	Large	Complex
		Middle	More Sensitive	Large	Complex-Medium
				Middle	Complex
	Strong	Easy	More Sensitive	Large	Complex

（3）The Level of Groundwater Environment Impact Assessment Work

On the basis of the classification condition of the construction project, 'the potential link and pollution index of the polluted groundwater' and the 'basic characteristics of the project site' and according to the provisions of Environmental Impact Assessment Technical Guideline - Groundwater Environment (HJ610—2011), the levels of groundwater environmental impact assessment work are classified. This project belongs to Class Ⅰ of the first level of construction projects.

7.3.2 Evaluation Scope

Table 7.3-2 shows the estimation scale and scope of various environmental elements. Table 7.3-1 is groundwater evaluation areal map.

Environmental Impact the Level and Scope of the Assessment Table 7.3-2

Environmental Elements	Evaluation Grade	Evaluation Scope
Surface Water Environment	Level 3	Chenxiang drainage channel of the project area;
Atmosphere Environment	Level 3	the circular area where landfill is the center and radius is 2.5 km;
Sound Environment	Level 2	outside the red line of the landfills 200m range;

Ecological Environment	Level 3	Project area boundaries extending outward 200m range；
Groundwater Environment	Level 1	In the area where Old Datong dumpsite is considered as the center and the boundary in the south is the area of this watershed, Shungeng Mountain and Qishangji, Hefu railway in the east, Huaishun south road in the west and the boundary in the north, the affecting area and sensitive area are determined, which are likely to be polluted by the pollutants. Based on above principle and the special distribution of the the same hydrogeologic units and also combined with the requirement of investigation and evaluation of groundwater status quo in the class Ⅰ construction project, the scope of the evaluation area is determined as 50 km2.
Society Environment	---	Huainan City Jiuda Tong District Jiulonggang Township, Datong Subdistrict Office; Huaishun Community, Chonghua Community, Xinnjian Community, Hongqi Community, Chenxiang Village, Jiulonggang Village , Datong Subdistrict Office's Zhanhou Community and Kuangnan Community;

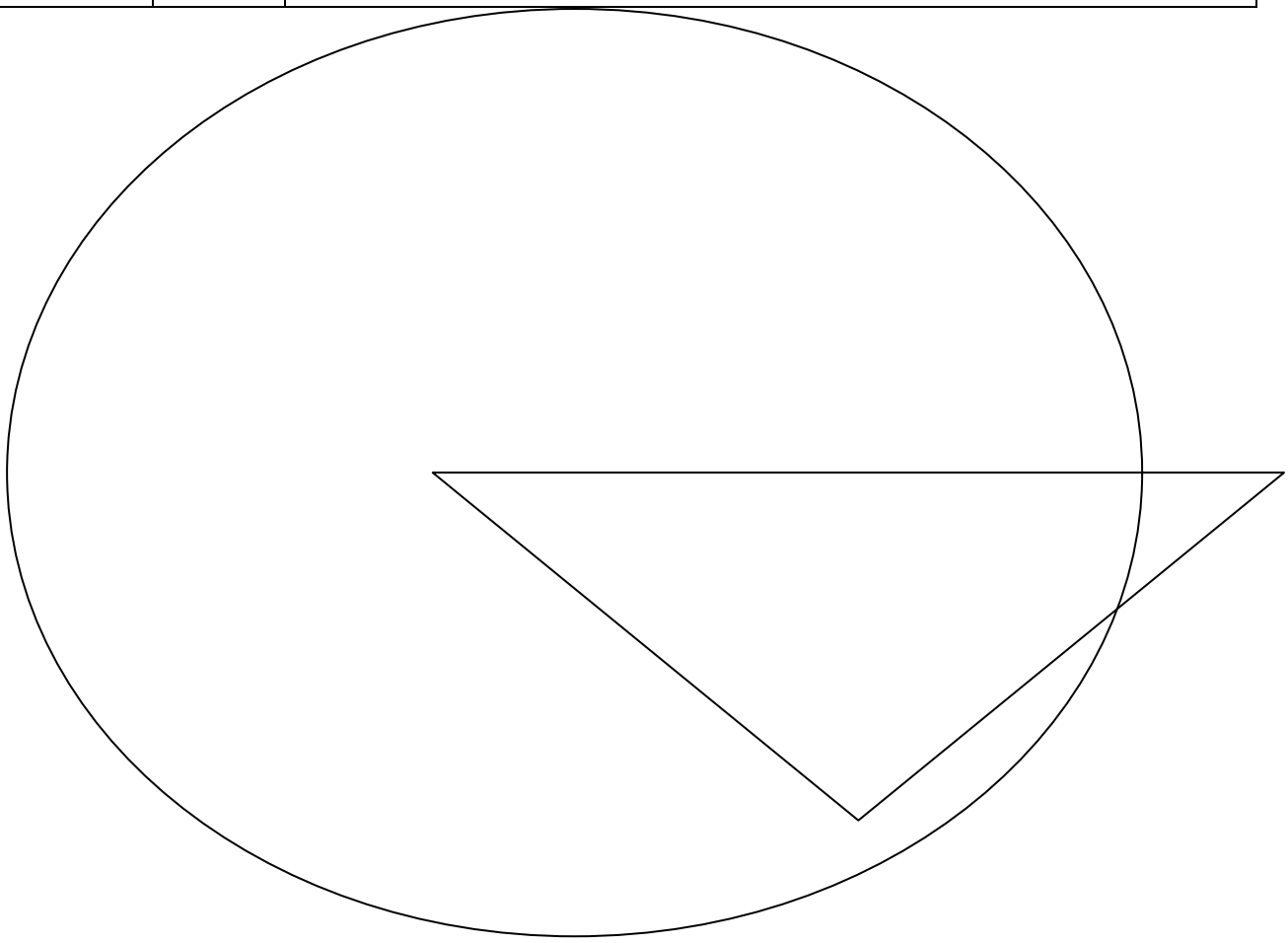


Table 7.3-1 The Scope of Groundwater Evaluation Areas

7.4 The Environmental Protection Goal

Evaluation range area does not have nature protection area, water conservation district, landscape and famous scenery and other special sensitive area and important sensitive area. The cultural relics of the project areas includes national key cultural relics protection units

mass graves that are the ruins of Huainan evidence by the Japanese invaders, secret reservoir, bunker dungeon three protection point and one remnants bunker. This project belongs to the ecological restoration project, the circum of above cultural relics units all have a large area of green isolation belt. When this project is working, all construction camps are far away from the cultural relics units, and the construction process does not involve the impact on the cultural relics. The south side Shungeng Mountain belongs to the leisure tourist area of Huainan city, and it does not belong to nature reserves or scenic spot. This project does not have a bad effect on Shungeng Mountain when in the construction of the projectin the con. According to field investigation, the environment protection targets of subcomponent 3, see table 7.4-1

Environmental Protection Objectives Table Table 7.4-1

No.	Environmental Elements	Environmental Protection Goal	Relative Orientation	Relative Distance (m)	Scale (People)	Environmental Function Goal
1	Surface Water Environment	Mmultiple subsidence pools and Datong Drainage channels, Chen Lane Drainage channel: two Drainage channels	---	---	Small Channel	Surface Water Environment Quality Standards (GB3838-2002) Ⅴ Class Standard；
2	Acoustic Environment, Atmospheric Environment	Garden Spot Comfortable Housing Project (inside district)	S	894	504	Sound Environment Quality Standards (GB3096-2008）'Class 2 Area'； Ambient Air Quality Standards (GB3095-1996) and its secondary standard in the remediation list；
		Chenxiang Village (outside district)	N	367	3250	
		Shunfa Runze Garden (outside district)	N	778	26000	
3	Groundwater Environment	Civil Wells Inside District Area	--	--	--	Groundwater Quality Standard (GB/T14848-93) Class Ⅲ Standard

Note: sensitive targets of the acoustic environment and atmospheric environment protection targets, within 200m range is the acoustic environment protection target, all of them are the atmosphere environmental protection target.

7.5 Engineering Analysis

7.5.1 Construction Period

During the construction period, the construction of the waste dumps shape-correction treatment, leachate collection system, landfill gas guide line system, sealing cover system etc., within a certain time, a certain areas will cause varying degrees of pollution impact on the regional environment. This influence is a short-term behavior, which will disappear at the end of the construction period.

During the construction period of this project, it will set construction camps; constructors eat out and only lodge in the camp.

7.5.1.1 Water Pollution Source

During the construction period, the wastewater mainly contains construction wastewater and the household wastewater of the constructors.

1. Construction Wastewater

During the construction period, construction wastewater is from various construction

machineries and equipments which produce flushing water with oil; main pollutants are COD, SS and petroleum.

In the project, transport vehicles are only washed and water quota is 100L/vehicle trips, 8 vehicle trips/d (construction days 300 days). Car-washing wastewater pollutants' generated conditions are shown in table 7.5 1

Car-washing Wastewater Pollutants List Table 7.5-1

Category	Project Name	COD	SS	Petroleum
Car Washing Wastewater （240m3/a）	Generated Concentration (mg/L)	100	300	10
	Generated Quantity （t/a）	0.024	0.072	0.0024

2. Household Wastewater

During the construction period, the wastewater includes washing wastewater and feces wastewater. Because the constructors are not eating in the construction areas, the need of the household water is small.

There are 30 constructors in the landfill site during construction period. The water quota is 150L/ (cap·d), pollution discharging coefficient is 0.8 and sewage emissions is 3.6 m3/d, 1080m3/a. The main pollutants' discharge concentration, generated and discharge quantity are shown in table 7.5 2.

Domestic Wastewater Pollutants List Table 7.5-2

Category	Project Name	COD	BOD5	NH3-N	SS
Household Wastewater （1080m3/a）	Generated Concentration (mg/L)	200	120	30	100
	Generated Quantity （t/a）	0.216	0.1296	0.0324	0.108

7.5.1.2 Atmospheric Pollution Source

In the construction period, the main air pollution sources are construction fugitive dust, construction machineries and vehicles exhaust dust, the asphalt smoke of road asphalt paving, and waste flipping generated stench.

Construction dust mainly comes from landfill main work engineering construction (such as garbage levee, vertical anti-seepage curtain and drainage, leachate collection system, landfill gas collection guide line system, the dump body covering plastic, sealing field operation, etc.) generated dust, transportation vehicle generated road dust, bulk material yard generated wind erosion dust etc., if this is not controlled, the dust will cause air pollution.

(1) The Dust of the Landfill Site Main Work Construction

The dust of main work construction mainly comes from the pile body shaping, densification performance and covering soil working, especially working in the in dry and larger wind weather.

This evaluation and analogy survey Dalian City Jinzhou Yongsheng Waste Oil Disposal Center General Industrial Solid Waste Safety Landfill, the present situation of environmental monitoring data, under the condition of normal wind speed and sunny day, the dust

concentration: landfill import road 0.45 ~ 0.72 mg/m3, the closed operation yard 0.24～1.73 mg/m3

(2) Vehicle Transportation Road Dust

In the process of the construction, the vehicle transportation mainly is cubic meter of earth and stone transportation and construction materials transportation. The needs of soil source in this project take from the excavation works of drainage system renovation, transportation distance is short.

Analogy pollutants generated conditions for the similar project; vehicle travelling dust in dust completely dry conditions can be calculated by the following empirical formula:

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

Where：Q— the dust of the driving vehicle ，kg/（km· one vehicle）；

V— Vehicle speed，km/h；

W—the load of the vehicle，t；

P—the amount of the road surface dust，kg/m2.

The Vehicle Dust in Different Velocity and Surface Cleaning Degree Table 7.5-3

P / Vehicle Speed	0.1	0.2	0.3	0.4	0.5	1.0
5(km/h)	0.051	0.086	0.116	0.144	0.171	0.287
10(km/h)	0.102	0.171	0.232	0.289	0.341	0.574
15(km/h)	0.153	0.257	0.349	0.433	0.512	0.861
20(km/h)	0.255	0.429	0.582	0.722	0.853	1.435

Table 7.5 3 is about the amount of dust emission in conditions of various degrees of surface clearness and different speed for a 10 tons truck when it passes through the road with 1 km long. As known from above table, in the same road cleaning degree, the faster the speed the more the amount of dust; while at the same speed, the road surface is dirtier and the amount of dust is larger. However due to the short transportation distances, speed is lower and dust is less.

According to the analogy survey, the generated dust of construction and transport vehicles has more effects within 30m that is a linear pollution; the roadside TSP can reach more than 10 mg/m3, generally the concentration between 1.5-30 mg/m3. In the flat ground, the generated dust has influence within 50m areas and TSP concentration in 50m is close to the background value.

(3) Bulk Material Dump Wind Erosion and Dust

The process of earthwork and Loose materials stacking can generate dust, especially under the dry climate and windy conditions and dust emission can be calculated by the experience formula of dust emission in the yard:

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

Where：Q— the amount of dust，kg/t·a；

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

V0—Wind speed of generated dust，m/s；

W— the moisture content of dust particles，%。

The amount of dust is connected with moisture content, therefore, avoiding air storage, ensuring certain moisture content and avoiding bare ground are the effective measures to reduce the dust that is caused by wind.

The air spread condition of the dust particles is associated with meteorological conditions such as wind speed etc. and also associated with the settling velocity of dust particles. Different particle size of dust particles' sedimentation velocity are shown in table 7.5 4.

Different Particle Size of Dust Particles' Sedimentation Velocity Table 7.5-4

Particles Diameter (μm)	10	20	30	40	50	60	70
Sedimentation Rate (m/s)	0.03	0.012	0.027	0.048	0.075	0.108	0.147
Particles Diameter (μm)	80	90	100	150	200	250	350
Sedimentation Rate (m/s)	0.158	0.170	0.182	0.239	0.804	1.005	1.829
Particles Diameter (μm)	450	550	650	750	850	950	1050
Sedimentation Rate (m/s)	2.211	2.614	3.016	3.418	3.820	4.222	4.624

As known from above table, dust settling velocity increases with the increase of particle size. When particle size is 250μm, the settling velocity is 1.005 m/s. When the project residual dust is greater than 250μm, the main influence scope is within close range of downwind direction of the raising dust point and what real impact the external environment are some tiny dust particles. In addition, according to the different local climate, its influence cope is also different.

(4) Construction Machinery Vehicle Exhaust

During construction, various construction machinery and transport vehicles burn gasoline and diesel and exhaust emissions which contain atmospheric pollutants THC, particulate matter, CO, NOX, etc. Emissions will have an impact on construction site. According to related statistics, generally a large construction vehicle emissions is CO 5.25 g/ (· km), HC 2.08 g/ (· km), 10.44 g/NO2 (km). This project has less construction machinery vehicles working at the same time, therefore vehicle exhaust emissions is less, which belong to the inorganized emissions.

(5)The asphalt Smoke

Asphalt gas mainly comes from the molten, mixing and paving process of the asphalt at the pavement construction stage, mainly producing pollutions THC, TSP and BaP.

Pollutants concentration generally in the downwind direction 50m away, benzene and [a] pyrene below 0.00001 mg/m3, phenol in the downwind direction 60m is≤0.01mg/m3, THC in the downwind direction 60m is≤ 0.16mg/m3.

(6) Flip Garbage Generated Stench

Because this project items need to be done to the existing landfill body shaping and cutting slope, thus will flip wastes 137846m^3. When flipping wastes it will generate odour and

have some influence on constructors and nearby residents.

7.5.1.3 Noise Pollution Source

During the construction noise mainly comes from construction machinery and transport vehicle noise, etc., the main noise sources including bulldozers, excavators, rollers, paver, loader, heavy truck, etc. Refer to Environmental Noise and Vibration Control Engineering Guidelines （HJ2034-2013）appendix A table A2 Common Construction Equipment Noise Source (sound pressure level), noise production equipment noise levels are shown in table 7.5 5.

Main Equipment Noise Source Table Table 7.5-5

Noise Production Equipment	Sound Level / Distance [dB(A)/m]	Noise Production Equipment	Sound Level / Distance [dB(A)/m]
Soil Shifter	83～88/5	Paver	80～90/5
Hydraulic Excavator	82～90/5	Wheel Loader	90～95/5
Various Road Roller	80～90/5	Dump Truck	82～90/5

7.5.1.4 Solid Waste

During the period of construction, the main solid waste is construction waste and constructor's household waste.

1. Construction Waste

The accounted construction wastes are: brick, stone, sand etc. from construction, and all kinds of building materials of packages and bags etc.

2. Household Waste

According to the subcomponent of the project, construction camps are set up (no dining room) at the construction site, and project construction personnel is 30 people. according to 0.5 kg/person·d of household waste quantity, the output of household waste is 15 kg/d, 4.95t/a. Construction duration is 2 years and 2 months and the total quantity is 10.8 t during construction.

7.5.2 Operation Period

7.5.2.1 Water Pollution Sources

Main water pollution sources in this operation period are leachate and the sewage from administrative staffs.

1. Leachate

After Datong old dumpsite site closed, the quantity of the landfill leachate is 23.34m3/d, 8519.1m3/a (calculated by 365d/a).

According to Domestic Landfill Leachate Treatment Engineering Technical Specifications (Trial)（HJ 564-2010）, leachate produced by Datong old dumpsite belongs to the leachate after closure and the typical water quality of leachate is pH 6 ~ 9, COD1000 ~ 5000 mg/L, BOD5300 ~ 2000 mg/L, NH3 - N1000 ~ 3000 mg/L, SS200 ~ 1000 mg/L.

In this evaluation, maximum water quality of Datong old dumpsite leachate is pH 6 ~ 9, COD5000mg/L, BOD52000mg/L, NH3 - N2000mg/L, SS1000mg/L.

Leachate produced by Datong old dumpsites is taken to to the east of Huainan city domestic waste sanitary landfill site leachate treatment station for centralized treatment by suction-type sewer scavenger. After processing, it is taken into the first sewage treatment plant of Huainan city.

East Huainan city household waste leachate treatment plant's design processing size is

200³/d, treatment process using 'coagulating sedimentation +MBR membrane bioreactor + nanofiltration (NF) +reverse osmosis (RO)'. The design water quality is as follows:COD 10000mg/L，ammonia nitrogen, 2500 mg/L, SS 2000 mg/L，pH 6～9 mg/L，total phosphorus 30 mg/L; Water outlet performs Household Waste Landfill Pollution Control Standard (GB 16889-2008) table 2 Limit on Water Pollutants Emission Concentration in the Existing and Newly Built Household Waste Dumpsite, namely: COD 100 mg/L, BOD5 30 mg/L, NH3 - N 30 mg/L, SS 25 mg/L.

The design of Huainan first sewage treatment plant processing scale is 100000 t/a, and the design inlet and outlet water quality are shown in table 7.5 6.

Design Inlet and Outlet Water Quality of Huainan First Sewage Treatment Plan

Table7.5-6 **Unit：mg/L**

Contaminate Index / Category	COD	BOD5	SS	NH3-N	TN	TP
Design Inflow Water Quality	280	105	130	52	60	2.5
Design Output Water Quality	50	10	10	5(8)	15	0.5
Removal Rate	82.14%	90.48%	92.31%	90.38%	75%	80%

These waste leachate main pollutants generated conditions and discharge conditions after treatment are shown in table 7.5-7

Main Pollutants' Output and Emissions of the Leachate Table 7.5-7

Pollutant Name	Generated Concentration (mg/L)	Waste Quantity (t/a)	Emission Concentration (mg/L)	Emission Load (t/a)
COD	5000	42.6	50	0.43
BOD5	2000	17.0	10	0.09
NH3-N	3000	25.6	5	0.04
SS	1000	8.5	10	0.09

2. Household Wastewater

During the operating period of this subcomponent, management personnel is 8 at the dumpsite and staffs are all in the plant for accommodation and dining. Water quota is 200 L/(cap·d) and drainage coefficient is 0.8. Household wastewater emissions are 1.28m3/d，467.2m3/a（calculated by 365d/a）. Because of the small amount of domestic sewage discharged in this project area, after insulation treatment by oil tank canteen oily wastewater discharges into the municipal sewage pipe network and enters into the first sewage treatment plant of Huainan together with other domestic sewage treated by septic tanks. The main pollutants and discharge conditions are shown in the table 7.5-8.

Project main water pollutants and discharge summary are shown in table 7.5-9.

Household Wastewater Pollutant Table 7.5-8

Pollutant Name	Generated Concentration (mg/L)	Waste Quantity （t/a)	Emission Concentration (mg/L)	Emission Load (t/a)
COD	200	0.093	50	0.023
BOD5	120	0.056	10	0.007
NH3-N	30	0.014	5	0.004
SS	100	0.047	10	0.007
Animal and Vegetable oils	10	0.005	5	0.004

Project Main Water Pollutants and Discharge Summary Table 7.5-9

Pollutant Name	Waste Quantity （t/a）	Reduction Quantity （t/a）	Emission Load （t/a）
COD	42.693	42.240	0.453
BOD5	17.056	16.959	0.097
NH3-N	8.514	8.470	0.044
SS	25.647	25.550	0.097
Animal and Vegetable oils	0.005	0.001	0.004

7.5.2.2 Atmospheric Pollution

The major air pollution in this operating period is landfill gas after the landfill closure.

In the decomposition process of garbage, discharge of landfill gas is related to many factors, such as the amount of landfill, the content of organic matter in waste, moisture, temperature, pH, landfill covered time and waste decomposition rate. Datong old dumpsite has been out of use for 5 years, and at present it is still in the gas phase, but the gas production rate declines year by year. According to the feasibility, the landfill piled garbage is about 60 ~ 800000 m3, to 2016 the expected gas production is about 715000 m3 / a, and emissions in per unit time is 81.6 m3 / h.

According to the survey, after closure household waste gases generally consist of CH4, CO2, and a small amount of NH3, N2, H2S, etc. Because of NH3 and H2S stimulating odour, therefore it has big impacts on the surrounding atmospheric environment. According to domestic waste landfill site actual operating situation, in general, each component of the landfill gas after closure is shown in table 7.5 - 10.

The Component of Domestic Waste Landfill Gas (LFG) Table 7.5-10

Component	Methane （CH4）	CO2	Nitrogen (N)	Oxygen (O)	Sulfide	Ammonia	H	CO	Micro-component
Volume Percentage %	45-50	40-60	2-5	0.1-1.0	0-1.0	0-0.2	0-0.2	0-0.2	0.01-0.6

Datong old dumpsite has been out of service for a long time and some measures has already been taken, such as covered with brick and head, waste residue, etc. According to the measured pollutant concentration of landfill downside wind sensitive target, and referring to domestic landfill components conditions, landfill gas main pollutants existing emission

concentration are shown in table 7.5-11.

According to the measured pollutant concentration of landfill downside wind sensitive target, and referring to domestic landfill components conditions, the emissions concentration of main pollutants' status of the landfill gas are shown in table 7.5-12.

This Project Landfill Gas Main Pollutants Current Emission Load Table 7.5-11

Name of Pollutants	Datong Old Dumpsite	
	Emission Load（t/a）	Emission Rate（kg/h）
H2S	0.05	0.006
NH3	0.26	0.030

This Project Landfill Gas Main Pollutants Current Emission Concentration

Table 7.5-12

Name of Pollutants	The Emission Concentration Of Datong Old Dumpsite Current Situation（mg/m3）
H2S	0.006
NH3	0.149

In the dumpsite, the landfill gas collection and treatment facilities are not provided, therefore this closure control is proposed to adopt vertical air stone cage to collect landfill gas, after combustion to discharge.

The collecting efficiency of guide gas stone cage is 95%, more easily collected at all after partial combustion, the H2S removal rate was 95%, NH3 collect partial combustion ratio as 86% to calculate, the H2S removal rate was 82%. After removing the exhaust emissions of NH3 and H2S are shown in table 7.5-13, emission concentration are shown in table 7.5-14.

Landfill Gas Pollutants Emission Load after Processing

Table 7.5-13

Name of Pollutants	Datong Old Dumpsite	
	Emission Load（t/a）	Emission Rate（kg/h）
H2S	0.003	0.0003
NH3	0.047	0.0005

Landfill Gas Pollutants Emission Concentration after Processing

Table 7.5-14

Name of Pollutants	Datong Old Dumpsite Emission Concentration（mg/m3）

H2S	3.0×10-4
NH3	2.7×10-2

7.5.2.3 Noise pollution

During the operation of the project, the main noise comes from leachate transportation vehicles. There are three times of transportation every day. The intensity of noise is 70~80dB (A) when driving.

7.5.2.4 Solid Waste

During the operation of the project, the main solid waste is the living garbage produced by production managers.

In the project operation period, there are 8 staff living and eating in the region, whose living garbage is calculated in 1kg/ (cap·d) as 8kg/d, 2.92t/a.

7.5.2.5 The collection of pollutants in operation period

The collection of pollutants produced during the subsidiary project operation can be seen in the Table 7.5-15.

The summary of pollutants produced and discharged in Datong Old Dumpsite operation process.

Table 7.5-15

classification	Sources of pollution	Main pollutants	Output （t/a）	Emission （t/a）
Exhaust gas	Landfill gas	H2S	0.05	0.003
		NH3	0.26	0.047
	Canteen fumes	Kitchen fume	2.64×10-3	2.64×10-3
Waste water	Garbage leachate	COD	42.6	0.43
		BOD5	17.0	0.09
		NH3-N	8.5	0.04
		SS	25.6	0.09
	Living waste water	COD	0.093	0.023
		BOD5	0.056	0.007
		NH3-N	0.014	0.004
		SS	0.047	0.007
		Animal and vegetable oils	0.005	0.004
Solid waste	Living garbage	Living garbage	2.92	/

7.5.2.6 The analysis of pollutants reduction

After this subsidiary project completed, landfill gas will be collected, leachate will be dealt with pollutants and the land will be cultivated. This will make a great sense to reduce the air pollution, the leachate pollution to the surface water and the ground water and reduction of water and soil loss.

1. The analysis of reduction of landfill gas pollutants

Before implementing the subsidiary project, the landfill gas was discharged into surrounding air in an unstructured form. After closing the land, the landfill gas will be collected and burnt first, and then discharged. The reduction of exhaust gas after closing the land can be seen in Table 7.5-16.

The Reduction of Exhaust Gas Table Table 7.5-16

Pollutants name	Emission before implementation （t/a）	Emission after implementation （t/a）	Reduction （t/a）
H2S	0.05	0.003	0.047
NH3	0.26	0.047	0.213

2. The analysis of the reduction of garbage leachate

Before the implementation of this subsidiary project, the leachate was not dealt with and discharged into surrounding surface water. Because of the infiltration of wet precipitation, the leachate becomes more as 178.17 m3/d. After closing the land, the guiding drainage system of rain on the surface was built, which reduced the leachate and collected and standardized leachate to discharge. After closing the land, the reduction of the waste water can be seen in 7.5-17.

The Subsidiary Project Leachate Emission Reduction Table Table 7.5-17

Pollutants name	Emission before implementation （t/a）	Emission after implementation （t/a）	Reduction （t/a）
COD	42.6	0.43	42.17
BOD5	17.0	0.09	16.91
NH3-N	8.5	0.04	8.46
SS	25.6	0.09	25.51

7.6 Environment Impact and Mitigation Measures during Construction

7.6.1 Water environment

7.6.1.1 The analysis of water environmental impact

The main polluting resources of this project: leachate accumulation in the trenches surrounded the landfill, construction machinery's running, dripping, and leaking oil pollutants mixed with rain water, living waste water in construction camp, washing by rain the soil produced when dig and fill or construction materials' pollution to water, whose main pollutants are SS.

The main polluting resources of producing waste water: the oiled waste water of cleaning the machines and the running, drilling, dripping and leaking of oil in the construction site. There is no toxic and hazardous substance in the production waste water, and its main pollutant is SS. if the oily wastewater is discharged into water, it will form an oil membrane on the water and cause the dissolved oxygen hard to recover and influence the water quality. If the oily wastewater is discharged at random, it will decrease the fertility of soil, change the structure of soil, and be harmful to the recovery of construction camp. The construction unit should stress the maintenance and management of construction machinery and vehicles in

order to prevent the leaking oil accident. The amount of production wastewater is about 8 m3/d.

The main pollutants in construction camp are BOD5 and COD etc. During the construction, there were 30 people here. The emission of living wastewater is about 3.6m3/d and the main polluting substances are organic materials and pathogenic microbes. According to the similar projects, the monitoring values of the various pollutants in living wastewater discharged by workers at the construction site: COD 200mg/L, BOD5 120mg/L.

The workers will not eat in the construction field. And there is a dry toilet here. The excrements and wastewater will be used by farmers as fertilizer. Construction personnel use the cleaning sediment wastewater to proof dust and do not discharge out.

Before the implementation, the leachate in the trenches surround the Datong old dumpsite is about 10m3. We suggest the construction unit using fecal suction truck to suck the excrements to the built leachate treatment planting in the living waste landfill, the east of Huainan City to solve. And then drain it to the First Wastewater Dealing Plant in Huainan City and discharge the water in standard.

7.6.1.2 Water pollution mitigation measures in construction period

1. The treatment of oily wastewater

Set gullies in the site of construction machinery or vehicles repairing and maintaining. Collect washing wastewater produced in checking and repairing. Set grease trap to deal with the oily wastewater. After sediment, the washing wastewater is used repeatedly and not drained outside.

2. Wastewater of sand/stone washing

The earth leaching water, foundation pit drainage and construction sand and stone washing wastewater can cause high concentration of suspended solids in water. Therefore, to prevent the pollution of the surface water, we suggest setting temporary sediment pool to collect all kinds of wastewater and deposit to repeatedly use as construction using water as much as possible.

3. The treatment of construction personnel living wastewater

The workers will not eat in the construction field. And there is a dry toilet here. The excrements and wastewater will be used by farmers as fertilizer. Construction personnel use the cleaning sediment wastewater to proof dust and do not discharge out.

7.6.2 The atmospheric environment

7.6.2.1 The analysis of the influence on atmospheric environment

(1) The analysis of foul-smelling influence

In the construction, due to the turnover and transportation of the garbage, the original garbage piles are changed, so the foul-smelling density in the surroundings would be increased. However, this garbage site has been stopped to use since 5 years ago. According to the monitoring leeward, the average Ammonium and Hydrogen sulfide of 2 days are 0.155 mg/m3 and 0.0054 mg/m3, which can reach the maximum allowable concentration of harmful substance in atmosphere according to the Standard for Industrial Enterprise Sanitation Design (TJ36--79). This can explain that the toxic and harmful substance produced when organic matter decomposes and most of foul-smelling gas is released. Although the Ammonium, Hydrogen sulfide and Methyl Mercaptan will increase, they are limited. Through the diffusion and dilution of surrounding air, the foul-smelling substance will disappear quickly. And there is no sensitive point within 300m around Datong old dumpsite Closing Treatment Project; therefore, the evaluation shows there is no influence or very small influence of foul-smell to habitants around.

(2) The analysis of the influence of CH4 burning and exploding

When the density of CH4 reaches to 5%-15%, it will explode. If its concentration is below 5%, it will not burn or explode. And if its concentration is above 15%, it will burn but not explode. According to the monitoring of the CH4 in Silihe Landfill in Hefei, the CH4concentration is 0.8340mg/m3 leeward (When monitored the CH4 concentration in Silihe Landfill, the landfill has been closed for 5 years. And the forecast landfill gas is 560m3/h). Convert the CH4 into volume 1.16ppm just as 1.16 of one million and it is far away from the concentration of burning and exploding. Therefore, the evaluation shows that in the garbage turnover period, there is no danger of exploding burning.

(3) The analysis of the dust influence when vehicles running in the construction site

The main dust in the landfill construction process comes from vehicle transportation. And the transportation concludes: garbage turnover and transportation, the covering and filling of the landfill, and the transportation of building materials on the dike. There are reasons causing road dust, and mainly are the vehicle speed, the wind speed, road dust quantity, humidity of road dust, and thickness of road dust. The wind speed also influences the transportation of the dust. According to the survey materials of construction, the concentration of the dust nearing ground in the construction site can reach to 1.5~30mg/m3.

According to the analogy survey, after taking measures of watering, the influence of the dust do to the environment can be decreased. There is no environmental sensitive point within 300m around here, so the dust cannot influence the sensitive point. But measures need to take to decrease the dust.

(4) Dust produced when hardening the road

All the landfills have their own road, and the roads which lead to the landfill first were hardened with concrete. The concrete was transported here by tanks and did not set the concrete mixing stations. Therefore, there was little dust when hardened the roads. According to the on-site survey, there is no environmental sensitive point within 500m around two sides of the 300m road from the woods road to the landfill. The transportation dust will not influence habitants. But measures still need to take to decrease the dust to protect the surrounding environment.

(5) Dust of the landfill project

Due to few building in the landfill, there is little dust here. The main dust of the construction process is the dust produced when forming the piles, compacting, getting and covering the soil. During the process of the turnover and arrangement of the garbage, the grass and some crops are rooted up, which makes the landfill naked. When the weather is dry and windy, dust is easy to be produced, which can be harmful to the surrounding environment. So measures need to be taken to reduce dust.

7.6.3 Acoustic environment

7.6.3.1 The analysis of noise influence in construction period

In Datong old dumpsite treatment process, the main construction equipment and the influencing distance to the environment can be seen in Table 7.6-2.

The Main Machinery in Construction and Influencing Distance of Noise Table 7.6-2

Noise production equipment	Noise level [dB(A)]	distance (m)	GB12523—2011standard	
			daytime	Night time
			70 dB(A)	55 dB(A)
			Construction machinery noise influencing distance（m）	

Bit	86	1	16	31
excavator	82～90	5	60～100	135～175
Bulldozer	83～88	5	65～90	140～165
Compactor	90	3	60	105
Loaders	90～95	5	100～125	175～199
Truck	82～90	5	60～-100	135～175
Road roller	80～90	5	50～100	126～175
Paver	80～90	5	50～100	126～175

According to the on-site survey, there is no there is no environmental sensitive point within 300m around Datong old dumpsite. So there is no noise influence to the habitants. And there is also no sensitive point within 500m around two sides of road from the woods road to the landfill, so the noise of transportation of the building materials and engineering materials in Datong old dumpsite treatment cannot influence the environment.

7.6.3.2 The noise decreasing measures during construction.

Datong old dumpsite closing treatment project has no environmental sensitive point, so there is no influence to the sensitive point. No noise pollution prevention measures will be taken, but the regulations in the Construction Field Environmental Noise Emission Standard (GB12523-2011) will be strictly implemented.

7.6.4 Solid waste

7.6.4.1 The analysis of solid waste influence to environment

The solid wastes produced in Datong old dumpsite closure treatment period are mainly living garbage, building garbage, living garbage turnover, and digging and filling.

The staff will be about 30 in the construction period. According to each people 0.5kg garbage each day, and the time is 26 months. The total garbage is 10.8t. If the living garbage cannot be dealt with well, it will damage the environmental sanitation and beauty. If it comes to the river, it will pollute the river. So it is necessary to deal with the living garbage. The garbage transportation is total 137880m3. Kinds of garbage need to be classified and recycled. The brick, stone and sand produced in the construction can be used as filling materials to fill the road base and lying areas. Command special people to collect and store the packaging box and bag, and transport them to the recycling centre to recycle.

We dug 35,900m3 and filled 169,200m3 during the construction. And transfer 133,000m3 from the area of water system and environment repairing. And the specific earthwork balance can be seen in Table 5.5-3.

7.6.4.2 The controlling measures of solid waste in construction period

1. The control and treatment measures of living garbage

The construction unit should enhance the management of the living garbage in the construction area. Set the classified bins and appoint the sanitation department to clean them and transport to the landfill. The bins need to be sprinkled exterminator often to prevent the growth of pest like flies and decrease the influence the garbage does to the project water environment and the staff’s living sanitation.

2. The control and treatment of other solid waste pollution

According to the Solid Waste Pollution Prevention Law, People’s Republic of China, our construction unit should clean the solid waste produced during the construction timely and deal with them according to the regulation from the environment sanitation administrative

department.

The construction unit plans to recycle the scrap, breaking-off steel, poor steel pipe, packaging belt, old equipment. Soil and sand waste are sent to be used as raw materials to the neighboring village. The building garbage should be collected as filling materials of the ground base. All kinds of package box and bag should be classified and stored and sent to the garbage station to recycle. The dealing plan of the demolishing building garbage should be sent to the related managing department in Huainan, and organize the transportation outward.

After construction, demolish the temporary infrastructure; clean the parking place of the machinery, stone preparation place, integrated storage and office and living place; clean the building garbage and other wastes; clean surrounding garbage, toilet, and smooth the puddle, use carbolic acid and quicklime to do the sterilization and do well the construction track recovery.

7.7 Environment Impact and Mitigation Measures in Operation Period

7.7.1 Water environment

7.7.1.1 Analysis of water environment

The water environment influences in Datong old dumpsite are mainly from garbage leachate and living wastewater of managing personnel.

1. The source and feature of water environment

The feature of leachate is influenced by garbage component, season, rainfall, landfill process and landfill time and so on. The features are as follows:

1) Leaching amount and water quality change a lot. When leaching amount increases, its concentration increases. And its leaching amount change is commonly related to the rainfall.

2) The leachate contains mixed substance. It contains aerobic organic pollutants, metal, plant nutrients (ammonium and nitrogen) and so on. Even contains toxic and harmful organic substance. And the pollutants concentration is high.

Datong Landfill stopped to use on June 30th, 2009, whose service time is 25 years. Leachate mainly comes from the water inside the garbage and the wastewater after degradation. At the same time, there is a large amount of bacteria, pathogenic bacteria and some toxic substance. Datong Landfill had served for 25 years, whose BOD5 and COD are tending stable.

2. The producing amount and dealing amount of leachate

According to the Stone and Soil Engineering and Technology Regulation of Living Garbage Landfill (CJJ176-2012), leachate daily amount can be calculated using the follow formula:

$$Q = \frac{I}{1000} \times \left(C_{L1}A_1 + C_{L2}A_2 + C_{L3}A_3\right) + \frac{M_D \times (W_C - F_C)}{\rho_W}$$

In the Formula:

Q-----total daily amount of the leachate, m3/d

I-----rainfall, which should take the average daily rainfall during 20 years 942.8mm/d

A1------ operating unit water collection areas, m2

CL1----- operating unit oozing coefficient, commonly 0.5~0.8

A2-----middle covering unit water collection area, m2

CL2-----middle covering unit oozing coefficient, commonly (0.4~0.6) CL1

A3-----final covering unit water collection, m2

CL3----- final covering unit oozing coefficient, commonly 0.1~0.2

Wc-----the original water content in the garbage (%)

MD-----daily landfill scale, t/d

Fc-----water content of completely degraded fields (%)

ρw----- density of the water (t/m3)

Due to the final covering of landfill, the water collection area is the final covering unit water collection area, 102616m2. According to the formula above and local rainfall materials, the daily leachate can be produced as:

Q=942.8×102616×0.1/（365×1000）=23.34m³/d

If there is no closing and covering measures are taken, the amount of daily leachate can reach to:

Q=942.8×98542×0.7/（365×1000）=178.17m³/d

So we can see if there is no closing and covering measure, the leachate's amount is higher than that through closing and covering dealing. So it will do harm to surrounding environment.

3. The Quality of Percolating Water

According to The Standard of Disposal for Percolating Water from Landfill of Household Garbage (experimental) (HJ564-2010), the percolating water from this dumping ground was percolated and filtrated liquid from enclosed area, the typical quality of which is like below:

COD：1000~5000mg/L；

BOD5：300~2000mg/L；

ammonia nitrogen：1000~3000mg/L；

SS：200~1000mg/L；

Ph：6~9.

The maximal value of water quality of percolating and filtrating liquid from Datong old dumpsite in this evaluation is: pH: 6～9，COD5000mg/L，BOD52000mg/L，NH3-N2000mg/L，SS1000mg/L。

4. Dispose Process of the Percolated and Filtrated Liquid

The percolating and filtrating liquid was gathered and discharged to regulating pool, then which was transferred by sewage truck to disposal station in Easter household garbage landfill of Huainan and disposed. This Station was designed to dispose 200m³/d per day. The technology of dispose was coagulation & sedimentation + membrane biological reactor + nanometer filter(NF) + reverse osmosis (RO), accord with the technology of pretreatment + biological disposal + advanced treatment, which was recommended by The Standard of Disposal for Percolating Water from Landfill of Household Garbage (CJJ 150-2010). The water quality of designed contamination was COD10000mg/L、NH3—N2500 mg/L、SS2000 mg/L、PH6—9、TP30 mg/L. The percolating and filtrating liquid from Datong old dumpsite contained less contamination, which will be easily disposed by disposal station in Easter household garbage landfill of Huainan and cost it 10 % of water. Therefore, it is practical to transfer percolating and filtrating liquid to disposal station in Easter household garbage

landfill of Huainan and disposed by it. The quality of disposed and discharged water meet the special discharge requirement limits from the regulation of contamination control of landfill of household garbage (GB 16889-2008). The first sewage disposal plant of Huainan will dispose the discharged water which is transfer red by pipe. The operation management of household garbage landfill of Huainan has agreed to receive percolating and filtrating liquid from the old landfill.

This project contains two sewage trucks, which designed to load 8 tons.

5. Due diligence

(1) The dispose station of percolation and filtrating liquid

The household garbage landfill of Huainan was located at Kongdian Township, Datong District, eastern of Huainan, south of King of Dragon Mountain. It was the original location of Jianghuai Cement Factory, and 10 kms transportation distance from downtown. The garbage truck transported through Nanshan Road, Qishan garden and special road to dumping zone.

This landfill services for Tianjia'an district, Datong district in downtown, economic development zone of city, and partly disposal for household garbage of Xiejiaji district. The garbage disposal technology was advanced anaerobic hygiene dumping method. The landfill covers 32hm2 and had a capacity of 4.05 million m^3. The capacity for landfill garbage was 3.68 million tons. (The density of garbage after compaction and decomposition was 1.0t/m^3 as calculated). The landfill was designed to dispose 500t/d, and increase 4% per year as disposal scale. The term of service was 15 years.

The landfill of household garbage in eastern Huainan contains sector I, which has a capacity of 1.85 million m^3, and sector II, which has a capacity of 2.2 million m^3. Sector I contains Zone A whose capacity was 0.95 million m^3 and Zone B, which capacity was 0.9 million m^3. On the basis of stage construction, Zone A was designed to build and apply. At present Zone A was close to reach its capacity and Zone B is constructing.

The dispose station in landfill of household garbage in eastern Huainan mainly disposes percolating and filtrating liquid from garbage, wastewater from industry, household and experiment. The station was designed to dispose 200m^3/d, which dispose procession was seen as picture 7.11. After rain & sewage diversion and cover for regulating pool, the actual disposed percolating and filtrating liquid was 80~110m3/d. The Disposed liquid discharged to First sewage disposal plant and purified. After household garbage incineration power generation plant of Huainan was constructed, the landfill of household garbage in eastern Huainan would receive less household garbage and generate less percolating and filtrating liquid. Therefore, the dispose station was capable to dispose the percolating & filtrating liquid from Datong old dumpsite.

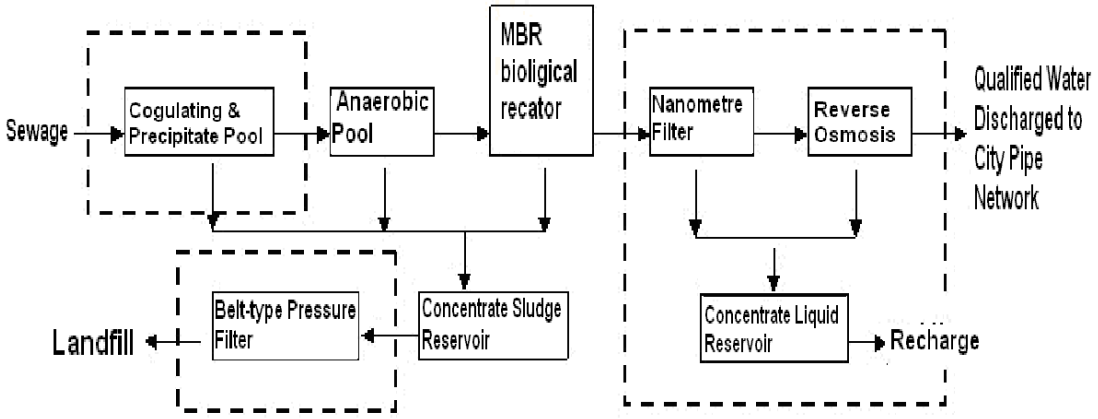


Figure 7.7-1 Dispose Procession of Percolating and Filtrating Liquid in Landfill of Household Garbage in East Huainan

In Nov. 2010, the Department of Environmental Protection in Anhui agreed the check before acceptance for the environmental protection of this project in Environment Case (2010) 1058: Agreement of check before acceptance for environmental protection for Zone A, first-stage construction of landfill of household garbage in eastern Huainan.

The inspection report for environment protection for Zone A, first-stage construction of landfill of household garbage in eastern Huainan, which generated by environment monitoring center of Anhui, indicated that the quantity of total mercury, total Chromium, total Cadmium, total lead, sexivalent chromium, total arsenic, in disposed wastewater from dispose station in this landfill was lower than the limit value of contaminate water from landfill of household garbage, according to The Standard of contamination control of household garbage landfill (GB16889-2008). The disposed wastewater was piped to First Sewage disposal plant of Huainan to purify.

In this environmental assessment period (2014.4.1-2014.4.13), the online check report for water quality in household garbage landfill in east Huainan indicated COD of water inlet and ammonia nitrogen were 3690mg/L, 1942.3 mg/L, and COD of yielding and ammonia nitrogen were 691 mg/L and 12.89 mg/L. The disposed wastewater was discharged to First Sewage Disposal plant of Huainan to purify.

(2) The First Sewage Disposal Plant of Huainan

The First Sewage Disposal Plant of Huainan (Eastern Sewage Disposal Plant for short) was located at Diding Road, Xiatao village, at the northern bank of Huaihe River. The disposed tail water meets the requirement of class A in first grade in The Emission Standard of Sewage Disposal in Town (GB18918-2002) and discharged into Huaihe River.

The First Sewage Disposal Plant of Huainan covers 7 ha and was designed to dispose 10 tons wastewater per day. It adopted second grade biochemical technology (oxidation ditch techniques) and serviced for a population of 0.5 million in 45 km2. Recently they planned to increase the disposal capacity to 0.15 million tons per day.

6. Runoff drainage system for rainwater on the ground

In the procession of construction, surface runoff may occur in case of heavy rainfall and

the most of contamination would be SS. It is hard to estimate the amount of runoff and contamination, which related to rainfall intensity, state of ground, etc. In order to discharge the rainwater easily from landfill and reduce the amount of rainwater gathered into landfill zone, further to reduce the cost of project construction, the close construction of landfill must contain drainage system inside and around of landfill and divide rainwater in the landfill zone efficiently into not-contaminated runoff(clean water) and contaminated by garbage runoff(sewage). This will reduce the amount of sewage.

The engineering measures of division into clean water and sewage:

① Drainage ditch in anchorage platform

② Drainage facility on the surface of accumulation of refuse；

③ Collection facility for leachate.

In the interest of drain the rainwater on the surface of accumulation of refuse, we designed the anchored embankment drainage along the stack of garbage, to achieve the division of clean water outside landfill and sewage in the landfill. The Drainage adopted concentrated discharge system and installed one water outlet at south-east of accumulation of refuse. The rainwater falling in the anchoring platform would go through drop platform into drainage ditch, finally into nearby surface drainage via delivery port.

On the accumulation of refuse, the rainwater should be discharged quickly, to reduce the permeation of rainwater and erosion of overburden soil.

In the close construction area, the drainage ditch was deployed along the platform on the accumulation of refuse and join up with vertical pipe to discharge the rainwater into drainage ditch in anchorage platform in actual situation. The drainage ditch on the surface of accumulation of refuse contains DN 400 HDPE half tube, which is 0.4m x 0.2m and 1845m in length.

7. Sanitary sewage

This subcomponent in Datong old dumpsite was operated by a crew of 8, and generated sanitary sewage 1.28m3/d. Because of a small amount of sewage, the oil-bearing sewage from dinning room was disposed by oil-separation pool and discharged into septic-tank with other sanitary sewage, all of which will be piped in municipal sewage pipe network.

7.7.1.2 Water environment pollution mitigation measures

The most water contamination during the operation of close construction of Datong old dumpsite was percolating water from landfill and a small amount of sanitary sewage. In order to prevent water pollution, we took several steps, such as artificial anti-seepage, rain sewage division, collection and drainage of leachate.

1. Artificial anti-seepage: The HPE membrane adopted on the roof of landfill zone would prevent the seepage, and the whole surface of original landfill zone covered artificial waterproof layer.

2. Rain sewage division: Reducing the rain capacity on the garbage reservoir by discharging the surface rainfall into cut-off ditch, thus we could decrease the amount of leachate.

3. Collection and drainage of leachate: After collection, the leachate would be piped to leachate regulating pool and trucked to and disposed by the disposal station in sanitary landfill, then it would be discharged after reaching the standard.

4. After disposal by separation tank, the oil-bearing sewage from dinning room would discharged into septic-tank with other sanitary sewage, finally piped in municipal sewage pipe network.

7.7.2 Atmospheric environment

7.7.2.1 Atmospheric environment impact during the operation service period

1. Torch burned fully

The dumping sites have gone out of service for 5 years, most of organics in which have been decomposed. According to the project of close construction, the remaining landfill gas would be approximately 25% of gas production in peaks, and hold an amount of 6.9×106 m3. The dumping sites adopted close construction and cover for leachate regulating pool, and the landfill gas would disposed by the torch burning method, so with the gas from leachate regulating pool. The stinky ammonia, hepatic gas, methane thiol in the landfill gas was attributable to combustible organic waste gas. The hepatic gas was easy to burn in the air and combustion formula was 2H2S+3O22═2H2O+2SO2. The combustion formula was CH4S（methane thiol）+3O2═SO2+CO2+4H2O when methane thiol burned fully. The stinky contamination would be decomposed by full combustion, and it would eliminate the impact to atmospheric environment by stinky gas.

2. Torch could not burn fully

According to project analysis, the discharge quantity of gas before and after landfill contamination H2S & NH3 disposal can be seen as below:

The Amount of Discharge after Landfill Gas Vontamination Disposal Chart 7.7-2

Name of contamination	Datong old dumpsite		Discharge rate（g/s）	
	Before combustion （t/a）	Not fully burned （t/a）	Before combustion	Not fully burned
H2S	0.05	0.003	0.00000317	0.00000019
NH3	0.26	0.047	0.0000165	0.00000298

3. The torch could not be ignited due to low concentration of methane.

Therefore, the stinky contamination would discharge directly.

The torch could not be ignited due to low concentration of methane, the stinky contamination ammonia, hepatic gas would discharge directly. According to design, the altitude of torch would be 8m height, and the diameter of exhaust funnel would be 200mm. The results of prediction for un-full combusted torch or torch without combustion were seen as chart 7.7-3 and 7.7-4.

The Stinky Contamination Discharge Result of Prediction for Un-full Combusted Torch:

Chart 7.7-3

Contamination	Influence distance by maxim concentration（m）	Maxim concentration（mg/m3）
Ammonia	50	2.66×10-5
Hepatic gas	50	1.7×10-6

The Stinky Contamination Discharge Result of Prediction for Torch without Combustion:
Chart 7.7-4

contamination	Influence distance by maxim concentration（m）	Maxim concentration（mg/m3）
Ammonia	50	1.47×10-4

Hepatic gas	50	2.82×10-5

As seen in charts above, the discharge concentration of ammonia and hepatic gas were far below requirement in The Standard of Stinky Contamination Discharge (GB14554-93), which means the stinky contamination discharge would not influence the surrounding environment whether the torch un-full combusted or torch was not combusted. Therefore, the evaluation believed that the stinky contamination discharged by torch-ignited type after close of construction and collection, would not cause any pollution effect on air environment.

7.7.2.2 Mitigation measures of atmospheric impact in operation period

(1) Using the measure of closing landfill to decrease foul-smell gas spread

To decrease the spread of the harmful gas in the gas, close the landfill. The specific measures are to compact the arranged garbage, and using the 35-mm thickness of break stone gas transportation layer and transport the waste gas through the pipe. The break stone layer is covered by 200g/m2 woven geotextile. Cover 25mmthick clay on the geotextile, and cover 1.0mmHDPE tough membrane on the clay. And then cover 45cm support soil layer and 15cm nutrient layer. The specific structure can be seen in 7.7-2. Through the 5 levels prevention and gas emission, the evaluation shows that this way can prevent the spread of foul-smell gas efficiently. The concentration of the foul-smelling gas will be lower than that now. And the Ammonium and Hydrogen sulfide decrease obviously.

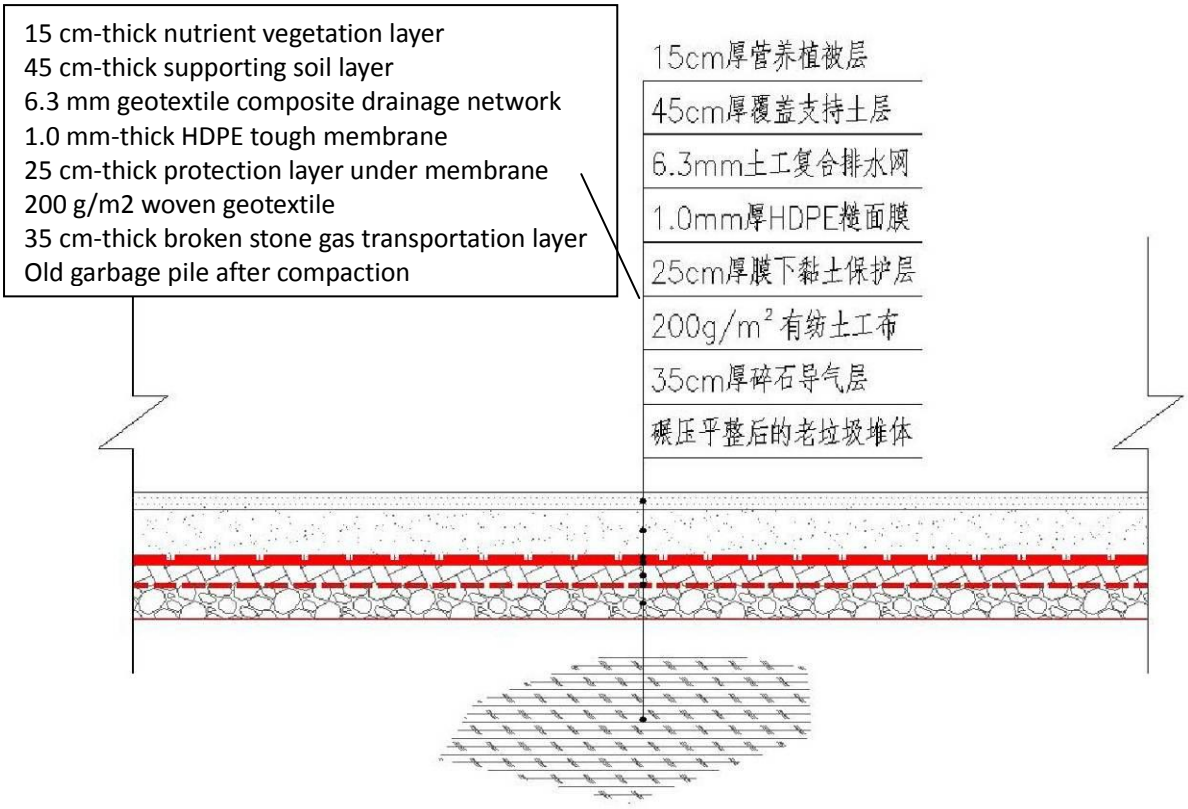


Table 7.7-2 The Structure Diagram of the Closing of Landfill Surface

(2) The control and treatment measures for foul-smell gas spread in garbage leachate regulating pool

The design will set a cover for garbage leachate regulating pool, and implement closing management. According to the state similar covering measures for garbage leachate

regulating pool in landfill, this can decrease the foul-smell gas for the percent of 99% and can decrease the harmful influence to the environment. According to the requirement of Garbage Leachate Treatment Technical Specifications (CJJ150-2010), the main resources of foul-smell are regulating pool and sludge dewatering facility, which should be closed and partially isolated and done liposuction. The foul-smell gas needs collecting and handling to discharge in organization. So the covering measures are adopted in the design. The regulating covering membrane adopts the 2.0mm-thick HDPE smooth membrane. And after covering, set collection pipe and drain pipe on the regulating pool side. Set aside a vent for gas emission, and guide the gas to the methane automatic combustion device. The evaluation shows that adopting the covering measures to garbage leachate regulating pool and lead the gas to methane automatic combustion device to burn can prevent the harmful influence to the environment.

(3) The treatment of landfill gas

The integrated use of the land gas is not concerned now. After burning the landfill gas, the pollutants are degraded or burnt by the flame, so there will be no harmful influence to the air. At the same time, greening the surface completely will improve the air environment surround.

7.7.3 Acoustic Environment

7.7.3.1 Noise Analysis in Operation Period

After the dump closure, the main noise comes from the fans that are used to extract landfill gas. The sound level is about 80-90dB (A). The submersible pumps are sued to drain leachate, as they are setting in the pool underground, they cause no noise. So we just need to consider the noise impact of the fans when making noise prediction. The evaluation requires the fans to be indoors. According to the boundary map of the dump provided by design, the fan room is about 30m from the boundary of the dump. In the evaluation, we use the non-directional point source geometry divergence attenuation basic formulas in the Technical Guidelines for Environmental Impact Assessment of the acoustic environment assessment （HJ2.4-2009）to make prediction, its concrete format is as follows.

LP（r）=LP（r0）-20lg（r/r0）

where：LP（r）—Octave band sound pressure level at a distance of r from the sound source

LP（r0）—Octave band sound pressure level at reference position r0

Noise Prediction of the Dump and Fan Factory Sector Table7.7--6

project	Eastern factory sector	Southern factory sector	Western factory sector	Northern factory sector
distance from factory sector（m）	70	200	480	30
sound insulation ability of maintenance structure （dB（A））	15	15	15	15
Sound pressure at 1 meter outdoor（dB（A））	65～75	65～75	65～75	65～75
Noise predition（dB（A））	28.1～38.1	19.0～29.1	11.4～21.4	35.5～45.5
class II standard in （GB12348—2008）：	Daytime 60 dB（A），nighttime50 dB（A）			

According to prediction, the factory sector noise conforms to the class II standard in Environmental Noise Emission Sandards of Industrial Enterprise Factory Sector, it is 60dB (A) in daytime and 50dB (A) in nighttime. As there is no sensitive spots around 300 meters

range of the dump, the fans noise has no impact to the environment sensitive spots during operation period.

7.7.3.2 Noise mitigation measures in operation period

As the fans of the dump keep long-term operation and their noise is of low frequency, the evaluation requires the fans to be set in the brick room and maintenance structure is necessary to block the noise during the operation time to ensure the factory sector noise level meets standard.

7.7.4 Environment Impact to Groundwater and Mitigation Measures

7.4.4.1 Evaluation of Currrent Groundwater Quality

1. Present use of groundwater

In order to realize the present state of using groundwater, we committed this evaluation, which was centered on the landfill and went outwardly and radically. At last, we committed the evaluation in five villages (Xuyingzi, Xiacai village, Jiulonggang, Gu Zhuang,Qishanji) inside the project area and seven villages (Chenyingzi, Datong district, east Chenyingzi, Liuzhuang, Qianyingzi, Shunnan Village, Qianjin Village) outside the project area. And the utilization of wells by the villagers is what we really cared. Besides, we evaluated the relevant circumstances of using groundwater near the project area by consulting relevant information.

The region has four major parts including rivers, lakes, natural precipitation and groundwater. Huaihe River is an important source of water for industrial and agricultural production and daily life. The groundwater distributes unevenly. Some residents in Chenxiang village and Qianchengzi villiage use phreatic water as domestic water. Some companies use crack confined water as domestic water.

As the evaluation shows, the rural residents near the project commonly get their drinking water from shallow groundwater at the depth of 4 to 20 meters. Their wells are commonly having a depth of 4 to 22 meters. The residents access their drinking water in the shallow water layer, where it is easy to get supplement from precipitation and surface water. Besides, rivers and canals are the main sources of shallow groundwater.

2. Evaluation of Groundwater Level

For fully grasping the state of groundwater level and flow and groundwater exploitation, we committed comprehensive groundwater investigation at the western and eastern dump inside the evaluation area range and the drainage channel region and all the involved villages (Chenchengzi, Datong district, east Chenyingzi, Liuzhuang, Qianyingzi, Xuyingzi, Xiacai villiage, Jiulonggang, Shunnan village, Qianjin village, Guzhuang, Qishanji .etc). And find out the groundwater conditions around the construction project basically. It includes types, water depth, well depth, pumping horizons and so on. This evaluation provides basic data for carrying out observation about groundwater environment. The concrete data is listed in Table 7.7-6 and Table 7.7-8. Here， the different point in different period is caused by usage of some monitoring wells and evaluation progress. However, the main points are located inside the project area and make the results meet the requirement of the evaluation. The distribution of the evaluated points is showed in Figure 7.7-1 and Figure 7.7-2.

By combining the related information of Engineering geological survey, hydrogeological drilling and groundwater investigations, we conclude that the depth of shallow groundwater is small, with a range of 0.5 to 12 meters. And the main sources of pollution are the eastern and western dump and drainage ditch area.

Statistics of Basic Information about the Groundwater Level Surveys（1）（Wet season）

Table7.7-6 **date：2013.07**

Survey point number	Coordinate		Water depth (m)	Well depth(m)	Layer level
	X	Y			
SW1	506100	3611564	0.80	13	phreatic water
SW2	505292	3611718	0.80	15	
SW3	504796	3611902	0.75	12	
SW4	504196	3612549	4.30	12	
SW5	502424	3612117	2.00	22	
SW6	506543	3610825	1.85	12	
SW7	507587	3610395	2.30	9	
SW8	509047	3610180	0.80	6	
SW9	509908	3608764	4.85	32	
SW10	510458	3607070	1.70	14	
SW11	509150	3611505	2.60	20	
SW12	504641	3610485	25.00	200	Karst water
SW13	505188	3609685	20.00	150	
SW14	506152	3610794	1.00	4	phreatic water

Statistics of Basic Information about the Groundwater Level Surveys（2）（Dry season）

Table7.7-7 **date：2014.01**

Survey point number	Coordinate		Water depth (m)	Well depth (m)	Layer level
	X	Y			
DX-1	506381	3610677	10	15	phreatic water
DX-8	506439	3610759	25	30	Karst water
DX-14	506439	3610759	5	15	phreatic water

Statistics of Basic Information about the Groundwater Level Surveys（3）（Medium season）

Table7.7-8 **date：2014.04**

Survey point number	Coordinate		Water depth (m)	Well depth (m)	Layer level
	X	Y			
DX-1'	505873	3611279	5.6	25	phreatic

DX-2'	505613	3610906	7.48	20	water
DX-3'	506650	3610710	21.9	25	Crack water
DX-4'	506914	3610392	-	23	
DX-5'	506314	3610861	11.6	20.3	phreatic water
DX-6'	506551	3610787	12.3	23.5	
DX-7'	506470	3611180	1.7	15	
DX-8'	50683	3611132	6.5	18.5	
DX-9'	506705	3611814	4.1	15	
DX-10'	507247	3611559	1.1	17.5	

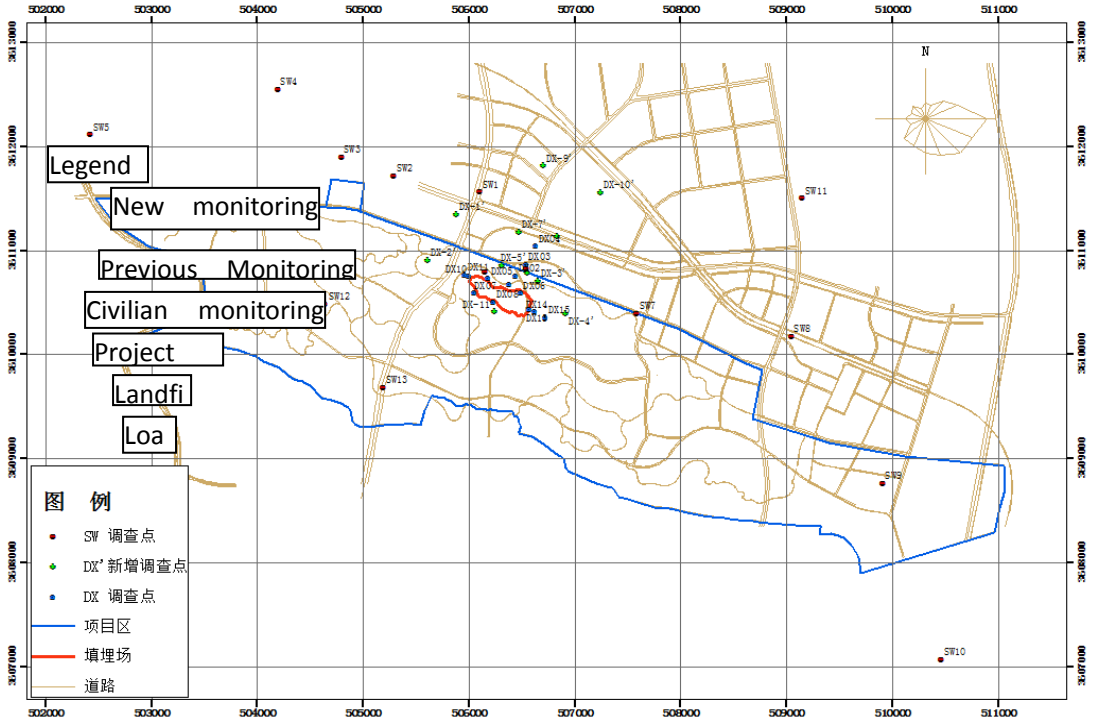


Figure7.7-1 Groundwater Level Surveys Point Distribution in Project Area

(a)

(b)

(c) (d)

Figure7.7-2 Photo of Groundwater Level Surveys

After a complete investigation process which covers wet season and medium season, the concrete groundwater level change process line was gotten and showed in Figure 7.7-3. The groundwater level changes to a lesser extent in all water period. In the wet period of July and August, the groundwater level raises slightly, which is caused by increase of atmospheric precipitation. According to the analysis of hydrogeological conditions in the evaluation area, we know that precipitation is one of the main sources for phreatic water.

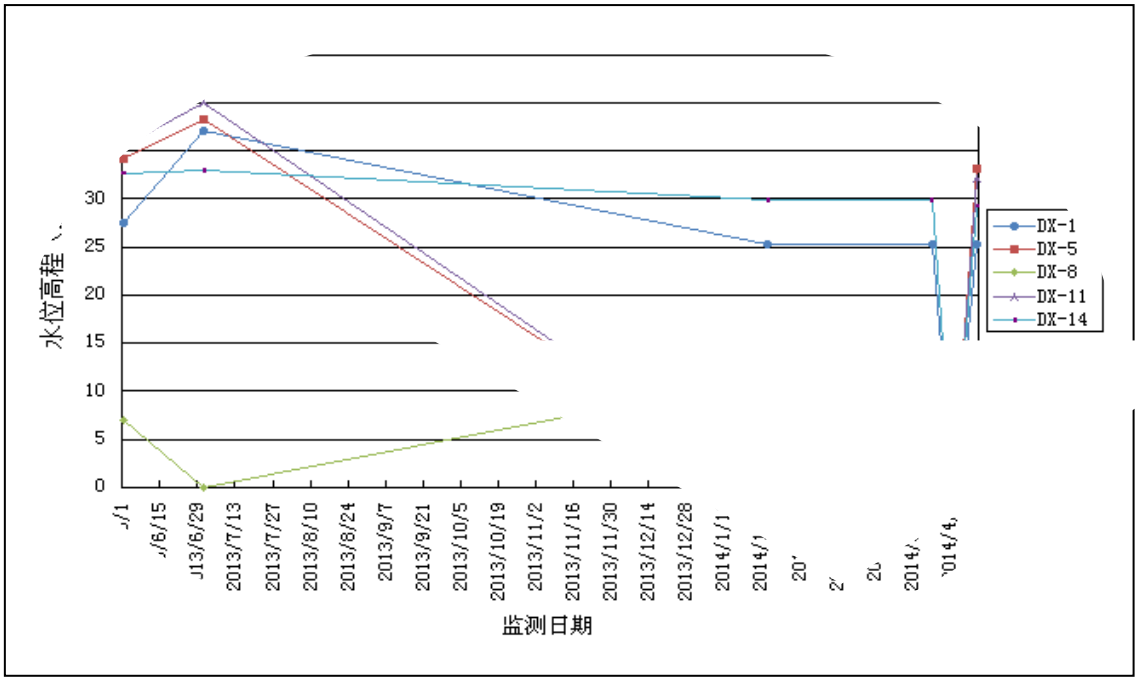


Figure 7.7--3 Groundwater Level Change Process Diagram

This evaluation start from June 2013, at first, we designated five term-long monitor well after field evaluation of the dump and referring related data. According to the current monitoring data, we can get groundwater level change process line of the dump. As shown in Figure 7.7—4, in the period of all water season, the amplitude of variation of groundwater level around the dump is 4 to 10 meters, with the tendency of declining. Some individual monitor well showed a lesser extent of rise. And tend to steady gradually. Some individual monitor wells show a strong fluctuation and this is caused by uneven rainfall or terrain.

3. Groundwater Environmental Quality Monitoring

（1）Monitoring locations

Combining information about ground engineering construction layout in the evaluation area features of groundwater in the evaluation and groundwater flow in the region, basing on

the principle of distributing monitor point out of controllability as well as functionality. We committed investigation and sampling and analysis on 24 groundwater quality monitoring points and 38 groundwater level observation points, in which there are 13 monitoring wells totally from DX-1 to DX-15 after excluding the non-normal use ones and 11 monitoring wells totally from DX-1' to DX-11' and 14 monitoring wells totally from SZ1 to SZ14. The concrete data is showed in Table 9.2-5 and Figure 9.2-5. The relevant towns includes Chenchengzi, Da tong district, East Chenchengzi, LiuZhuang, Qianchengzi, Xuchengzi, Xiacai village, Jiulonggang, Shunnan villiage, Qianjin villiage, GuZhuang, Qishanji and so on. Monitoring content includes loose pore water, bedrock fissure water and karst aquifers.

（2）Monitoring parameters

According to Groundwater Monitoring Technical Specifications （HJ/T 164-2004）and Groundwater Quality Standards (GB/T14848-93) and considering with project potential contamination characteristic factor, we determine groundwater quality evaluation factor as follows.

Routine investigation factor (17): pH, total hardness, total dissolved solids, ammonia, nitrate, nitrite, volatile phenol, total cyanide, permanganate index, fluoride, arsenic, mercury, cadmium, hexavalent chromium, iron, manganese, coliforms.

Characteristic factor (4): COD, chlorides, sulfates, nitrites.

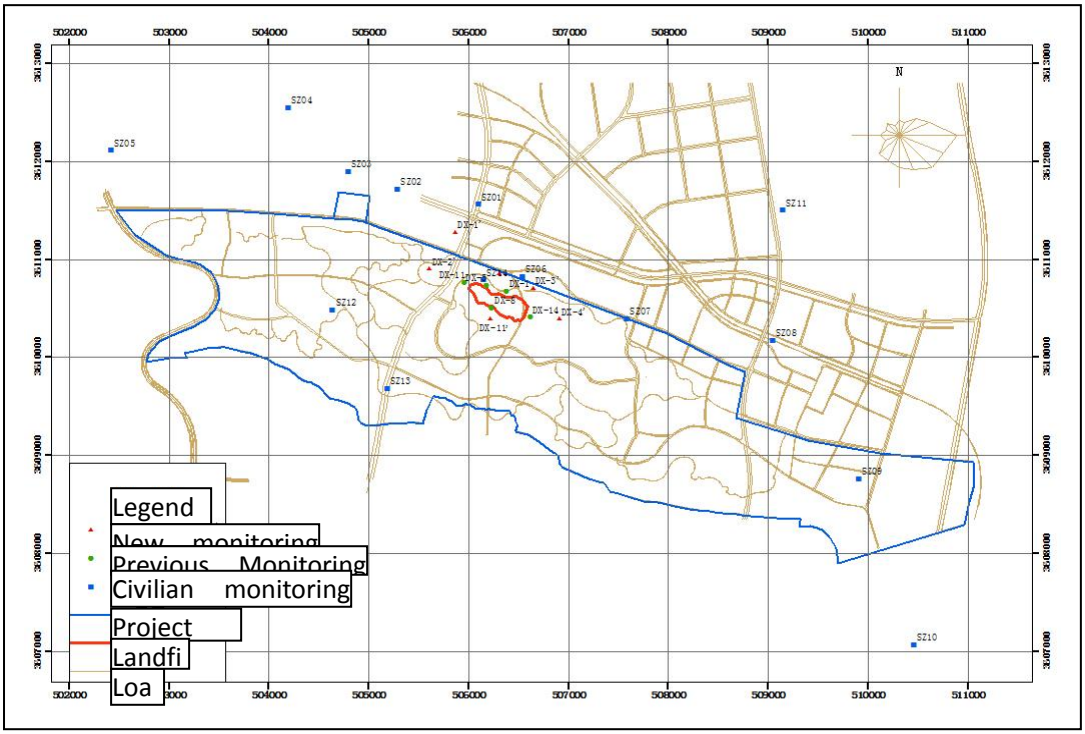


Figure 7.7-4 Comprehensive Distribution Map for Groundwater Quality Monitoring Points in Project Area

Table7.7--9 Groundwater Monitoring Locations

Unified Number	Well number	coordinate		Well depth（m）	Groundwater depth (m)	Monitoring type
		X	Y			
1	DX-1	506381	3610677	16.4	7.7	water

2	DX-5	506182	3610735	26	2.5	
3	DX-8	506234	3610508	30.7	29.5	Karst water
4	DX-11	505958	3610767	37	34.6	Fissure water
5	DX-14	506619	3610413	15	5	water
6	DX-2'	505614	3610906	20	7.1	
7	DX-3'	506650	3610710	25	21.5	
8	DX-5'	506314	3610861	20.3	19.1	Karst water
9	DX-6'	506551	3610787	23.5	12.3	water
10	DX-11'	505873	3611279	25	5.6	
11	SZ01	506100	3611564	3	0.80	
12	SZ02	505292	3611718	15	0.80	
13	SZ03	504796	3611902	2	0.75	
14	SZ04	504196	3612549	12	4.30	
15	SZ05	502424	3612117	22	2.00	
16	SZ06	506543	3610825	12	1.85	
17	SZ07	507587	3610395	9	2.30	
18	SZ08	509047	3610180	6	0.80	
19	SZ09	509908	3608764	32	4.85	
20	SZ10	510458	3607070	14	1.70	
21	SZ11	509150	3611505	20	2.60	
22	SZ12	504641	3610485	200	25.00	Karst water
23	SZ13	505188	3609685	150	20.00	
24	SZ14	506152	3610794	4	1.00	phreatic water

（3）Sampling Method

Using open type sampler to pump groundwater sample, the sampler was clean three to four times before filling with water.

The management and analysis and qualify control of groundwater is based on Groundwater Monitoring Technical Specifications (HJ/T164).

4. Groundwater Environmental Quality Evaluation

This evaluation started from June 2013, by committing investigation at landfill site and referring to related material, we get data of 14 civilian monitoring wells（SZ1~SZ14）in an area of 50 square kilometers centered on the project area. It showed that all other factors meet groundwater third type standard except for total hardness and total dissolved solids; the hardness of the exploration holes（DX1~DX15）around the dump, total dissolved solids, permanganate index, ammonia, chloride, sulfate, nitrite, total coliform number and total bacteria number are all exceeded the third type standard value of groundwater to some degree.

According to the current monitoring data, we can get water qualify changing process line of some monitoring wells during the evaluation, as showed in figure 7.7-5 and figure 7.7-6. From the groundwater qualify changing process of a complete water season we know that the concentration of ammonia nitrogen, COD, nitrate ions of the groundwater around the landfill showed a downward trend while the sulfate showed a rising trend and the overall changes tend to be stabilized.

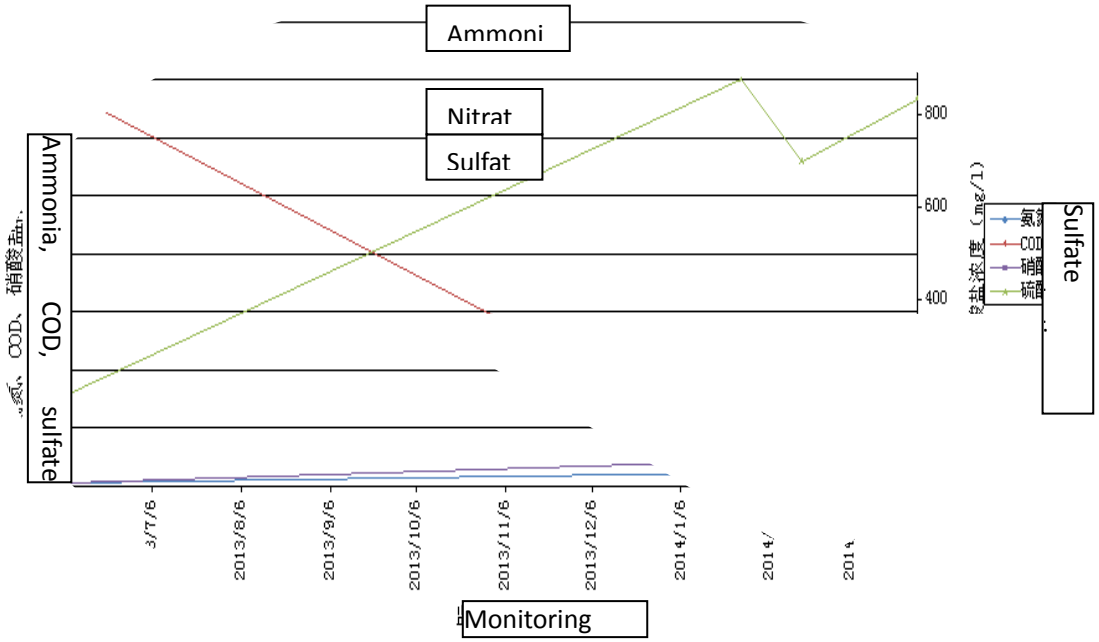


Figure7.7- 5 DX-1 Groundwater Qualify Changing of Monitoring Points in a Complete Water Season

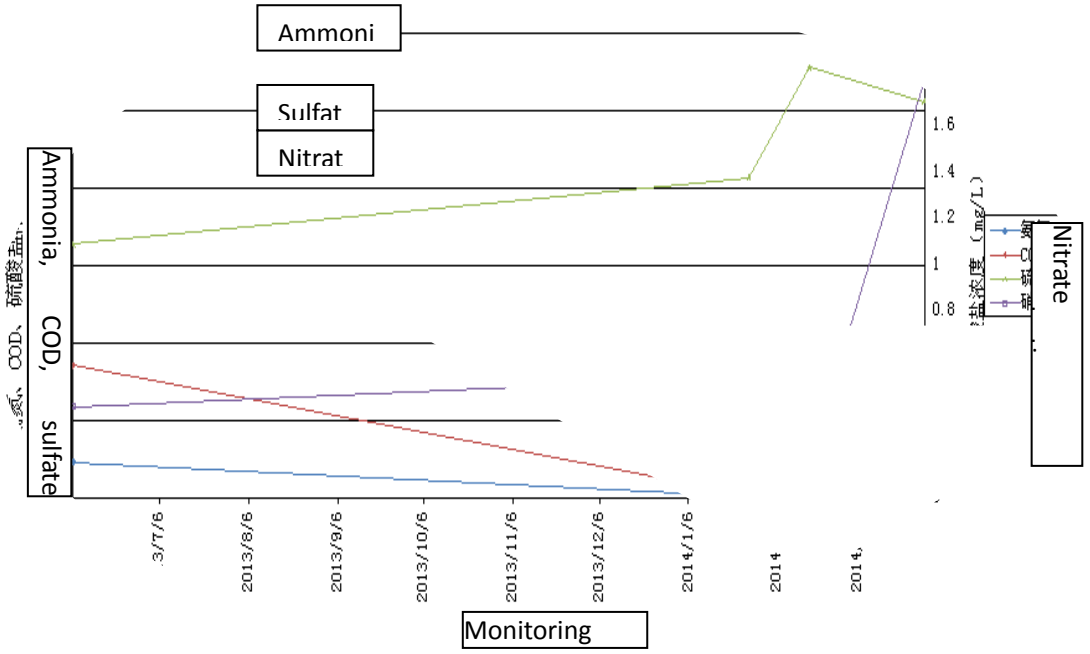


Figure7.7-6 DX-14 Groundwater Qualify Changing of Monitoring Points in a Complete Water Season

In summary, from the analysis of present state of groundwater qualify, we know that the landfill is mainly used to stack municipal solid waste, as leachate seep into underground aquifers at some region, makes most indicators cannot meet standard. And the COD and

ammonia nitrogen are which exceed the standard seriously. At some individual region, lead content exceed the standard. However, at the peripheral area of the landfill, most indicators conform to the third type standard of Groundwater Quality Standards except for some individual indicators. The rough polluted horizontal range of groundwater at the landfill region nowadays is showed in Figure 7.7-7.

According to the long-term monitoring data, we know that the concentration of ammonia, COD, nitrate and other ions in groundwater around the landfill showed a declining trend in a complete water season while the sulfate shows a rising trend and the overall changes tend to be stabilized. The concrete groundwater quality data at different monitoring points during different period is showed in table 7.7-10 to table 7.7-12.

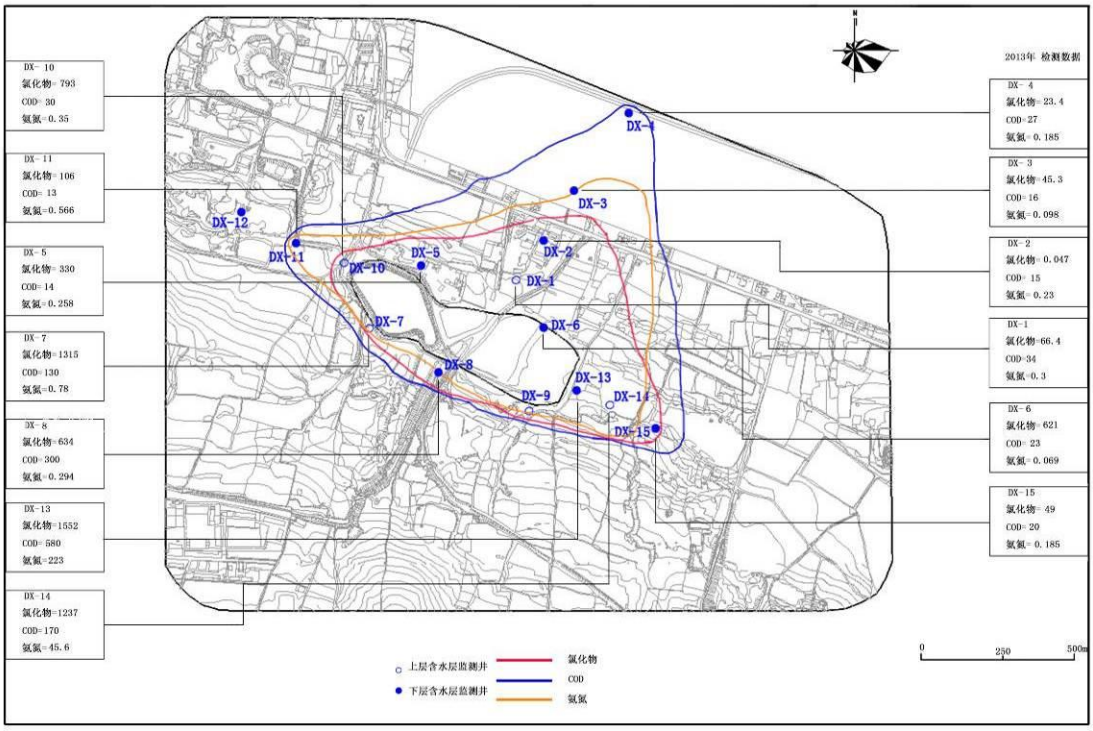


Figure7.7- 7 Horizon Map of Pollution Situation

Status Quo of Water Quality of Groundwater（1）（Wet season） **Date: 2013.07**

Table7.7-10

Serial number	pH	NH4+ mg/L	Cl- mg/L	SO42- mg/L	Cu mg/L	NO3- mg/L	NO2- mg/L	Pb mg/L	Fe mg/L	Permanganate index mg/L
Class Ⅲ standard of groundwater	6.5-8.5	≤0.2	≤250	≤250	≤1	≤20	≤0.02	≤0.05	≤0.3	≤3
SZ1	7.38	<0.03	220.85	213.25	<0.005	0.34	0.001	0.008	0.02	0.92
SZ2	7.71	<0.03	142.51	224.78	<0.005	13.94	0.048	0.005	<0.01	0.76
SZ3	7.59	<0.03	67.71	266.57	<0.005	3.97	0.010	0.006	<0.01	0.94
SZ4	7.62	<0.03	186.82	50.91	<0.005	7.56	0.001	0.006	0.01	0.39
SZ5	7.42	<0.03	48.21	40.83	<0.005	7.79	<0.001	0.007	<0.01	0.13
SZ6	7.42	<0.03	180.44	196.92	<0.005	25.97	0.003	0.006	<0.01	0.68
SZ7	7.12	<0.03	116.63	386.16	<0.005	3.95	0.019	0.007	<0.01	1.90
SZ8	7.34	<0.03	67.71	215.65	<0.005	2.67	0.016	0.007	<0.01	1.03
SZ9	7.14	<0.03	41.83	87.41	<0.005	16.95	0.004	0.005	0.04	0.50
SZ10	7.29	<0.03	88.63	160.90	<0.005	14.12	0.060	0.006	<0.01	0.77
SZ11	7.38	<0.03	60.62	38.90	<0.005	<0.12	<0.001	0.006	<0.01	0.70
SZ12	7.44	<0.03	28.01	237.75	<0.005	5.41	<0.001	<0.005	<0.01	0.81
SZ13	7.30	<0.03	39.00	164.74	<0.005	7.89	0.001	<0.005	<0.01	0.67
SZ14	7.68	<0.03	31.55	401.05	0.009	0.14	<0.001	<0.005	<0.01	4.65
Serial number	Zn mg/L	Cd mg/L	Mn mg/L	Phenol mg/L	Cyanide mg/L	As mg/L	Hg mg/L	Cr6+ mg/L	Total Hardness mg/L	Solubility total solids mg/L

Class Ⅲ standard of groundwater	≤1	≤0.01	≤0.1	≤0.002	≤0.05	≤0.05	≤0.001	≤0.05	≤450	≤1000
SZ1	0.02	0.0008	0.07	<0.002	<0.002	0.0001	0.00003	<0.004	705.13	1050.03
SZ2	<0.01	0.0006	0.01	<0.002	<0.002	<0.0001	0.00003	<0.004	552.50	891.01
SZ3	0.03	0.0005	<0.01	<0.002	<0.002	<0.0001	0.00002	<0.004	600.04	937.88
SZ4	0.01	0.0005	<0.01	<0.002	<0.002	<0.0001	0.00001	<0.004	594.53	897.28
SZ5	<0.01	0.0004	<0.01	<0.002	<0.002	<0.0001	0.00004	<0.004	366.33	483.85
SZ6	0.01	0.0005	<0.01	<0.002	<0.002	<0.0001	0.00003	<0.004	718.15	1115.24
SZ7	0.03	0.0005	<0.01	<0.002	<0.002	<0.0001	0.00003	<0.004	771.19	1291.88
SZ8	0.01	0.0004	0.01	<0.002	<0.002	<0.0001	0.00002	<0.004	558.00	807.73
SZ9	0.01	0.0004	<0.01	<0.002	<0.002	<0.0001	0.00001	<0.004	495.45	620.52
SZ10	0.05	0.0006	0.01	<0.002	<0.002	<0.0001	<0.00001	<0.004	599.04	794.26
SZ11	0.01	0.0004	0.08	<0.002	<0.002	<0.0001	<0.00001	<0.004	374.34	463.03
SZ12	0.01	0.0003	<0.01	<0.002	<0.002	<0.0001	<0.00001	<0.004	582.52	721.23
SZ13	0.01	0.0004	<0.01	<0.002	<0.002	<0.0001	<0.00001	<0.004	519.97	629.57
SZ14	<0.01	0.0004	0.02	<0.002	<0.002	0.0001	<0.00001	<0.004	588.53	821.86

Note：The bold value in the table is the excessive value

Serial number of sampling points **Status Quo of Water Quality of Groundwater（2）（Dry season ）** **Date：2014.01** **Table7.7-11**	pH	Ammonia mg/L	Chloride mg/L	COD mg/L	Sulfate mg/L	Mercury mg/L	Nitrate mg/L	Nitrite mg/L	Total hardness mg/L

Class Ⅲ standard of groundwater	6.5-8.5	≤0.2	≤250	≤3.0	≤250	≤1	≤20	≤0.02	≤450
DX-1	7.69	1.07	326	3.44	876	0.001L	2.14	0.001L	523
DX-8	7.61	1.13	551	3.04	661	0.001L	14.2	0.001L	297
DX-14	8.41	1.62	1370	4.38	413	0.001L	0.517	0.001L	404
Serial number of sampling points	Copper mg/L	Zinc mg/L	Arsenic mg/L	Lead mg/L	Cadmium mg/L	Chromium (VI) mg/L	Fluoride mg/L	Volatile phenols mg/L	Total dissolved solids mg/L
Class Ⅲ standard of groundwater	≤1.0	≤1.0	≤0.05	≤0.05	≤0.01	≤0.05	≤1.0	≤0.002	≤1000
DX-1	0.009L	0.054	0.001L	0.0025L	0.0005L	0.004L	2.1	0.0003L	1463
DX-8	0.009L	0.01	0.001L	0.0025L	0.0005L	0.004L	1.9	0.0003L	1883
DX-14	0.009L	0.049	0.002	0.0025L	0.0019	0.004L	5.1	0.0003L	2653

Note：The bold value in the table is the excessive value

Status Quo of Water Quality of Groundwater（3）（Medium season）　　Date：2014.04

Table7.7-12

Serial number of sampling points	pH	Ammonia mg/L	Chloride mg/L	COD mg/L	Sulfate mg/L	Mercury mg/L	Nitrite mg/L	Nitrite mg/L	Total hardness mg/L
Class Ⅲ standard of groundwater	6.5-8.5	≤0.2	≤250	≤3.0	≤250	≤1	≤20	≤0.02	≤450
DX-1	7.41	0.031	308	4.17	834	0.0001L	2.54	0.006	930
DX-2	7.46	0.754	245	6.22	1160	0.0001L	10.1	0.079	398
DX-14	8.92	164	1880	15	511	0.0002	1.8	0.038	461
DX-5′	7.52	0.391	41	1.83	178	0.0001L	50.5	0.094	458

DX-6′	7.49	0.111	100	2	159	0.0001L	156	0.022	739
DX-7′	7.39	0.042	34.5	0.94	144	0.0001L	18	0.045	377
Serial number of sampling points	Copper mg/L	Zinc mg/L	Arsenic mg/L	Lead mg/L	Cadmium mg/L	Chromium (VI) mg/L	Fluoride mg/L	Volatile phenols mg/L	Total dissolved solids mg/L
Class Ⅲ standard of groundwater	≤1.0	≤1.0	≤0.05	≤0.05	≤0.01	≤0.05	≤1.0	≤0.002	≤1000
DX-1	0.009L	0.005	0.001L	0.0025L	0.0005L	0.004L	2.1	0.0003L	2492
DX-2	0.009L	0.124	0.001L	0.0044	0.0005L	0.004L	1.8	0.0003L	2645
DX-14	0.009L	0.036	0.001L	0.0038	0.0005L	0.004L	4.4	0.0003L	4101
DX-5′	0.009L	0.001L	0.001L	0.0025L	0.0005L	0.004L	0.83	0.0003L	868
DX-6′	0.009L	0.058	0.001L	0.0025L	0.0005L	0.004L	0.82	0.0003L	1254
DX-7′	0.009L	0.278	0.001L	0.0065	0.0005L	0.004L	0.54	0.0003L	723

Note：The bold value in the table is the excessive value

After accumulating relevant material and committing evaluation about environment status quo in the project region, we analyzed dynamic variation rule of groundwater at the project area, besides, environmental hydrogeological conditions, pollution status quo and hydraulic connection between aquifers and surface water were evaluated as well. As the work we had finished, we master the dynamic characteristics of groundwater at the evaluation area during at least one continuous hydrological year, and it is showed in figure 7.7-8.

Comprehensive Environmental Hydrogeological Map

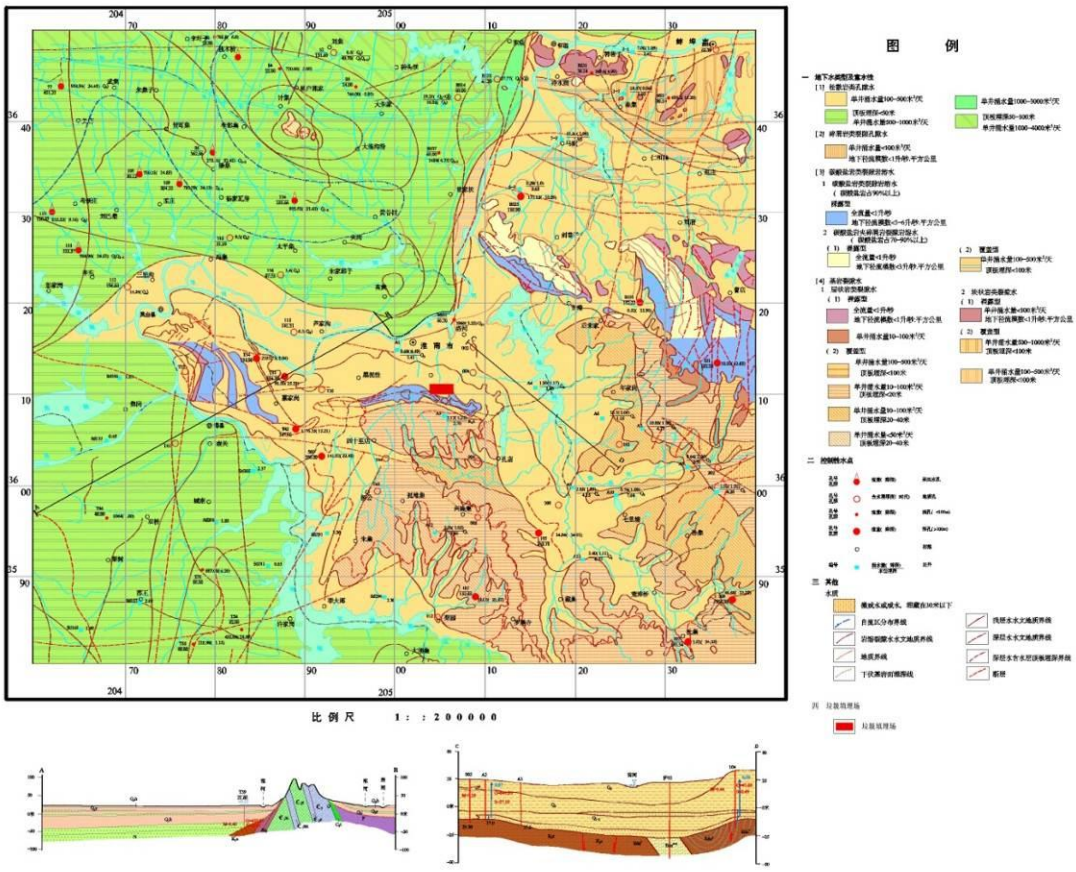


Figure7.7- 8 Comprehensive Environmental Hydrogeological Map

7.4.4.2 Environmental impact prediction and assessment of groundwater

Goundwater pollution under different scenarios after landfill closure was predicted by applying models, and details are given in Annex 3.

7.4.4.3 Measures of protecting underground water environment

1. Engineering measures

（1）Anti-seepage measures

In the landfills, the main factor that causes pollution to underground water is the leakage of landfill leachate. This landfill is a municipal solid waste landfills, the main pollution factors of which are COD and ammonia nitrogen, whose major damping method are diffusing in pore water, permeating with surface water and migrating with karstic water after entering karstic channels. Therefore, to avoid the pollution of underground water, especially to prevent it from entering karstic channels, surface ati-seepage measures should be taken.

On the border of the landfills, we should build a border dam and a system to collect and process leachate. And then we should build vertical barricades to prevent leachate from

leaking out of the landfills. The barricades should contain a layer of high condensed polyethylene film, of which the minimum thickness is 600mm, and an anti-seepage layer of compounding clay, which can extend to a depth of 3m in the landfill anti-seepage. The total area of the vertical barricades is about 19,110 square meters. At last, a system to collect and process landfills gas is to be set up.

According to the properties of pollutants that may be leaked into underground water in landfills and the constructive ways of landfills, project areas can be divided into key pollution prevention areas and general pollution prevention areas.

Key pollution prevention areas: In these areas, the leakage of pollutants that pollute underground water environment is hard to notice and process timely.

General pollution prevention areas: they mean the northern parts of landfills, the surrounding of the drainage ditches and the units on the surface. These areas can be noticed timely and processed on site. They include the roads around landfills and the systems of landfill leachate collection, etc.

（2）The monitoring of underground water pollution

To keep up with the situation of controlling underground water environment pollution around the site of the factory timely and accurately, a system for supervising and controlling underground water through the whole evaluating areas should be established.

According to the requirements of the Technical Manual of Underground Water Environment Monitoring HJ/T164-2004, monitoring wells for underground water should be established according to the flowing direction of underground water in the evaluating areas. The principles are as follows:

①Encrypted monitoring principle in key pollution areas

②Putting stress on the monitoring of underground water in unconsolidated formation and shallow layer and taking the deep karstic water into account.

③Synchronically contrasting the upstream and downstream in key pollution areas

④Establishing monitoring wells along the flowing direction of underground water and controlling with the horizontal and vertical monitoring lines

The monitoring objects include underground water in unconsolidated formation and karstic water. The monitoring pore should be equipped with water level monitoring devices and water drawing devices. After project is carried out, a new environmental protecting and monitoring station should be set up and laboratory monitoring devices are installed.

The monitoring projects include: Ph, total hardness, total dissolved solids, Ammonia Nitrogen, Nitrate, Nitrite, Volatile Phenol, total Cyanide, Permanganate index, Fluoride, Arsenic, Mercury, Cadmium, Hexavalent Chromium, Ferrum, Manganese, Coliform, COD, BOD, Chloride, total Phosphorus, total Nitrogen, Sulfate, Plumbum.

2. Non-engineering measures

While taking the engineering measures mentioned above, non-engineering measures are also carried out to monitor and manage the ground water environment. They include:

In order to protect the valuable ground water resource and environment, the dynamic monitoring of water resource should be strengthened to provide the basic information for the dynamic management of ground water environment.

The coordination with related departments is needed. A dynamic monitoring system of surface subsidence should be established to provide the basic information for carrying out precautionary measures for project buildings timely.

A system of reporting to the administrative departments of environmental protection

should be established.

7.4.4.4 Conclusions and suggestions

1. The analysis of hydro-geological conditions

The stratum of this area belongs to Huainan Plot, Huainan and Huaibei Subarea, Huabei Stratum, where the quaternary fluvial facies are well developed. Miscellaneous filling(Qml 4)mainly includes the municipal solid waste, the black, the saturated, the partial broken bricks , the macadam and the rhizomes of plants, etc. Alleviating accumulation (Qal 4~3)mainly includes the brown-yellow clay, the grayish-yellow clay and the gray silty clay, which spread widely and whose thickness vary from several meters to tens of meters. Carboniferous (C) mainly includes the limestone, the mudstone and the coal seam, etc. According to its current condition and hydraulic character, the groundwater within the area can be divided into the pore water of loose rock, the fissure water of clastic rock and the karstic water of carbonate rock. They connected closely, constituting a united aquifer unit. On the whole, the flowing direction of ground water is from the southwest to the northeast.

2. The survey and evaluation of the status of ground water

（1）To fully grasp and evaluate the groundwater level, flowing direction and exploitation, a comprehensive ground water survey is carried out in areas including the Chenyingzi, Datong District, East Chenyingzi, Liu Village, Qianyingzi, Xuyingzi, Xiacai Village, Jiulonggang, Shunnan Village, Qianjin Village, Gu Village and Qishanji, etc. The shallow water nearby is not deep, about 0.5~12. The dynamic change of the underground water level in the wet, normal and dry season is not distinct. It rises a little only in the wet season-August, which is mainly caused by the increase of rainfall.

（2）On the basis of analyzing the impact of this project on the ground water flowing downstream in this area, according to the hydro-geological condition, water level and related sensitive objects around the evaluating area, the simulating scope of the impact evaluation is centered around the landfill, and then boundaries are determined according to the hydro-0geological map of the evaluation area. The total area is 50km2. On-site survey, hydro-geological investigation and elementary simulating prediction are also carried out.

（3）This survey begins from June, 2013. According to the on-site survey on the dumpsite and related information, 5 long-term monitoring wells around the landfill area are determined. On the basis of the current monitoring data, it can be concluded from the change of water level through a period of wet, normal and dry season that the water level around the landfill changes from about 4 to 10m with a downward trend; the water level of individual monitoring wells goes up slightly; the overall change of water level is stable.

3. Prediction of the impact onground water environment

（1）Through a rational generalization of the hydro-geological conditions in evaluating area, the hydro-geological conceptual model, the mathematic and numerical model of the flowing field and solute migration of underground water are established. A model identification and test for the numerical model of underground water flowing field is carried out. The result is good and the establishment of models is basically correct.

（2）The established numerical model sets up two situations of theground water pollution during the project construction and operation period. And predictions on the solute migration are carried out respectively. The predicting result shows that: after leaking, landfill leachate mainly spreads in the pore aquifer through diffusion and the scope is relatively small, and then it spreads downwards slowly. Therefore, without carrying out anti-seepage measures, the leaking pollution migrates more distant and the impact of leaking pollution on water is heavier. After leaking, pollutants will enter the karst aquifer. As the antifouling property of the claypan is weak, and the concentration of pollutants is low, it is hard to repair.

（3）This evaluation predicts the implementation effect of the underground water

contingency plan. That is, once the anti-seepage system in working areas fractures, based on the verifying of the monitoring data of observing wells, observing wells will be changed to pumping wells, and the polluted water will be pumped to the wastewater treatment station.

（4）Based on the survey of the 14 civil monitoring wells within 50km2 around the project area, we find that except for the total hardness and the total dissolved solids, other factors meet the three standards of underground water, that is the landfill leachate in the landfill area impacts on the exploratory wells around; the total number of coliform and bacteria in the surrounding ground water seriously overweight.

（5）Seen from the change of water quality through a period of wet, normal and dry season, the concentration of ammonia nitrogen, COD and nitrate in underground water around the landfill show a downward trend while the sulfate shows a rising trend. The overall change is stable.

4. Groundwater environment protection measures

（1）According to the properties of pollutants, these areas are divided into key pollution prevention areas and general pollution prevention areas. In key pollution prevention areas, ground anti-seepage design is executed according to The Technical Requirements on the Construction of Hazardous Wastes Landfill (issued for trial by National Environmental Protection Administration on April 30, 2004) and The Pollution Controlling Standard on Hazardous Wastes Landfill (GB18598-2001); while in general pollution prevention areas, the areas are designed as type Ⅱ landfill according to The Pollution Controlling Standard on the Landfill for Storing and Processing General Industrial Solid Wastes (GB18599－2001).

（2）To grasp and evaluate the change of underground water quality timely and accurately , a regional underground water monitoring system is established. 5 monitoring wells are established to detect groundwater pollution timely.

（3）On the premise that the construction units strengthen management, enhance environmental awareness and execute strictly the measures such as zoning anti-seepage, monitoring and management and making contingency plans, the project will not have a significant adverse impact on surrounding and downstream underground water environment.

7.7.5 Solid wastes

After the municipal dumpsite begins to operate, 8 people will execute the management permanently. The output of solid waste is 8kg/d, which will be collected by environmental protection departments and sent to the east dumpsite to be processed.

Chapter VIII Environment Impact and Mitigating Measures of Subcomponent 4

8.1 Project Overview

The regional infrastructure construction includes road project, water supply project, drainage project, streetlights and signals project and greening project.

8.1.1 Road engineering

1. The project scope and scale

Road engineering includes Zhongxing Road, Wanxiang Road, Jiukong Road and Yanshan Road, totaling approximately 8.334km. Zhongxing Road extends from Linchang Road in the north to Yanshan Road in the south; Wanxiang Road extends from Linchang Road in the north to Yanshan Road in the south; Jiukong Road extends from Linchang Road

in the north to Yanshan Road in the south; Yanshan Road extends from Zhongxing Road in the west to Zhendong Road in the east. The geographic position of the four roads are shown in table8.1-1

According to Huainan City Master Plan and Huainan Comprehensive Transpotation Plan (2010-2020), the planning red line width of Zhongxing Road is 60m, which is the main road of the city. In line with the requirements of the Shixing, the width of the implementing red line is 30m. Considering that the roadway of Zhongxing Road is narrow recently and the traffic flow is small, it is regarded as the secondary main road of the city for the time being.

Therefore, among the four roads, Zhongxing Road and Wanxiang Road are planned as the secondary main roads, while Jiukong Road and Yanshan Road are planned as the branch roads. The main technical indexes of road engineering are set in table8.1-1.

Overview of the Main Technical Indexes of Road Engineering Table8.1-1

Number	Projects	Measurement	Zhongshan Road	Wanxiang Road	Jiukong Road	Yanshan Road
1	Road grade		Secondary main road	Secondary main road	Branch road	Branch road
2	Designing length	m	1356	1520	1388	4075
3	Designing speed	km/h	40	40	20	20
4	The red line width	m	30	25	10	10
5	Pavement standard axle load		BZZ-100	BZZ-100	BZZ-100	BZZ-100
6	Designing lifespan	year	15	15	10	10
7	Motorway width	m	3.5/3.25	3.5/3.25	3.5/3.25	3.5/3.25

2. Cross section design

(1) Zhongxing Road

Recent cross section：3.0m pavement+2.5m non-motorway+2.0m treelawn+ 2×7.5m carriageway+2.0m treelawn+2.5m non-motorway +3.0m pavement＝30.0m

60m red line on Zhongxing Road is needed to be reserved to leave a space for Zhongxing Road to expand in the long-term.

(2) Wanxiang Road

2.5m pavement +3.0m non-motorway +2×7.0m carriageway +3.0m non-motorway +2.5m pavement＝25.0m

(3) Jiukong Road, Yanshan Road

2×5.0m carriageway＝10.0m

3. The design of intersection

16 intersections are to be set in road engineering, which are all plane intersections, applying strenching signal intersecting. The strenching control of grade intersections are

shown in table 8.1-2.

The Controlling Requirements of the Grade Intersections Width Table 8.1-2

Road grade		The intersection width	The length of the widening			Remarks
Secondary main road	Entering road	3.25 ～ 3.5m	Total length 95m	Straight line section 70m	Gradual change section 25m	When the distance between two intersections is ≤300m，only execute control on the entrance section.
	Exiting road	3.5m	Total length 50m	Straight line section 30m	Gradual change section 20m	When the distance between two intersections is ≤300m，only execute control on the entrance section. When bus stops are set in the entrance section, the length of the platform should be added.

4. Pavement structure design

The four roads are made of asphalt and concrete. Considering the long-term overlay, it will apply a transition pavement in the short terms. According to the road grade, combined with the lifespan of pavement, times of traffic axle load and roadbed, the plan for the pavement structure is determined in table 8.1-3.

5. Roadbed treatment 1

The cut slope rate of this project is 1:1 and the bank slope rate is 1:1.5.

This project is located in colliery subsidence area. Taking its loose soil texture and deep landfill into consideration, impacted road roller is used to carry out compaction treatment of the roadbed.

6. Illuminating engineering

According to the requirements of national energy saving and environmental protection, the lighting source is LED streetlight.

7. Power supply and distribution

The power source of the streetlights distribution box comes from the nearby status box transformer substation through buried cables. If there is no status box transformer substation or the capacity is not reserved, then reconsider setting box transformer substation.

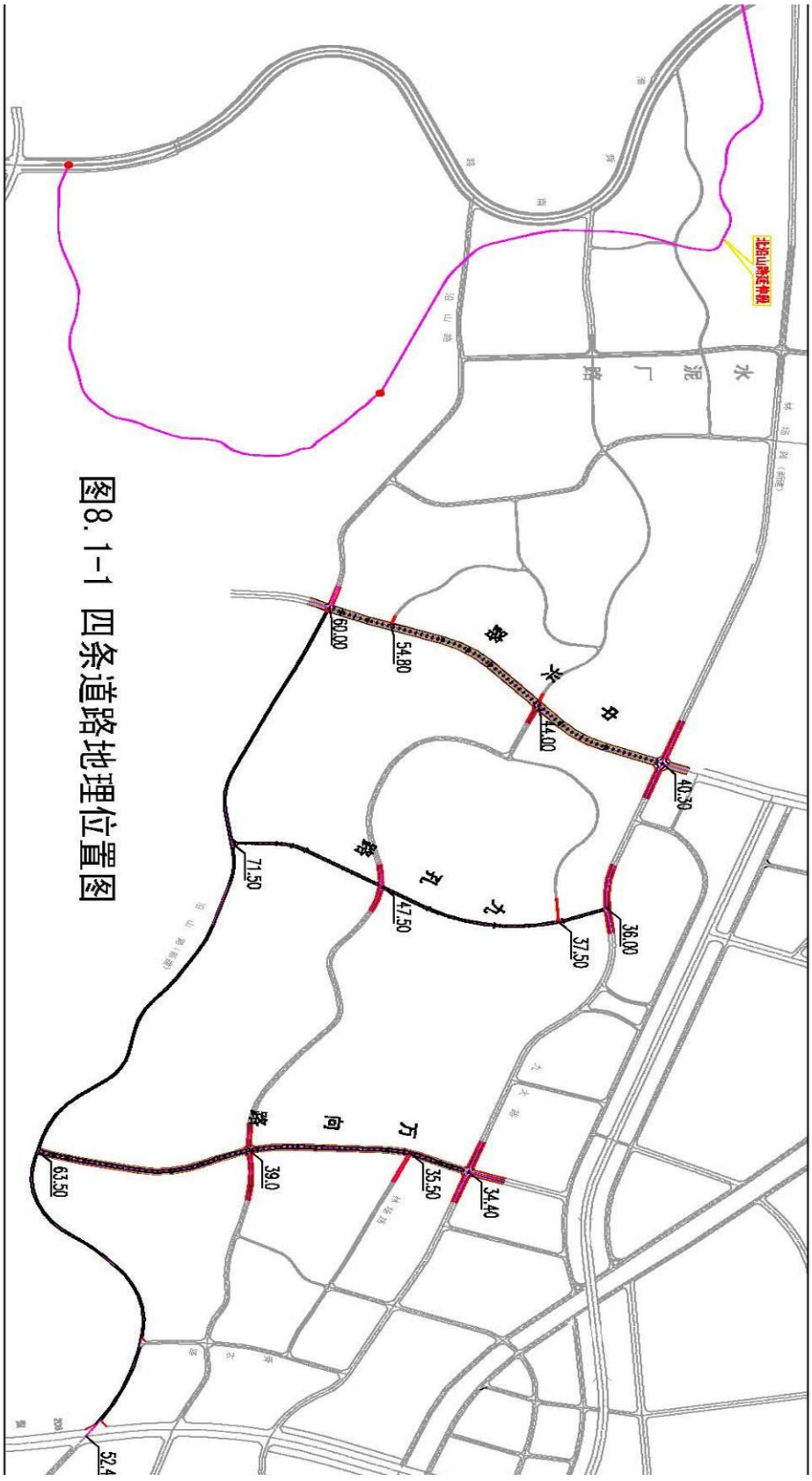


Figure 8.1-1Geografical Location Map of four roads

万向路	Wanxiang Road
九孔路	Jiukong Road
中兴路	Zhongxing Road
水泥厂路	Cement Plant Road

8. Landscape engineering

Border trees are mainly evergreen camphors, treelawn is deciduous trees, together with the evergreen dungarunga fragrans and colorful crape myrtles, hedge plants and foliage bushes are mainly photinia serrulatas, Kinson privets, Phnom Penh box-trees, French ilexes, China Loropetals, nandinas and Chinese mahonias. They are trimmed to be a ribbon-like shape.

On both sides of the roads, a trash will be set every 80m.

The Overview of Pavement Structure of Road Engineering Table 8.1-3

Pavement structure	Zhongxing Road、Wanxiang Road	Jiukong Road、Yanshan Road
Pavement Structure of Motorway	4cm thickness AC-13C fine grained type modified bituminous concrete（forward overrelay）	
	5cm thickness AC-20C tmiddle-grained bituminous concrete	
	Tack coat(0.3～0.6l/m2)	
	6cm thickness asphalt macadam	5cm thickness asphalt macadam
	0.5cm thickness slurry seal+priming oil（0.7～1.5l/m2）	0.5cm thickness slurry seal+ polyester fiber +priming oil（0.7～1.5l/m2）
	32cm thickness 5% cement stabilized crushed stone base(two layer continuous rolling paving mechanically)	30cm thickness 5% cement stabilized crushed stone base (two layer continuous rolling paving mechanically)
	30cm thickness grading macadam subbase	20cm thickness grading macadam subbase
	After treatment, Roadbed compaction degree≥94%（designed compressive modulus≥35MPa）	Packed soil compaction degree≥94% （ designed compressive modulus≥35MPa）
Pavement Structure of bicycle lane	3cm thickness AC-10F bituminous concrete	
	Stick layer of oil(0.3～0.6l/m2)	
	5cmthickness asphalt macadarm	
	0.5cm thickness slurry seal+priming oil（0.7～1.5 l/m2）	
	20cm thickness 5% cement stabilized crushed stone base	
	20cm thickness grading macadam subbase	

	Packed soil compaction degree≥93%
Pavement Structure of sidewalk	30cm×15cmx×6.5cm water permeable brick
	3cm thickness peameable bonding leveling layer
	15cm thickness C20 permeable cement concrete base
	20cm thickness graded gravel cushion
	Packed soil compaction degree≥90%

8.1.2 Water Supply Engineering

1. Project content

The main content of the project is the underground water supply pipeline engineering for thefour proposed projects including Zhongxing Road, Jiukong road, and Wanxiang road fin the project area The total length of the water supply pipeline is 8.574km (in municipal road, main pipe's length is 8.108km), and its diameter is DN150 ~ DN300.

2. Water supply system layout in the project area

On the basis of "Professional Plan of Water Supply Engineering in Huainan City" (2009 ~ 2020), the project area's water supply system is relatively independent, and regional water is supplied by the Zhongxing South Road Pump Station uniformly. , then The water is introduced to the project area at the intersection of the nine road and Zhongxing South Road with DN400 main pipe (according to the project area's development situation, DN400 main pipe can be split into two DN300 pipeline and are implemented by stages). The layout of water supply pipe network is shown in 8.1-2 in details:

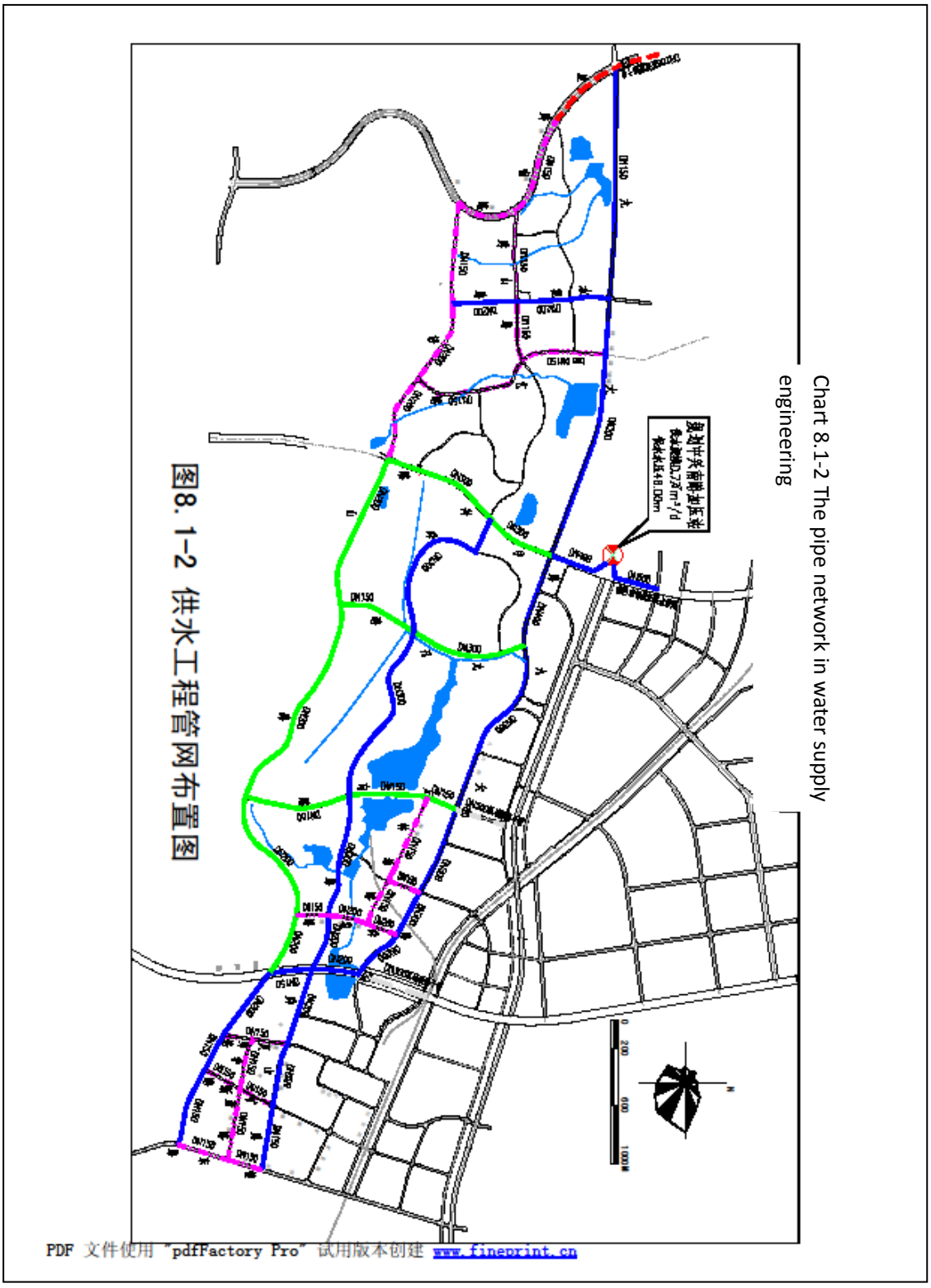


Chart 8.1-2 The pipe network in water supply engineering

3. Tubing

When Slotted construction starts, the pipes above DN200 pipe employ water-supplied ductile iron pipe, and pipes below DN200 use the water-supplied pipeline with high density polyethylene pipe.

4. Engineering quantities of water supply network

Engineering quantities of water supply network is displayed in chart 8.1-4。

Engineering Quantities of Water Supply Network Chart 8.1-4

No.	Road	Status	Pipe diameter (mm)	Pipe length (km)	Tubing
1	Zhongxing Rd(No 9 Rd-Yanshan Rd)	Newly built	DN300	1.117	nodular cast iron
	Zhongxing Rd(reserved pipe)	Newly built	DN150	0.140	PE
2	Jiukong Rd(Linchang Rd-Shunshan Rd)	Newly built	DN300	0.866	nodular cast iron
	Jiukong Rd(Shunshan Rd-Yanshan Rd)	Newly built	DN200	0.580	PE
	Changxing Rd(reserved pipe)	Newly built	DN150	0.068	PE
3	Wanxiang Rd(No 9 Rd-Shushan Rd)	Newly built	DN300	0.788	nodular cast iron
	Wanxiang Rd(Shunshan Rd-Yanshan Rd)	Newly built	DN200	0.760	PE
	Wanxiang Rd(reserved pipe)	Newly built	DN150	0.168	PE
4	Yanshan Rd(Zhonhxing Rd-206 national road)	Newly built	DN200	3.997	PE
	Yanshan Rd(reserved pipe)	Newly built	DN150	0.090	PE
Totally	Newly built		8.574		

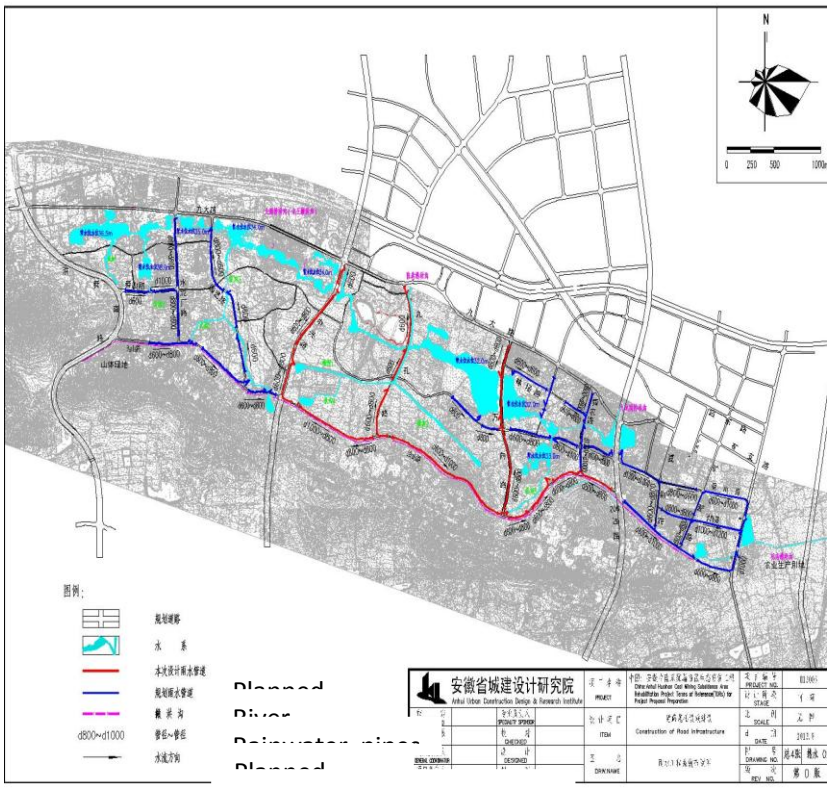
8.1.3 Drainage Project

8.1.3.1The rain engineering

The south side of this area is mountain, so in the rainy season, with a large quantity of water, it is necessary to build the flood diversion channel on the south side along Yanshan road to avoid water entering the municipal pipeline system. System layout is divided into the West and .

West : It is high in South and low In North. , and it is narrow in north and south while is long in east and west. Considering the properties of surrounding land comprehensively, western water pipeline are disembogues into the nearest planned water body.

East: the terrain in West is high but low in East, rain water's main pipeline are laid in east and west direction and injected to planed water towards east.
the main content of the project is the underground rain water pipeline engineering for the four proposed projects including Zhongxing Road, Jiukong Road, and Wanxiang Road four in the project area, and water pipeline's length amounts to 8.16km and diameter is DN600 ~ DN1000; the flood diversion channel in Yanshan Rd is 7.1km. The layout of rain water pipeline network and rain water engineering qualities are shown in Figure 8.1-3 and 8.1-5 respectively.



8.1-3layout of Rain Water Pipeline Network

Project Quantities in Rain water PipelineNetwork Chart 8.1-5

Road	Pipe diameter	Pipe length（m）	Tubing	Construction way
Zhongxing Rd	d600	840	PE	excavation
	d800	440	PE	excavation
Jiukong Rd	d600	1160	PE	excavation
	d800	200	PE	excavation
Wanxiang Rd	d600	930	PE	excavation
	d800	560	PE	excavation
Yanshan Rd	d600	2010	PE	excavation
	d800	1460	PE	excavation
	d1000	560	reinforced concrete	excavation
	ditch	7100	mortared rubble	excavation
Totally（m）	15260			

8.1.3.2 Sewage Project

The project area is within the scope of service of the first sewage treatment plant in Huainan City. At present, the first sewage treatment plant has been run for many years, and the sewage main pipeline network has been applied to the north of the project area about

500m. Upon review, the present pipe diameter and elevation can meet the requirements of the sewage injection. Therefore, the regional sewage pipe network system is the improvement of the whole sewer system in Huainan city.

The project area sewage pipe network system is divided into the East and the west district, the sewage pipe network system layout is shown in figure 8.1-4.

Figure 8.1-4 Layout of The Sewage Pipe Network System

West: It is hign in the South is high and low in the North.Besides, in the north it has built sewage pipes in Huaibeng south Rd(d800) and Zhongxing Rd(d800).Therefore, the intermal sewage pipelines are mainly laid towards north side along Huaishun south Rd, Nanshan Rd, Linchang Rd, and sewage pipe diameter is d400~d500.

East: : It is hign in the South and low in the North , high in the west and low in the east , the sewage is hoisted by Jiu Long Gang sewage pump sewage at the intersection of S334 and railway junction station, and injectedto Zhongxing Road North with status of d800 sewage pipes towards West. Internal sewage pipelines in this project area are mainly constructed along Wanxiang Rd, Shunshan Rd, and No 9 Rd, and sewage pipe diameter is d400~d800 .

The mainsewer projects in the project area mainly include the sewage pipes below the peoposed Zhongxing Road, Wanxiang Road and Yanshan Road. The Kowloon Gang sewage pumping station has been completed and operated normally

The main sewer projects in the project area include the sewage pipes below the proposed Zhongxing Road, Wanxiang Road and Yanshan Road. The engineering quantity of sewage pipeline network is shown in Figure 8.1-6.

Engineering Quantities of sewage pipeline network

Road	Pipe diameter	Pipe length（m）	Tubing	Construction way

Zhongxing Rd	d400	1720	PE	excavation
	D500	360	PE	excavation
Wanxiang Rd	d400	1160	PE	excavation
	D800	690	“F”reinforced concrete	Mechanical pipe jacking
Yanshan Rd	d400	1100	PE	excavation
Totally（m）	5040			

8.2 Evaluation Level and Scope

8.2.1Evaluation level

1. Water environment

The main water pollution in subcomponent four operation isthe daily life sewage in the roadside service station, whose emission volume is 6.58m3/d, less than 100m3/d. after being treated in sedimentation tank ,the wastewater containing oil in the restaurant can be treated in the septic tank with other living sewage, and be drained off into the municipal sewage pipe network, entering into the Huainan first sewage treatment plant.

Therefore, according to the relevant provisions in "Technical Guidelines for Environmental Impact Assessment of Water Environment" (HJ/T2.3-93), the water environment can be assessed as the third level,to describwater pollutant type, water volume, water quality and discharge path, as well as to analyze the environmental impact of sewage discharge briefly.

2. Atmosphere environment

The air pollution sources of proposed built project are mainly the automobile exhaust and road dust. According to the provisions of HJ2.2 2008, it is agreed that the atmospheric environment’s impact evaluation is the third level.

3. Sound Environment

After the engineering comes into operation, the noise level variation within evaluation scope is under 5dB (A), in the class 2 environmental function zone. so according to the regulation of HJ2.4 2009, sound environmental impact evaluation level is regarded as the second level.

4. Ecosystem Environment

As for the evaluation level classification of engineering ecosystem impact, please refer to chart 8.2-1.

Ecological Impact Assessment Classification Table Chart 8.2-1

ecological sensitivity of impacted region	project’s occupation area(waters)scope		
	area≥20km2 or length≥100km	area2km2-20km2 or length 50km-100km	area≤2km2 or length ≤50km
special ecological region	Level one	Level one	Level one
important ecological region	Level two	Level two	Level one
general region	Level two	Level three	Level two

The total length of road engineering in subcomponent four is 8.337km , less than 50km. The proposed constructed land belongs to planed traffic road, and ecological sensitivity of region belongs to the general area where has no natural reserves, natural and historical heritage, scenic area, the water source protection area or other environmentally sensitive areas. According to the provisions in "Technical Guidelines for Environmental Impact Evaluation Ecological Impact" (HJ19 2011), the ecological environment evaluation level is the third level, mainly conducting qualitative analysis of the influence in construction period.

8.2.2 Evaluation Scope

On the basis of regulations of evaluation level and scope in the “Technical Guidelines for Environmental Impact Evaluation”, and according to the engineering characteristics of proposed built projects and the environmental features of nearby areas, The evaluation level and scope of all the environmental factors are determined, see table 8.2-2.

Evaluation Level and Scope of Environmental Impacts Table 8.2--2

Environmental factors	Evaluation level	Evaluation scope
Sound environment	Level two	200 meters. within the red line on both sides of the proposed built Zhongtxing Rd, Wanxiang Rd, Yanshan Rd and Jiukong Rd
Surface water environment	Level three	500m above the upstream outlet to 3000m below the downstream outlet, totally 3500m’s evaluation scope.
atmosphere	Level three	200 meters. within the red line on both sides of the proposed built red line on both sides of Zhongtxing Rd, Wanxiang Rd, Yanshan Rd and Jiukong Rd
Ecosystem environment	Level three	project area’s border extends outward for 200m.
Social environemnt	---	Nine Datong areas of Huainan city nine Long Gang town, Datong streets community;Nine Long Gang town’s Huaishun community, Chonghua community, Xinjian community, Hongqi community, Chenxiang village, Jiulong gang village, rear station community of Datong street, Nankuang community.

8.3 The objectives of environmental protection

Evaluation scope excludes natural reserves, scenic area, the water source protection area or other sensitive and important ecological regions. Cultural relics in the poject area include three protected sites of the criminal evidence relics of Japanese incasion belonging to the national key cultural relics protection institute-slaughter grave, secret reservoir and bunker dungeon and a blockhouse relics. The project belongs to the ecological restoration project, the cultural relics institutes above are separated by large green belt nearby, thus, during the project construction, the construction sites are all far from the cultural relics, not having impact on the cultural relics in the construction process. The south of the project area is the Shungeng Mountain, belonging to the regional tourism and leisure place in Huainan City, rather than the natural protection areas or scenic areas, and the project will not produce adverse effects on it.. On the basis of on-site investigation, the environmental protection objectives of subcomponent four is shown in chart 8.3-1.

Environmental Protection Objectives Chart 8.3-1

No.	Environmental factors	Environmental protection objectives	Relative location	Relative distance (m)	scale(person)	Environment functional objectives
1	Surface water environment	multiple subsidence pool and Da tong pai ditch, Cheng xiang pai ditch, Jiu long gang pai ditch and Sun dian pai ditch	---	---	Small scale ditch	the environmental quality standards for surface water(GB3838-2002 category V；
2	Sound and atmosphere environment	Datong social welfare home （urban）	W	212	410	Quality standards for Sound environment （GB3096-2008） category two; Quality standards for atmosphere(GB3095-1996) and its amendment level two
		Yuan yi chang housing project（urban）	E	61	504	
		Kuang bei village （urban）	E	214	212	
		Nanshan church （urban）	N	100	400	
		Chongwen village （urban）	NE	186	60	
		Jiu long gang primary school （urban）	NE	355	600	
		Jiefang village （urban）	NE	353	200	
		Chenxiang village (extra-urban)	N	245	3250	
3	Ecosystem environment	Shungeng mountain scenic area	S	75	---	if destroy Shungeng mountain’s land, water and plant.

Note：” In The sensitive objectives in sound and atmosphere environment protection, objectives within 200m is regarded as sound environment protection objective and all objectives are all atmosphere environment protection objectives.”

8.4 Project Analysis

8.4.1Construction period

During construction period, In the process of road construction, water supply pipeline constuction, drainage pipeline construction and material transportation during this subcompenent construction period,sit will cause different degrees of pollution on regional environment in a certain time and at a certain place. But this is a short-term effect, andcan disappear after the construction period.

Allocate construct sites during the construction of this subcompenent. Construction workers shall eat out and merely go back sites to sleep.

8.4.1.1 Water pollution source

The wastewater generated in construction period is mainly fconstruction sewage and worker’s living sewage.

1.Construction wastewater

Construction wastewater produced in the construction period is the oil flushing water of mechanic equipments, and the main pollutants are SS, COD, and petroleum.
The subcomponent only flushed the transport vehicles, and the water quota is 100L/ train,

10 train number /d (construction period of a year is 300 days). Wastewater pollutants from washing vehicles are shown in table 8.4-1

Wastewater Pollutants from Washing Vehicles Chart 8.4-1

Category	Project	COD	SS	Petroleum
Wastewater of washing vehicles（300m3/a）	Density (mg/L)	100	300	10
	Production volume（t/a）	0.030	0.090	0.003

2. Domestic Sewage

During the construction, domestic sewage includes washing wastewater and excrement wastewater. Because of the construction workersnot having dinner in the sites, life-water quantity is relative few.

During this subcomponent construction period, the total personal number is 50, the water consumption quota is 150L/ (cap • d), the sewage coefficient is 0.8, the sewage emissions is 6m3/d, 1800m3/a. The production and emission density of main pollutants are shown in chart 8.4-2.

lliving Sewage and Pollutants Chart 8.4-2

Category	Project	COD	BOD5	NH3-N	SS
Domestic sewage（1800m3/a）	density(mg/L)	200	120	30	100
	Production volume（t/a）	0.360	0.216	0.054	0.180

8.4.1.2 Atmosphere pollution source

During this subcomponent construction period, the atmospheric pollution sources are mainly construction dust, construction machinery vehicle exhaust, and asphalt fumes produced by road asphalt paving.

Construction dusts are mainly the wind erosion dust from the excavation of earthwork yard and bulk material yard, the road dust produced by transport vehicles,and etc. without being controlled, the dust can cause air pollution, so it is necessary to control the generation and emissions of the dust effectively.

1. The wind erosion dust from the excavation of earthwork yardand bulk material yard

The pipeline construction of this subcompenent project requires to excavating surface, and earthwork will be temporarily piled on both sides, so it will produce dustin the earthwork and bulk material stacking process especially in the dry and windy conditions.

When the particle size is 250um, the settling velocity is 1.005m/s. When the dust particals produced in the the excavation of this subcomponent are larger than 250um, the main influence scope is within the close range at the dust's downwind point., and what the really influence on the external environment are the tiny dust particles. In addition, according to the climate conditions of the site, its influence is also different.

2. The road dust from transport vehicles

In the process of the construction, the vehicles mainly transport materials such as stone, sand, pipe and so on.

According to the analogy survey, dust caused by construction and transport vehicles may have a greater influence on the roadside scopeof30m along the roads, forming a linear

pollution. The roadsideTSP can reach more than 10 mg/m3 and the general density is between 1.5 to30 mg/m3. Dust caused by flat ground mainly influences ascope of 50m.

3. The exhaust from construction transport vehicles

In the construction process, when various engineering machinery and transport vehicles burn gasoline and diesel, they generated exhaust containing CO, NOX, THC and other pollutants, which will have an impact on construction site. According to related statistics, generally, the emission of a large construction vehicleis CO 5.25 g/(vehicle · km), HC 2.08 g/(vehicle · km), and 10.44 g/NO2 (km). The construction machinery vehicles operating at the same time in this project are not many, so the vehicles' exhaust emission is less, belonging to the fugitive emissions.

4. The asphalt fume

The asphalt fume mainly comes from the asphalt molting,stirring, paving process in the pavement construction stage, , and it main produces THC, TSP and BaP pollution. Pollutants concentration is generally 50 m away in the downwind. The benzene [a] pyrene is below 0.00001 mg/m3, the phenol is 60 m in the downwind and is 0.01 mg/m3, theTHC is 60m in the downwind and is 0.16 mg/m3.

8.4.1.2 Noise pollution source

The noise in construction period mainly comes from construction machinery and transport vehicle and so on. The main noise sources include bulldozers, excavators, rollers, paver, loaders, heavy truck, etc., the main noise source in different stages is shown in table 8.4 3. Reference is made to Guidelines for Environmental Noise and Vibration Control Engineering (HJ2034-2013),appendix A table A2 ,common construction equipment noise(sound pressure level), equipment noise levels are shown in table 8.4 3.

Main Noise Pollution Sources Chart 8.4-3

Project	Construction stage	noise pollution source
Regional facilities	Fundamental construction	Excavators, bulldozers, loaders
	Road construction	Roller, paver, dump trucks
Service sites on the roadside	earthwork	Excavators, bulldozers, loaders, dump trucks
	Fundamental construction	Driver, pneumatic pick, vibratory rammer, bituminous concrete truck mixer, concrete pump, air compressor
	Structure construction	Various transport vehicles, woodworking saws

Noise IntensityofMain Equipment Chart 8.4-4

Noise generated equipment	intensity/distance[dB	Noise	intensity/distance
bulldozer	83～88/5	paver	80～90/5
Hydraulic excavator	82～90/5	Wheel loader	90～95/5
All kinds of roller	80～90/5	Dump trucks	82～90/5
driver	100～110/5	Vibratory	92～100/5
pick	88～92/5	Bituminous	85～90/5
Air compressor	88～92/5	Concrete	88～95/5
Woodworking saws	93～99/5	Angle grinder	90～96/5

8.4.1.4 Solid waste

During theconstruction, the solid waste is mainly construction waste and construction personnel's daily life garbage.

1. The construction waste

Construction waste aremainly the brick, stone, sand, and etc produced in construction., as well as all kinds of building materials of boxes, bags, and etc.

2. Life garbage

This subcompenent set up camp at the construction site (no canteen),. The construction personnel are 50. , Assuming tant one person produces 0.5 kg garbage onr day., then the totaol living garbage is 25 kg one day, and 8.25 ton one year. The construction period is 1 yearand 6 months, so the total quantity is of 12.4 ton.

8.4.2 Operation Period

8.4.2.1Atmosphere pollution source

The major air pollution sources in the operation period are the exhaust generated by the road vehicles.

Road vehicles' exhaust pollutants are mainly from crankcase air volatilization and vent emissions, fuel system. The main pollutant isCO and NO2, they have an certain influence on ambient air quality on both sides.

Please Refer to Environmental Impact Assessment of Highway Construction Project (Trial) "(JTJ 005-96).The recommended value of vehicle bicycle emission factor are shown in chart 8.4 6.

Recommended Value of Vehicle Emission Factor (mg/m) Chart 8.4-6

Average speed(km/h)		50.00	60.00	70.00	80.00	90.00	100.00
Small cars	CO	31.34	23.68	17.90	14.76	10.24	7.72
	NO2	1.77	2.37	2.96	3.71	3.85	3.99
Medium cars	CO	30.18	26.19	24.76	25.47	28.55	34.78
	NO2	5.40	6.30	7.20	8.30	8.80	9.30
Large cars	CO	5.25	4.48	4.10	4.01	4.23	4.77
	NO2	10.44	10.48	11.10	14.71	15.64	18.38

According to the study, Zhongxing road's designed speed is 40 km/h, Wanxiang road's designed speed is 30 km/h; Jiukong road and Yanshan roads' designed speed is 20 km/h, which are all less than 50 km/h, so the car's exhaust emissions is too small to be neglected.

8.4.2.2 Noise pollution source

During construction, the noise is mainly the road traffic noise. After being put into operation, the noise source of motor vehicles driving on the highway is unsteady.When the vehicles are operated, the engine and transmission system, cooling system and other parts will produce noise; the air turbulent in travel, the friction between exhaust system, tire and road surface and so on also can produce noise; due to faltness degree of road surface, vehicles may produce noise too. Generally, the traffic noise is related with vehicle's sound power, traffic flow, vehicle speed, vehicles' size, road's condition and so on.

8.5 Environmental impact and mitigation measures during

construction period

8.5.1 Hydrographic environment

8.5.1.1 Analysis of the impact on hydrographic environment

The waste water during construction is mainly construction waste water and construction personnel's domestic wastewater.

1. Construction waste water

The construction waste water produced during construction period includes all kinds of oil cooling and washing water from construction machinery equipment, etc. The main pollutants in the wastewater of mechanical equipment are COD, SS and oil. If oily waste water of construction machinery is discharged into water directly, it willforman oil film on the water surface, andmake the dissolved oxygen in water uneasy to recove, which will influence water quality. If oily wastewater is drained off into the land, it will reduce soil fertility, and change the soil structure. It cannot be directly discharged outside,it needs an bio-safety disposal. The car washing wastewater amount in this subcompenent is 300m3 one yaer, of which the main pollutants are COD, BOD5, NH3 - N, SS and the concentration are 200mg/L,120 mg/L,30 mg/L,100mg/L respectively. The car washing wastewater discharge is 10m3 one day

2. Domestic sewage

The main pollutants of construction camp sewage are BOD5, COD, etc. There are 50 people during the construction peak. If the dialy per capital of water consumption is 0.15m3, the daily amount is 7.5m3 at the construction site. If the folding fouling coefficient is calculated as 0.8, the sewage emission is about 6m3 one day. The main pollutants in sewage are organic matter and pathogenic microbes. According to the similar engineering monitoring value, the various kinds of sewage pollutants in construction site form construction personnel are COD with concentration of 200 mg/L, BOD5 with concentration of 120 mg/L.

8.5.1.2 Water pollution prevention and control measures during construction

Water environment impacts during the construction mainly include: oil contamination produced by construction machinery when it runs, bleeds, drips or leaks, oily sewage from outdoor equipment washed by rain, etc., and construction camp sewage, etc. It need to take measures against the mentioned sewage to prevent them from contaimining the nearby waters.

1. Oily wastewater treatment

The main pollutant of oily waste water in construction is petroleum. In the maintenance field of construction machinery or vehicles, gully should be set to collect washing wastewater, as well as the separation tank for oily wastewater treatment. Rather than being discharged out, the car washing wastewater can be used in recycle after being treated in the recycling handing system (drain + precipitation) equipped in car washing site,

2. Construction personnel life sewage treatment

Dry latrine is adopted and the manure wastewater is used by area residents as agricultural fertilizer. After being precipitated (sharing treatment facilities with car washing wastewater), the washing wastewater sediments(will be used for water spraying and dust suppression without being discharged outward

8.5.2 Atmospheric environment

8.5.2.1 The impact on atmospheric environment

(1) The impact of road construction dust

Ground vegetation will be cleared in the process of road construction and all land within the scope of the designed road red line will be naked. The bare surface of the earth can generate dust in dry weather or when the wind speed is larger. At the construction stage, earthwork excavation and filling and other construction activities can also produce dust. The analogy analysis of the air pollution caused by TSP concentration localized within the construction area is carriedout. From the other similar engineering construction, the scope of the impact of air pollutantsemitted during construction period is limited to the nearby area of construction road, and the degree is extremely limited.

(2) Vehicle transportation road dust

There are many factors of vehicle transportation road dust, which are mainly related to vehicle speed, wind speed, road area of dust, dust road area of humidity and thickness of dust on the ground. And wind speed and road surface humidity directly affect the discharge and the transmission distance of dust. According to the relevant construction engineering survey data, the dust concentration near the ground surface in the construction site can reach 1.5～30mg/m3. According to analogy investigation, the road and soil dust impact on the environment can greatly slow downafter sprinkler and other measures are taken. The test results of road sprinklering for dust suppressionon the construction area are shown in table 8.5 1.

The Test Results of Road Sprinkleing for Dust suppression Table 8.5-1

Distance from the side of the road		0	20	50	100	200
TSP（mg/m3）	No water	11.03	2.89	1.15	0.86	0.56
	Sprinkle water	2.11	1.40	0.68	0.60	0.29

(3)Vehicle exhaust

The exhaust of large construction vehicles and construction equipment cause certain effect on air quality near the construction area. Due to the small traffic flow, car exhaust quantity is very limited and the effect on atmospheric environment is also small.

(4)The influence of mixing material and dust

Ballast, stone and other materials are easy to cause dust in the mixing process. According to the mixing station siacreslation investigation data, there are no environmental sensitive sites within the scope of about 300 m ~ 500 m from the construction sites of Jiukong road and Wanxiang road.. The construction dust does not affect residents' environmental air quality or the impact is very small. There is a king housing project at the crossing of Zhongxing road and Yanshan road with a total of 144 units, 4 buildings, in which no people has yet checked in. The residential area has a distance of 61 m away from Zhongxing road red line, 30 m away from Yanshan road red line. In the construction phase, it needs to take necessary dustproof measures in order to reduce the influence of the material mixing and road dust on ambient air in residential area.

(5)Asphalt smoke

The asphalt’s melting, mixing, paving of the project will produce smoke and dust, which is mainly composed of THC, the TSP and BaP, and THC and BaP are harmful substances. It will cause certain pollution to the air and is also harmful to human body. But the evaluation requires for the use of commodity asphalt without asphalt mixing plant in engineering construction in the process, therefore, the asphalt smoke is less in the asphalt paving process, at the same time, fully enclosed asphalt paving car is adopted to avoid the open way of working in the past, which can fundamentally solve the problem of open paving car pollution. The delay time of asphalt emission is very short during paving asphalt pavement.

According to the analogy analysis of the same type domesticconstruction survey, in the road asphalt paving peocess duringconstruction, the pollutant concentrations is generally 50 m from the downwind, and the benzopyrene is below 0.00001mg/m3, while the THC is 60m from the dowanwind and is below 0.16 mg/m3. The BaP can meet the maxiacresm allowable emission concentration for asphalt gas ofAir Pollution Discharge Standard (GB16297-1996), and ITS influence is small on the surroundings.

(6) Water supply and drainage pipeline construction

When the construction of water supply and drainage pipeline are carried out together, the influence on atmospheric environment mainly displays in road construction, and water supply and drainage pipeline construction is acresch smaller compared with road construction. Construction along the Yanshan road is mainly for river bank pile soil, under the condition of dry weather and strong winds, they kick up dust. There is one residential area between Zhongxing road and Yanshan road, and the construction dust may influence the its atmospheric environment.

8.5.2.2 Mitigation measures

1. Road construction mitigation measures of air pollution

(1) To optimize the construction plan and take covering measures

To optimize the construction plan tomake the construction excavation and the engineering soil slag be backfilled on site or outbounded in time, so as to reduce the amount of waste residue and reduce the discharge of dust; If there is a pile of clay, it should be covered with plastic sheeting or dustproof net to reduce dust heap of soil. Bulk road materials shall not be piled up in great quantities. If you need to pile up plastic sheeting or dustproof, net cover processing should be adopted. Openair for a long time without prevention measures would not be allowed.

(2) The compaction and water spraying for dust suppression

The road should be constructed in segments.In the first section , except the trench on the soft ground, roller compaction processing should be adopted. One section should be compacted after constructing to minimize the dust emission; Road construction should be equipped with sprinkler before construction.All the bare ground of the construction site should maintain a certain humidity to avoid a large number of dust caused by vehicle in and out or wind, which can pollute the surrounding environment.

(3) Vehicle washing

Due to the compaction of construction road, especially the acresddy road on rainy days, transport vehicle will easily entrain a large number of sediment. The evaluation shows that transportation vehicles at the construction site should be cleaned before leaving. In places where vehicles leave the construction site, vehicle cleaning device should be set up to prevent the wheel entrainment of sediment after cleaning from affecting the urban environment.

(4) Cover measures for acresck truck

When vehicles ship waste residue out, the first thing should be ensureed is that the waste will not be spilled. Secondly, acresck truck should take covering measures to prevent dust from polluting atmospheric environment.

(5) Prevention measures for pavement materials production pollution

All 4 road pavement construction materials, asphalt concrete or concrete acresst should adopt goods asphalt concrete or concrete. Asphalt concrete and concrete should not be manufactured or producted at the road construction site to eliminate the influence on atmospheric environment during the preparation of pavement materials.

(6) The sub grade material mixing operation

In thesub grade material mixing homework, it firstly needs to humidify the mixing material until there is no dust when mixing to reduce material mixing dust.

(7) Pavement asphalt preparation

In the sub grade material mixing homework, it needs firstlyto humidifythe mixing material until there is no dustwhen mixing. For the construction of Zhongxing road and Yanshan road, it should be mixed at 300 m away from residential area. The mixed subgrade material will be delivered to the road near the residential area by vehiclesto reduce material mixing dust.

2. Air pollution prevention and control measures of construction camp

At all the construction camp of this project area, small coal-fired boilers shall not be used without any dust prevention measures. All construction camps should adopt all types of clean energy. The evaluation requires that construction camps should use liquefied petroleum gas or electricity for cooking and heating. Using clean energy can basically eliminate the influence of construction camp on atmospheric environment.

8.5.3 Sound environment

8.5.3.1 Impact on sound environmental

The regional infrastructure construction noise production equipment and construction equipment affect distance s is shown in Table 8.5--2。

The Main Mechanical Equipments and their Noise Affect Distance During the ConstructionTable 8.5-2

Noise production equipment	Noise level [dB(A)]	Distance (m)	GB12523—2011 criterion	
			Day time	Night time
			70 dB(A)	55 dB(A)
			Construction machinery noise affect distance（m）	
Excavator	82～90	5	60～100	135～175
Bulldozer	83～88	5	65～90	140～165
Concrete vibrator	88～92	5	75～100	150～175
Self discharging Truck	82～90	5	60～100	135～175
Road roller	80～90	5	50～100	126～175
Wheel loader	90～95	5	100～125	175～199
Chainsaw	101	1	21	37
Drill	102	1	22	37
Electric welding machine	90	1	10	35
Cutter bar	88	2	36	66
Bituminous concrete mixer truck	85～90	5	75～100	150～175
Concrete delivery pump	88～95	5	90～125	150～199
Paver	80～90	5	50～100	126～175

Note: chainsaw, drill, electric welding machine and cutter bar are all set indoor and it is estimated that the sound insulation is about 20 dB (A) through building envelope.

According to field investigation and combining the present status analysis of the project area, there is no environmental sensitive site on both sides of Jiukong road and Wanxiang road within the scope of 300 m. Therefore, construction noise from Jiukong road and Wanxiang road won't produce environment interference or noise to sensitive sites. There are residential areas at the crossing of Zhongxing road and Yanshan road. Construction noise from Zhongxing road and Yanshan road will have an influence on the residential areas. Therefore, we need to take necessary measures to reduce noise .

8.5.3.2 Mitigation measures for the impact on sound environmental

There is no environmental sensitive site within a scope of 300 m on both sides of Jiukong road and Wanxiang road, and the construction noise has no impact on the environment sensitive sites. Construction noise has mainly influence on the residential area. Evaluation thinks that high noise equipment construction should be forbidden during 22.00 ~ 6.00 at night within a scope of 200 m in the residential area. And the standard in Evironmental Noise Emission Standrad at Construction Site (GB12523-2011) should be shall strictly implementedof, i.e.70 dB (A) in the day, 55 dB (A) at night.

8.5.4 Solid waste

8.5.4.1 Impact analysis

The solid waste in this subcompenent project construction is mainly the living garbage from construction personnel, the construction waste, the waste residue, etc.

(1) Living garbage

There are about 50 people during the project construction. If the emission of garbage is 0.5 kg per person per day, the total living garbage is 10.625 t in 17 months construction period. If living garbage is not properly treated, it would hurt the environment health and beauty. And if it is discharged into rivers, water quality will be polluted, so living garbage should be cleaned up in time.

(2) Construction waste and waste residue

If construction waste is scattered and discarded in the process of comprehensive treatment, it will be harmful to the environment.

(3) Abandoned earthworks

In this construction, the excavation earthwork is 140000 m3 and the filling earthworks are 200600 m3. This subcompenent transfers 60600 m3 from the drainage area. Specific conditions balance is shown in table 5.5 3.

8.5.4.2 Solid waste pollution control measures during construction period

According to the People's Republic of China Soild Waste Pollution Prevention and Control Law, the construction unit shall clean up and transport away solid waste without delay in the process of engineering construction, and use or disposal the soild waste in accordance with the regulations of the administrative department of environmental health.

During construction period, the construction waste should be stacked and collected as the filling material of foundation; the boxes and bags of all kinds of building materials and so on should be classified and stored by specially-assigned person, and be transportedto the junkyard for recycling. The disposal scheme of the demolited construction waste should be implemented after declaring to the administrative departments of Huainan, and be timely organized to transport out of the construction site.

After the project, demolition construction area, overlay facilities, parking area for construction machinery, stone material field, integrated warehouse and office site should

clean up timely. The living garbage, privy and sinkhole acresst be cleaned, and use carbolic acid, quick lime to disinfect, in order to make the construction to be back to work.

Living garbage shall not be disposed casually and the construction unit should appoint the responsible for collection.Strengthen the management of construction work area living garbage, set the classification bin and entrust local sanitation department to remove on a regular basis. The trash cans in the construction area need spraying potions to prevent propagation of pests, such as the fly, in order to reduce the adverse effect of life garbage onregional water environment and construction personnel health.

8.6 The environmental impact and mitigation measures in the operational phase

8.6.1 Water environment

8.6.1.2 Water environment impact analysis in the operation phase

The water pollution source in operating period of this subcompenent is mainly the domestic sewage of residents living along the sweage collection pippline under the new-built acresnicipal road.

This design will bring the 4 road sewage pipe network (on either side of Jiukong road no dirt unit, Jiukong road doesn't design sewage pipelines) into the whole system. Through the four roads'sewage pipe network and planned sewage pipe network, it ensures that the sewage pipe network system of the subsidence area can form a system, and it can be smoothly discharged into the acresnicipal sewage pipe network in north and finally flow to the north into the first sewage treatment plant of Huainan city.

The design area is in the service scope.of Huainan pioneered first sewage treatment plant (formerly the first sewage treatment plant of Huainan city)

Huainan pioneered first sewage treatment plant (formerly the first sewage treatment plant of Huainan city) went into test run in July 2002. Factory is located on the north shore side of Huai River in Tao Road in Tian jia'an district, covering a total area of 105 acres, disposing 100000 m3 wastewater one day The secondary biochemical treatment (carrousel 2000 oxidation ditch process) is adopted. The present capacity is 90000 m3 one day, and the treated discharge water meets the design level of B standard. At present, the sewage treatment plant is under an upgrading project.

8.6.1.2 Water pollution control measures

There is no wasterwater during the operating period of this subcompenent, and the area has set up sewage pipes to collect resident sewage, which will flow into the service scope of Huainan pioneered first sewage treatment plant (formerly the first sewage treatment plant of Huainan city).

8.6.2 Atmospheric environment

8.6.2.1 Impact on Atmospheric environmental

(1) Road dust

The impact on environment inoperating period is mainly road dust. Regular cleaning and sprinkling water are required to ensure the roads are clean. As long as sprinkling, cleaning and suppressing dust frequently, road dust in operating period will have a small influence on ambient air.

(2)Vehicle exhaust

①Pollutant discharge coefficient

According to the "Evironmental impact Assessment Standard of highway construction" (JTG B03-2006), CO and NOx are the main automobile exhaust emissions. When the

emission coefficient is set to auto miniacresm driving speed of 50 km/h, the project design of road vehicle speed is less than 50 km/h. When calculating emissions at the speed of 50 km/h, the vehicle emission exhaust pollutant discharge coefficient is shown in table 8.6 1.

The Automobile Exhaust Emission Rate with a Speed of 50 km/h Table 8.6-1

Vehicle	Small car		Medium car		Full-size car	
Pollutant	CO	NOx	CO	NOx	CO	NOx
(mg/car·m)	31.34	1.77	30.18	5.40	5.25	10.44

②Design traffic flow

Design traffic flow, see table 8.6-2。

Designed Traffic load Table 8.6-2

Street name	Starting place	Terminal place	Design speed	Traffic volume in 2017 （pcu/h）	Traffic volume in 2020 （pcu/h）	Traffic volume in 2030 （pcu/h）
Zhongxing Road	Linchang Road	Yanshan Road	40	1616	2401	4895
Wanxing Road	Linchang Road	Yanshan Road	40	976	1538	2551
Jiukong Road	Linchang Road	Yanshan Road	20	464	598	1047
Yanshan Road	Zhongxing Road	G206	20	337	471	848

③Vehicle classification

According to the analogy survey, the proportion of small, medium and large vehicles is shown in table 8.6-3; the traffic flow of different types are shown in table 8.6-4

The Proportion of Small, Medium and Large Vehicles Table 8.6-3

Year	Model proportion（%）			Day and night proportion
	Small vehicle	Medium vehicle	Large vehicle	
2017	60%	25%	15%	10:4
2020	70%	20%	10%	
2030	75%	15%	10%	

Project Traffic Volume Peridiction

Table 8.6-4 **Unit：One car/h**

Street name	Characteristic year	Day time			Night time		
		Small vehicle	Medium vehicle	Large vehicle	Small vehicle	Medium vehicle	Large vehicle
Zhongxing Road	2017	970	404	242	388	162	97
	2020	1681	480	240	672	192	96

	2030	3671	734	490	1468	294	196
Wanxing Road	2017	586	244	146	234	98	58
	2020	1076	308	154	430	123	62
	2030	1913	383	255	765	153	102
Jiukong Road	2017	278	116	70	111	46	28
	2020	418	120	60	167	48	24
	2030	785	157	105	314	63	42
Yanshan Road	2017	202	84	51	81	34	20
	2020	330	94	47	132	38	19
	2030	636	127	85	254	51	34

④Quantity of pollutant emission

According to car exhaust emission rate, thevapor emissions are shown in table 8.6-5 and 8.6-7.

Automobile Exhaust CO EmissionsPrediction

Table 8.6-5 **Unit：(g/h·m)**

Street name	Characteristic year	Day time			Night time		
		Small vehicle	Medium vehicle	Large vehicle	Small vehicle	Medium vehicle	Large vehicle
Zhongxing Road	2017	30.40	12.19	1.27	12.15	4.87	0.51
	2020	52.68	14.48	1.26	21.07	5.79	0.50
	2030	115.05	22.15	2.57	46.02	8.86	1.03
Wanxing Road	2017	18.36	7.36	0.76	7.34	2.94	0.30
	2020	34.09	9.30	0.81	13.64	3.72	0.32
	2030	59.95	11.56	1.33	23.98	4.62	0.53
Jiukong Road	2017	8.71	3.50	0.37	3.48	1.40	0.15
	2020	13.10	3.62	0.32	5.24	1.45	0.13
	2030	24.60	4.74	0.56	9.84	1.88	0.22
Yanshan Road	2017	6.33	2.53	0.27	2.53	1.01	0.11
	2020	10.34	2.84	0.25	4.14	1.14	0.10
	2030	19.93	2.83	0.44	7.97	1.13	0.18

Automobile Exhaust NOx Emission Prediction

Table 8.6-6 **Unit：(g/h·m)**

Street name	Characteristic year	Day time			Night time		
		Small vehicle	Medium vehicle	Large vehicle	Small vehicle	Medium vehicle	Large vehicle
Zhongxing Road	2017	1.72	2.18	2.53	0.69	0.87	1.01
	2020	2.98	2.59	2.51	1.19	1.04	1.00

	2030	6.50	3.96	5.11	2.60	1.58	2.04
Wanxing Road	2017	1.03	1.32	1.52	0.41	0.53	0.61
	2020	1.90	1.66	1.61	0.76	0.66	0.64
	2030	3.38	2.07	2.66	1.35	0.83	1.06
Jiukong Road	2017	0.49	0.63	0.73	0.20	0.25	0.29
	2020	0.74	0.65	0.63	0.30	0.26	0.25
	2030	1.39	0.85	1.10	0.56	0.34	0.44
Yanshan Road	2017	0.36	0.45	0.53	0.14	0.18	0.21
	2020	0.58	0.51	0.49	0.23	0.20	0.20
	2030	1.12	0.68	0.89	0.45	0.27	0.36

⑤Automobile exhaust effect prediction

According to the project planning, there is one residential area at the crossing of Zhongxing road and Yanshan road, and the residential area is 45 m away from Zhongxing road red line, 30 m away from Yanshan road. The car exhaust is predicted and calculated according to the Environmental Impact Assessment Code of Highway Construction Project (JTG B03-2006).

Cvertical=（2/π）1/2Qj/Uσzexp-((h2)/2σz2))

In the foracresla

Cvertical—When the wind is vertical with line source (θ=90°), ground concentration，mg/m3；

Qj —Gaseous j pollutants emission source intensity, mg/ (car·m)

U—Forecast of the wind speed at the high point of effective emission source, m/s， take the average wind speed of Huainan city2.5 m/s；

h—Effective emission source level, m, value for1.5 m

σz—Vertical diffusion parameters, m, σz=（σza2-σz02）0.5，σza=a（0.001x）b, σz0=5-3.5（U-0.5）； Neutral weather forecast is the main consideration, According to meteorological data of Huainan city, the neutral atmospheric stability of Huainan city is accounted for 55%. Neutral weather of a and b value is 86.49 and 0.92332 respectively.

⑥Predict outcomes

According to the project planning, there is only a residential area at the intersection of Zhongxing road and Yanshan road, the main consideration of the prediction is the impact of car exhaust emissions in Zhongxing road on the atmospheric environment. The forecast results of CO at 20 m and NOx at 40 m away from road red linein Zhongxing road are shown in table 8.6-7:

The Predicted Sutomobile Exhaust Concentration in Zhongxing road

Table 8.6-7 **Unit: mg/m3**

Year	CO concentration 20m away from boundary lines	NOx concentration 40m away from boundary lines
2017	0.87	0.092
2020	1.37	0.116

2030	2.78	0.223
Standard hours	10	0.25

The red line of designed Zhongxing road is 61 m away from planning residential area; car exhaust emissions can meet the standard requirements by calculation the ground concentration. The road traffic of Yanshan road is 20%less than that of Zhongxing road. It is expected that the CO and NOx within 10 m from the road red line can meet the standard requirements. Other road traffic is less than that of Zhongxing road and there is no planning land for residential areas, therefore, the road vehicle exhaust emissions have no impact on residents. According to the atmospheric environment monitoring results of Huainan urban, NOx monitoring results are usually less than 0.1 mg/m3, which illustrates that the automobile exhaust has no impact on ambient air quality of Huainan city. The road traffic of the project area is far less than that of urban area; therefore, the evaluation thinks that the impact of the exhaust on the air in the project is small.

8.6.2.2 Mitigation measures of impace on atmospheric environment

(1) Road dust

The impactatmospheric environment is mainly the road dust.Because the roads built in this project belong to the acresnicipal public roads of Huainan city when finished. It is operated by the sanitation department of Huainan city during the operating period. During the operating period, the roads should be cleaned every day. When the weather is dry, water sprinklering should be implemented to ensure that the road is clean. As long as the roads are kept clean, dust generated in vehicle traffic will be significantly reduced and the influence on the road along the route will significantly reduce.

(2) Vehicle exhaust

During the project operating period, all vehicles are social vehicles. Exhaust controlis mainly in the charge of vehicle management department. It should be controlled based on all kinds of car emissions standards of the state and overweighted vehicles should be resolutely forbidden on the road. Make sure that all kinds of vehicle emissions reach the national standards.

8.6.3 Sound environment

8.6.3.1 Impact on sound environmental

There is no environmental sensitive site within a scope of 300 m on both sides of Jiukong road and Wanxiang road during the operational phase of the design, and the traffic noise has no impact on the environment. So, traffic noise prediction analysis is not needed. The traffic noise impact prediction analysis is mainly for residential area of Zhongxing road and Yanshan road during the operating phase.

In order to reflect the traffic noise impact of Zhongxing road and Yanshan road on the residential area, this evaluation adopts the forecast analysi with the method of analogy. And the analogy measured results are shown in Table 8.6-8. The north second ring is analogized to Zhongxing road; Lixin road is analogized to Yanshan road. According to the analogy monitoring results, the residential area at the crossing of Future Zhongxing road and Yanshan road can meet the standards for acoustic environmental quality of category 4 all the da. Although it can meet the standard requirementst, it has certain effect on the sound environment of the residential area.

Noise Analogy Monitoring Results Table 8.6-8

Analogy road name	Traffic flow	Day time（dB（A）		
		7.5m	30m	45m

	（car/h）	Range	Average	Range	Average	Range	Average
North second ring in Hefei	5088	62～80	72			53～68	62
Lixin Road in Hefei	1230	62～72	65	55～66	58		
Analogy road name	Traffic flow （car/h）	Night time（dB（A）					
		7.5m		30m		45m	
		Range	Average	Range	Average	Range	Average
North second ring in Hefei	1840	52-75	65			43-63	53
Lixin Road in Hefei	192	43-65	50	42-60	47		

8.6.3.2 Mitigation measures of acoustic environment

There is no environmental sensitive site within 300 m on both sides of Jiukong Road and Wanxiang Road. The king housing project of the residential area at the crossing of Zhongxing road and Yanshan road mainly take use of the building structure and sound insulation measures. According to the site investigation, at present the king housing project adopts brick structure. Windows and doors adopt double deck glass of sound insulation. The sound insulation quantity is expected to be between 15 ~ 20 dB (A). Through the soundproofing windows and doors, the noise of the residential area can meet the category 2 standards in the Quality Standards for Acoustic Environment.

8.6.4 Solid waste

There is no solid waste during the operating period of this subcompenent.

Chapter IX Subcompenent Five Impact on Environment and Mitigation Measures

9.1 Project overview

9.1.1 Roadside service point

According to the feasibility study, the largest traffic in the project area is controlled in around 4000 until 2020. The visitor capacity is controlled in 300000, and the per capita capacity is about 842. According to the specification requirements, it needs to build two roadside service points covering an area of about 4000 m2.

This project includes central roadside service point and eastern roadside service point, which is known as no. 2 and no. 3 post of the environment restoration engineering. The central roadside service point covers an area of 3621.9 m2, which is located in the northwest of planning South mountain road and Yanshan road. The eastern roadside service point covers an area of 4732.0 m2, which is located at the crossing of 206 state road and Yanshan road.

1.Construction content and scale

The construction scale of the roadside service point is shown in Table 9.1 1.

The roadside service point scale list Table 9.1-1

Item		Central roadside service point	Eastern roadside service point	Unit
Total area of used land		3621.90	4732.00	m2
Total gross floor area		1200.00	419.40	m2
Including	Casual dining	139.60	755.00	m2
	Service center	165.5	193	m2
	Public toilet	20.00	18.00	m2
	Post	94.3	234.00	m2
Structural style		Frame structure	Frame structure	—
Road surface		455.00	0.00	m2
Parking area		650.00	689.90	m2
Square area		365.30	1137.50	m2
Greenland area		911.6	2412.2	m2

Land layout

Central main roadside service point has two big function areas of rest and dining and comprehensive service;The eastern roadside service point is mainly for entrancecomprehensive service function. Land layouts are respectively shown in Figure 9.1-1 and Figure 9.1-2.

Figure 9.1-1 Land layout of central roadside service point

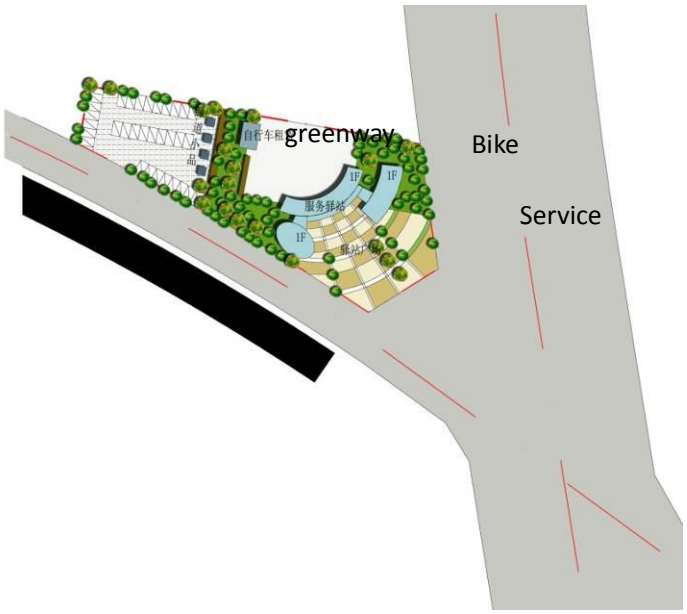


Figure 9.1-2 Land layout of eastern roadside service point

2. Road traffic and parking

The separation of pedenstrain and vehicular, and the priority for pedenstrainwill make the roadside service point base more humane

Garage system is designed as a whole in the planning and design system. The central roadside service base set a main axis and a secondary road to contact various districts efficiently and fast. The eastern roadside service base gives an priority to paving roadways, which is decorated with a certain greenway to increase the landscape appreciation. The main dealership road in the base is 7 m wide.

Landscape trails arranged along the axis connected all groups and functional areas, which guarantees the integrity of pedestrian system and appreciation.

3. Comprehensive outdoor pipe network

(1) Domestic water supply system

Domestic water is supplied directly by the acresnicipal pipe network, and the pressure pipe is switched by southwest main entrance. Outdoor living water supply shares pipes with and the fire-fightingwater, and the pipe diameter is DN100mm.

(2) Fire-fighting water supply system

The water amount of outdoor fire protection design is 15 L/s. Fire water supply is from the urban water supply network, which adopts the same system for life and fire water supply. There are two introducting water pipes, the diameter is DN100mm. Outdoor pipe network lays along a circular shape, and the main pipe diameter is DN100mm. 6 fire hydrants of SS150/80-1.6 type are set onthe outside ring pipes for outdoor fire water.

(3) Outdoor drainage system

With the construction of septic tanks, sewage pollution is carried away regularly.

9.1.2 Flowers and trees market

Flowers and trees market is located on the east side of Zhongxing road. The south side of the base is the originalDatong dumpsite. The western is miniascape garden. The southwest are bases and orchards for flowers and trees. The east area is anecological resort. The terrain is flat in the base and the ecological environment is good. Close to Jiukong road and Linchang road, there is a green road throughout the subsidence area,

which is adjacent to the base on the west side. The traffic location advantage is obvious. With the resources supply of flowers and trees market in southwest nursery base, it will form a self-marketing production chain of the nursery stock flowers.

1. Construction scale and contents

The flowers and trees market covers an area of 83539.85 m2, with a total construction area of 35267.79 m2, and the volume rate is 0.42. It is mainly composed with steel shed and greenhouse withone- layeand frame structure building with two or three layers..

The administrative offices and stores electronic trading center in the base adopt frame structure, and the construction scale is 563.06 m2. The high-quality goods exhibition center is a layer of intelligent greenhouse flowers, which adopts steel structure with a construction area of 3412.15 m2. Flowers and trees market gives priority to a layer of steel structure in greenhouses and sunlight greenhouse, of which the sunlight greenhouse has 2 buildings with a construction area of 5785.62 m2; 5 steel sheds covers an area of 13822.13 m2. The fish and bird stone trading market is frame structure building of two or three layers with a total construction area of 11121.77 m2. The antique market construction area is 3275.4 m2, the fish and bird market construction area is 3154.77 m2,the stone market construction area is 4005.57 m2. The parking space can provide 200 car spaces and 30 truck parking spaces.

Main economic and technical index of flowers and trees market is shown in Table 9.1-3.

2. General layout

Fish and bird stone market area, exhibition area, flowers and trees market management area are laid along the main palnned road and landscape axis from north to south, from west to east. A decorated landscape green area is set up is in the south of the park near the dangerous subsidence areas. It is the landscape endpoint to the main landscape axis of north and south. It is also the transition of the base and the surrounding area. Flowers and trees market of general layout is shown in Table 9.1-2.

Flowers and trees market main economic and technical index list Table 9.1-2

Item		Amount	Unit
Total area of used land		83539.85	m2
Total gross floor area		35267.79	m2
Administrative housing construction area		563.06	m2
Electronic trading center building area		563.06	m2
High-quality goods of flowers and trees exhibition center building area		3412.15	m2
The fish and bird stone antique market building area		11121.77	m2
Flowers and trees market	Solar greenhouse	5785.62	m2
	Steel structure canopy	13822.13	m2
Road surface		15030.62	m2
Parking area		9143.07	m2
Square area		2213.99	m2

Greenland area	30441.64.	m2
Plot ratio	0.42	
Switch board room	2 places（each 150 ㎡）	each/m 2
Fence	256.8	m2

Figure 9.1-3 Flowers and trees market general layout

3. Road system

The roads in this area are divided into two levelss. They are the main road with red line width of 7 mand the secondary road with red line width of 5 m. The main road is responsible for the connection between the market and the city. The secondary path is responsible for the connection between various main roads, displayand sales units.

4. Comprehensive outdoor pipe network

(1) Domestic water supply system

Domestic water is provided by acresnicipal water supply, and pipe network dual water supply is from base of forest road, north of acresnicipal water. The director inlet pipe diameter is DN200, and branch pipe diameter is DN100. The water supplypipelineis arranged in cricoids + dendrite to satisfy the life and management water of personnel in the market.

(2) Fire water supply system

The fire water is supplied by acresnicipal water in this project, and it shares the same supply system with living water. Outdoor fire water is by 10 l/s.

Set the ground type outdoor fire hydrant. The distance between fire hydrant spacing is not more than 120 m, and the protection radius is not more than 150 m. To set a valve well between fire hydrants to divide the fire annihilator pipe into several segments, and each fire hydrant number is not more than five. To set a certain number of MF/ABC4 type dry powder fire extinguishers per layer indoor.

(3) Outdoor drainage system

The rain sewage diversion system is adopted. Rainwater heads to the drainage. The sewage is discharged into the ditch of the southeast base. The main rainwater diameter is DN600, and the total length is 519 m; the branch pipe diameter is DN300, and the total length is 2310 m.

The sewage in the base flows into acresnicipal sewage pipe network in Zhongxing road. through the regional septic tank after being processed.

5. Business scope and model

The business scope of the flowers and trees market includes flowers nursery stock show sales, landscape plant sales, information collection of flowers, nursery stock production, supply and sales, flowers nursery stock products logistics,horticultural exposition or agricultural fair, etc.

By adopting the "market + merchants + logistics information" management mode, all stores are rented to merchants, and company is permanently responsible for the property management of the market and the exhit areas

9.1.3 Nursery base

The planning nursery base covers an area of 54.6 hm2, which is divided into east, middle and west three districts by Zhongxing road and acresnicipal branch on the east side. The area in the Middle East area is about 16.68 hm2, area in the middle is 15.47 hm2. West district covers an area of 22.45 hm2. Nursery base in the project area position is as shown in Figure 9.1-5.

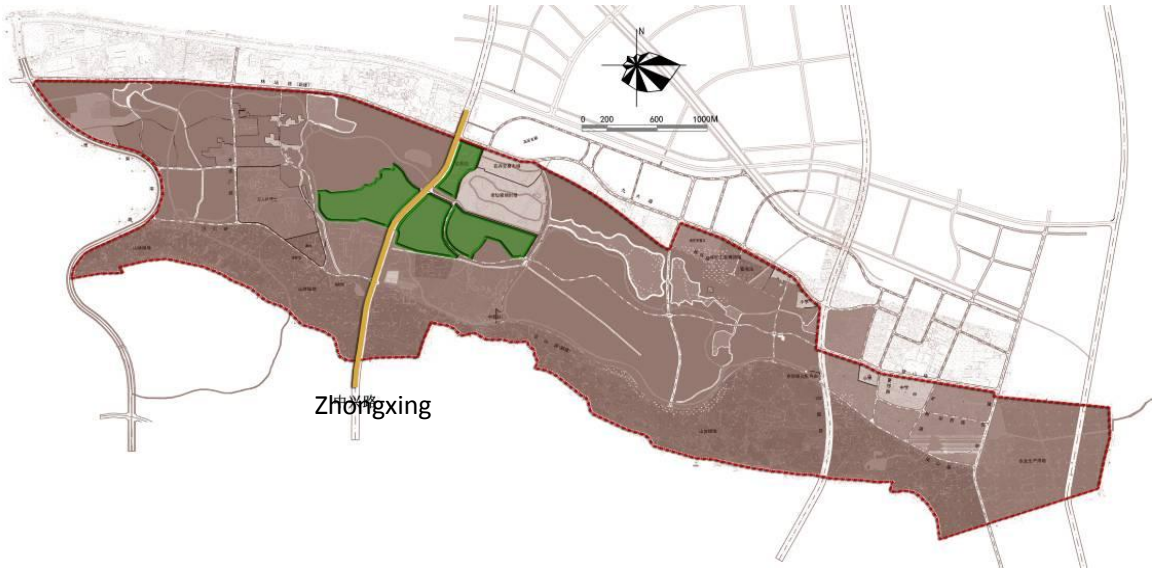


Figure 9.1-5 Miniascape garden and nursery base project locations

1. Function division

The seedling base is divided into production and non-production parts. Production area includes greenhouse nursery garden, outdoor breeding area, domesticated area, cultivate area, seedling transplantation, bleachery, integrated warehouse, etc. Non-production area includes park service administrative zone (including management center and the earth centre) and park road. The overall east and central area of the nursery base is used as cultivate area, and the rest functions are focused on the west of the base. The nursery base economic and technical indicators are shown in Table 9.1-4. The nursery base layout is shown in Figure 9.1-6.

The Economic and Technical Indicators of the Nursery Base Table 9.1-3

NO.	Item		Area	Unit	Proportion	Remark
1	Total area of used land		54.6	hm 2	100%	
2	Non-production area	Management district	0.48	hm 2	7.24%	Including management room, earth centre buildings and parking space
		Road	3.47	hm 2		Concrete road, secondary road system
3	Production area	Greenhouse nursery garden	3	hm 2	92.76%	
		Outdoor breeding areas	3.22	hm 2		Tending seedlings
		Domesticated area	1.13	hm 2		
		Seedling transplant area	12.98	hm 2		Plant seedling with space of by 0.5～1.0m×0.5～1.5m
		Cultivate area	29.9	hm 2		Plant seedling with space of by 1.5～3.0m×1.5～3.0m
		Bleachery and warehouse	0.37	hm 2		Including bleachery and comprehensive warehouse

图9. 1-6 苗圃基地和盆景园规划平面图

Figure 9.1-6 Nursery base and miniascape garden planning

1. Industrial layout

The greenhouse seedling nursery base has 2 fully automatic intelligent greenhouses with an area of 5000 ㎡ , and 2 ordinary sunlight greenhouses with an area of 10000 ㎡. They are mainly served as a precious tree species breeding base. Specific varieties are decided by main operating body based on the market situation. The plant varieties in the nursery base are decided by main operating body based on market demand and nursery production cycle situation.

2. Traffic planning

The road traffic planning, following the principle of "economic economical, convenient and practical", consists of road network and parking lot. The road is the secondary road system with main road and branches. The main roads are the concrete pavement, and traffic transport road. The branches are f the gravel road and small vehicles road. For each area of the nursery base, an inward and outward is set. The inward and outward in western and eastern area are set up in Zhongxing road. The inward and outward in east district is on acresnicipal branch.

The first class road is the main roads with planning red line width of 5.0 m, and with concrete road surface. Usually it is a one-way traffic, and will be partial widened to be used as car sites; the secondary roads is used as base homework roads, located in various functional areas with planning red line width of 2.0 m, and with concrete surface; the parking lot is planned in the center of the park management, arranging 20 layout parking.

3. Construction content

The concrete construction contents of the nursery base are shown in Table 9.1-5.

The nursery base construction content list Table 9.1-4

NO.	Functional zone	Construction content
1	Park service administrative	Management room covers an area of 770 ㎡, a layer of frame structure, main functions including daily affairs management, office, reception, meeting, sales, etc.
		itcovers an area of 468 ㎡, among which the construction area is 936 ㎡ withtwo-layer frame structure. It mainly cultivates high quality seedlings of flowers and trees and tissues new varieties of seeedlingsthrough tissue culture and cloning technology application.
		Warehouse covers an area of 495 ㎡, a layer of frame structure, a concentrated set of seeds and fertilizer storage room, equipment and maintenance room, the power supply control room and other functional space. Also set up about 3400 ㎡ of concrete, the green coffees which are used for drying and pile up of nursery stock, goods with a short time.
2	Greenhouse nursery garden	The flat area, which is located in the central west end, set up an automatic temperature controlling greenhouse about 15 acres, 2 common greenhouses about 30 acres, a total of 45 acres.
3	Outdoor breeding area	It is located in the outside of greenhouse nursery garden, inner side of west main street, including seeding breeding area and cutting breeding ground.
4	Domesticated area	It is used to introduce foreign new species and varieties, to gradually adapt to the local climate, soil conditions, in order to get a good survival rate of planting, and cultivated.

5	Seedling transplant area	It is the production area used to develop various kinds of transplant seedlings.
6	Cultivate area	It is the production area used to large size seedlings.

4. Irrigation pipe network planning

According to the calculation, the nursery base irrigation water consumption is 249141 m^3 all the year round. The yearly water storage capacity near theNursery baseis about 1.146 million m^3, which is enough to support the nurseryirrigation water use of the nursery base .The nursery uses sprinklering irrigation, and the head irrigation pipe adopts DN150 with total length of about 5200 m; the branch adopts DN32 with total length of about 9000 m. The nursery base irrigation pipe network planning is shown in Figure 9.1-7.

5. Water supply pipe network planning

Life water and greenhouse irrigation water adopts separate water supply pipe network by municipal water supply. Water consumption is small. The diameter of main pipe is DN100 hwith total length of 993 m, while branch pipe diameter is DN65 with total length of 802 m. The drinking water and fire water share one line, heading into a circular.

6. Drainage pipe network planning

Rain sewage diversion system is adopted and the rain water is directly scattered into the gardens, irrigation ponds and transit water system; the sewage is discharged into municipal sewage pipe network. Due to the small amount of sewage, the planning main sewage pipe adopts DN300, with total length of 268 m; Branch pipe adopts DN200 with total length of 92 m.

7. Engineering quantities of the Nursery base

Specific work quantities of nursery base are shown in Table 9.1-6.

8. Personnel allocation

The nursery operating unit will decide its staff numbers of earth centre technical and management personnel, financial personnel, nursery stock sales, procurement staff number according to their own specific circumstances.

Daily production maintenance staff member is about 27 people.Their daily work content are nursery stock management and production, including weeding, watering, spray insecticide, pruning, seedling planting, seeding mining, binding and loading, etc.

9.1.4 Miniascape garden

Miniascape garden is located in the west side of flowers and trees market, covering an area of about 7.4 hm2. Miniascape garden proposes to construct a bonsai exhibition base for the integration of construction bonsai cultivation, sales, display and popular science. Miniascape garden location in the project area is shown in Figure 9.1-5. Miniascape garden planning layout is shown in Figure 9.1-5.

Functional partition layout

The miniascape garden is divided int othe outdoor production area and the greenhouse production area. The outdoor production area is the production area for enterprises, mainly for outdoor plant breeding. The investors has constructed a greenhouse concentration in greenhouse production zone, and enterprises can lease greenhouse facilities to foster more precious, environmental temperature requirements of the higher miniascape varieties according to its circumstance.

Miniascape garden is divided according to the management idea of "invest to attract the

existing retail investors into the garden".According to the different size, it is leased to enterprises of different production capacity. The park road is 5 m wide, and thebonsai enterprises are arranged along the road. The economic and technical indicators of the miniascape garden are shown in Table 9.1-6.

Table 9.1-5 Quantities of Nursery Base

NO.	Item name	Construction content	Quantities	Unit
1	Road hardening	Main road is 5.0m wide, 4629m long, concrete pavement	23145	㎡
		Secondary road is 2.0m wide, 5796m long, macadam pavement	11592	㎡
2	Building	Management room：concrete frame structure, one layer	702	㎡
		The earth centre: concrete frame structure, 2 layers	936	
		Warehouse: concrete frame structure, 1 layer	495	
3	Solar greenhouse	10000 ㎡×2,	20000	㎡
4	Joint intelligent greenhouse	5000 ㎡×2, contains a complete set of equipment inside	10000	㎡
5	Irrigation network	1. Main pipe DN150	4967	m
		2. Branch DN32	8690	m
6	Parking space	Planting grass brick	192.5	㎡
7	Bleachery	10cm thick plain concrete floor	3380	㎡
8	Fence	Wire gelizha style	5909	m
9	Life water supply network	1. Main pipe DN100	993	m
		2. Branch DN65	802	m
10	Sewage network	1. Main pipe DN300	268	m
		2. Branch DN200	92	m
11	Power line	Buried pipelines	5663	m
12	Telecommunications line	Buried pipelines	223	m
13	Production land for land consolidation		472300	㎡
14	Small pumping station		2	base

The Economic and Technical Index OF Miniascape garden Table 9.1-6

NO.	Item	Area	Unit	Remark
1	Total area of used land	8.1	hm2	
2	Bonsai business land	4.46	hm2	Planning dealerstotal is30

	Including	Big business user	1.34	hm2	A total of 3 users
		Middle business user	1.09	hm2	A total of 5 users
		Small business user	2.03	hm2	A total of 22 users
3	Road		0.32	hm2	
4	Ecological protection afforestation		1.22	hm2	
5	Landscape leisure square		0.60	hm2	
6	Building		0.37	hm2	
7	\Drainage system		1.13	hm2	Planning drainage flows through the park

Industrial layout

The bonsai is generally classified into stump potted plants and landscape bonsai. The stump bonsai chooses the trees which have small leaves, or is easy to survival, orgrow slowly, or live a longlive, or have exotic trunk,, better with gorgeous flowers and fruits. Landscape bonsai should select topic in advance, and be elaborately designed. According to the theme, stone and processing should be selected. It can also be made for each stone condition along with the class applies. The industry content regards the stump potted landscape as the main content. The operator can specialize in landscape bonsai according to their own conditions and hobby interest selectively.

Construction content

Concrete construction contents of miniascape garden are shown in Table 9.1-7.

Miniascape Garden Construction Content list Table 9.1-7

NO.	Functional zone	Construction content
1	Bonsai cultivation area	Focusing bonsai cultivation and sales, including the stump bonsai and landscape bonsai.
2	Greenhouse cultivation area	1 Sunlight greenhouse, a building area of 2000 m2, enterprises can rent space inside the greenhouse, more expensive, environment and temperature requirements of the higher concentration of bonsai will be cultivated here.
3	Protection afforestation	Greening in the periphery of the bonsai production environment, production area and peripheral and internal roads relative isolation.
4	Underground pipeline	The water supply system in bonsai park will be directly accessed from the municipal water supply pipe network, sharing water supply system with life and fire water. The drainage system adopts rain sewage diversion system, and sewage will be directly connected to the municipal sewage pipe network by the underground pipe network, rainwater nearby emissions into green space.

4. Traffic planning

The planning width of the road red line in the bonsai paris is 7m, the pavement surface is

concrete.

5. Irrigation planning

According to the calculation, the average irrigation water of miniascape garden is 170.55m³/d. Theirrigation water is from municipal water supply, adopting the hoses to water.

6. Water supply and drainage planning

The water supply system of the bonsai park is directly accessed from the municipal water supply pipe network, sharing water supply system with life, fire water supply.

The drainage system adopts rain sewage diversion system, and sewage will be directly connected to the municipal sewage pipe network by the underground pipe network, the rainwater is discharged into the nearby green space.

7. Engineering Quantities of Miniascape Garden

Miniascape garden specific quantities are shown in Table 9.1-8.

Engineering Quantitied of Miniascape Garden Table 9.1-8

NO.	Item name	Construction content	Quantities	Unit
1	Road hardening	7m wide, 829m long, concrete pavement	5803	㎡
2	Solar greenhouse	Cover an area of 2000 ㎡，	2000	㎡
3	Enterprise management room	Brick structure, one layer	1200	㎡
4	Production land for land consolidation	Bonsai production space	52435	㎡
5	Protection afforestation		11312	㎡
6	Parking space	Unit Size 2.5m*5.5m, Planting grass brick	1513	㎡
7	Water supply network	DN100	569	m
		DN65	1310	m
8	Sewage pipe network	1.Main pipe DN300	569	m
		2.Brance DN200	1310	m
9	Power line	Buried pipelines	1360	m
10	Telecommunications line	Buried pipelines	1360	m
11	Fence	Wire gelizha style	4504	m

8. Personnel allocation

The staffs are allocated according to the production scale of different enterprises: 1 for small family enterprises, 2 for family enterprises, 3 for large family enterprises, the total number is about 54.

The work content of bonsai workers includes daily production,processing and maintenance work, such as the lashing, modelling and trimmingof bonsais, etc.

9.2 Evaluation level and scope

9.2.1 Evaluation level

1. Water environment

The main water pollution sources in subcompenent Five are mainly the living sewage of the nursery managers and merchants in the flowers and trees market, the miniascape garden and the nursery base.The sewage emissions is 178.68m3 one day. After being treated in ssedimentation tanks, the restaurant oily wastewater is discharged into the municipal sewage pipe networ on Zhongxing road after being treated in septic tankstogether with other domestic sewage, and then enter in Huainan first sewage treatment plant.

Therefore, according to the relevant provision in the Technical Guideline for Environmental Impact Assessment - Water Environment (HJ/T2.3-93), the water environment is evaluated as the thirdlevel, indicating the type of water pollutants, water quantity, water quality and discharge whereabouts, which briefly analyzes the impact of the wastewater discharge on the environment..

2. Atmospheric environment

The atmospheric pollution sources are mainly thecooking oil fume in the canteen of the flowers and trees trading market, miniascape garden and nursery. According to the calssificaton of evaluation level and the environmental characteristics of the project areain theTechnical Guideline for Environmental Impact Assessment- Atmospheric Environment (HJ2.2-2008), the atmospheric environment si assessed as the third level

3. Environmental noise

The noise in operation phase mainly comes from the water pump, reclamation and cultivation equipment of the spraying system, and the intensity of the sound source is 70 ~ 85 dB（A）. The acoustic environment functional areas in construction project is the category 2according to the Quality Standard ofAcoustic Environment (GB3096-2008), and according to the Technical Guideline for eEnvironmental Impact Assessment -Sound Environment HJ2.4-2009,the soundenvironmental impact is assessed as the second level.

4. Ecological environment

Ecological impact assessment work hierarchies are shown in Table 9.2-1.

Ecological Impact Assessment Classification t Table 9.2-1

Affect the regional ecological sensitivity	The project covers an area of (water) range		
	Area≥20km2 Or lenghth≥100km	Area2km2-20km2 Or lenghth50km-100km	Area≤2km2 Or lenghth≤50km
Special biome	Level I	Level I	Level I
Important biome	Level I	Level II	Level III
General region	Level II	Level III	Level III

In subcomponent Five, the regional exploitation araeis 0.7035 km2, and the total area is ≤2km2.The ecological sensitivity belongs to general area. According to the Technical Guideline for Environmental Impact Assessment- Environmental impact (HJ19-2011), the ecological environment evaluation is determined as level 3.

9.2.2 Evaluation scope

The evaluation leveland the evaluation scope of various environmental factors are shown in Table 9.2-2;

The level andScope of environmental impact assessment Table 9.2-2

Environmental elements	Evaluation rating	Evaluation scope
Surface water environment	Level III	Upstream outlet of 500 m to 3000 m downstream, 3500 m of the evaluation scope
Ambient air	Level III	Centered on the project area, with rectangular scope of the dominant wind direction 5×5km2, main shaft along the dominant wind direction
Loud environment	Level II	The range of 200 m out of project area factory;
Ecological environment	Level III	In the project boundary to enlarge the range of 200 m;
Social environment	---	Nine areas in Huainan City, Jiu longgang county, Datong subdistrict office; Huaishun community, Chonghua community, Xinjian community, Hongqi community, Chenxiang village, Jiulong village in Jiu longgang county. Zhanhou community and Kuangnan community in Datong subdistrict office.

9.3 Environmental protection goal

There is no nature reserve, water source reserves, scenic areas and other special sensitive area and important sensitive area within the evaluation scope. Cultural relics in project area include the mass graves which is the evidence of Japanese invaders' crimnes in Huainan, belonging to the national key cultural relic protection unit, the secret reservoir, and the bunker dungeon, and the remnants of a bunker. This project belongs to the ecological restoration project.There are large geen belts around the mentioned cultural relics.. During the project construction, the construction sites are far away from the units of cultural relics, so the construction process does not impact the cultural relics. The Shungeng Mountain in the south of the construction site belongs to the leisure tourist area of Huainan city, rather than the nature reserves or scenic spots, and the project construction will not affect it. According to site investigation, the environmental protection target of subcomponent Four is shown in Table 9.3-1.

Environmental protection objectivities Table 9.3-1

NO.	Environmental elements	Environmental protection objectivities	Relative orientation	Relative distance(m)	Scale(person)	Environmental function objectivities
1	Surface water environment	multiple subsidence pool and chase having groove, Chenxiang lane ditch, Jiu longgang having gully, Sun dian four having channels	---	---	Small ditch	The surface water environment quality standard (GB3838-2002) level V；
2	Loud environment,	King housing project(inside the region)	W	220	504	The standards for acoustic environmental quality

	atmospheric environment	Chenxiang county(outside the region)	N	367	3250	（GB3096-2008）level II； The ambient air quality standard (GB3095-1996) And modified list level II；
		Christian church of Nanshan(inside the region)	N	51	400	
		Chongwen county(inside the region)	E	148	60	
		Jiu longgang primary school(inside the region)	E	321	600	
		Jiefang county(inside the region)	E	313	200	

Note： "Among the sensitive targets in the acoustic environment, atmospheric environment protection targets, the targets which are within the scope of 200 m are the protection objectivies of acoustic environment protection , and all are the protection objectivities of the atmosphere environmental protection".

9.4 Engineering Analysis

9.4.1 Construction Period

In the construction period, the construction of roadside service point, nursery, bonsai garden and plant trade market will have different degrees of polluting on the regional environment in certain period and certain range. Such effect is short-term and will disappear when the construction is finished.

In the construction period, construction camps will be set. The construction personnel eat outside, only putting up in the camps.

9.4.1.1 Water Pollution Source

The waste water in construction period mainly contains construction wastewater and domestic wastewater of the construction personnel.

1. Construction Wastewater

The construction wastewater produced during construction period is washing water with oil pollution produced by various mechanical equipments. Main contaminants are SS, COD and petroleum type.

In this subcomponent construction,only the transport vehicles are washed with fixed quantity of 100L/vehicle, 6 vehicles/d (annual construction days 300). The production of washing wastewater contaminant is showed in Table 9.4-1.

Washing Wastewater Contaminant list Table 9.4-1

Category	Item Name	COD	SS	Petroleum
Washing wastewater （180m3/a）	Production density(mg/L)	100	300	10
	Output（t/a）	0.018	0.054	0.0018

2. Domestic Wastewater

The domestic wastewater during construction period contains washing wastewater and fecal sewage. The domestic water consumption is little because construction personnel do not eat in the region.

The total number of people in the construction period is 30. The fixed water consumption is 150/L (cap·d); the pollution discharging coefficient is 0.8; and the discharging

consumption of domestic sewage is 3.6m3/d，1080m3/a. The producing and discharging density and consumption of main contaminant are showed in Table 9.4-2.

Domestic Wastewater Contaminant list Table 9.4-2

Category	Item Name	COD	BOD5	NH3-N	SS
Domestic wastewater （1080m3/a）	Production density (mg/L)	200	120	30	100
	Output（t/a）	0.216	0.1296	0.0324	0.108

9.4.1.2 Air Pollution Source

The air pollution source in construction period mainly contains the construction dust, and the exhaust of mechanical vehicles.

The construction dust mainly comes from wind erosion dust of earthwork and bulk material yards and road dust of transport vehicles etc. The dust may pollute the air if not being controlled, so the production and discharge of dust should be controlled effectively.

1. Wind Erosion Dust

During the construction, both earthwork and bulk material piling will cause dust, especially in dry and windy climate.

When the grain diameter is 250um, the sedimentation rate is 1.005m/s. The main effected range is close to the downwind direction of dust point, but it's the tiny dust particles that truly influence the external environment. Besides, according to different on-site climate situation, the influenced range will be different.

2. Road Dust of Vehicle Transportation

In the construction process, vehicles are mainly for transporting earthwork, pebble and yellow sand etc.

According to the analogy survey, the dust caused by construction and transport vehicles has greater effect on an scope within 30m of the roadsides and it is an linear pollution. The TSP on theroadsides can reach more than 10 mg/m3, with the general density between 1.5 mg/m3 to 30mg/m3. The dust caused by smoothing the field mainly influences an scope within 50m.

3. Exhaust of Construction Mechanical Vehicles

During the construction, the exhaust from various engineering machinery and transport vehicles when burning petroleum or diesel contains THC, PM, CO and NOx etc, and they will have certain effect on construction site after the discharge. According to relevant statistics, contaminant emissions of general large engineering vehicle are CO 5.25g/ (vehicle· km), HC 2.08g/ (vehicle· km), NO2 10.44g/ (vehicle·km). In the construction, there are relatively less mechanical vehicles operated at the same time, so the exhaust is less. It belongs to the fugitive emission.

9.4.1.3 Noise Pollution Source

Noise in construction period mainly comes from mechanical equipments and transport vehicles etc. The main noise source includes bulldozer, excavator, pile driver, loader, concrete mixer truck and air compressor etc. The main noise sources in different stages in this subcomponent are showed in Table 9.4-3. Refer to Table A2 in Appendix A Common construction equipments noise source (SPL) of Guidelines for Environmental Noise and Vibration Control Engineering (HJ2034-2013). Noise level of noise-producing equipment is showed 9.4-4.

Main Noise Source Table 9.4-3

Item Name	Construction Stage	Noise Source
Regional development and utilization	earthwork	excavator, bulldozer, loader, lorry
	basic construction	concrete mixer truck, concrete pump, road roller, paver
	structural construction	All kinds of transport vehicles, woodworking saw, electric drill, cutting machine, etc

Main Equipment Noise Source Table Table 9.4-4

Noise-producing Equipment	Level/Distance [dB(A)/m]	Noise-producing Equipment	Level/Distance [dB(A)/m]
Bulldozer	83～88/5	Paver	80～90/5
Hydraulic excavator	82～90/5	Wheel loader	90～95/5
All kinds of pavers	80～90/5	Self-discharging truck	82～90/5
Pile driver	100～110/5	Vibratory rammer	92～100/5
Air pick	88～92/5	Concrete mixer truck	85～90/5
Air compressor	88～92/5	Concrete pump	88～95/5
Woodworking saw	93～99/5	Angle grinder	90～96/5

9.4.1.4 Solid Waste

The solid waste during the construction mainly contains construction waste and domestic garbage of construction personnel.

1. Construction Waste

The construction waste mainly contains brick, stone and yellow sand etc produced in construction, as well as various construction materials' packing boxes, bags etc. The quantity can't be estimated.

2. Domestic Waste

This subcomponent sets construction camps in construction site (no dining room). There are 30 construction staff and the domestic garbage output is 0.5kg cap/d, and the output is 15kg/d, 4.95t/a. The construction will last for 2 years and 3 months and the total output during the construction period is 11.2t.

9.4.2 Operation Period

9.4.2.1 Water Pollution Source

In the operation period, the water pollution source is mainly the domestic sewage from the roadside service point, plant trade market, bonsai garden and nursery.

According to feasibility study, the average visitor flow-rate at roadside service point is 822 person-time/d and the annual visitor capacity is controlled within300,000 . In

consideration of there is a dining center in the service point, the water consumption norm is 10L/ (cap·d), and the pollution discharging coefficient is 0.8, so thedomestic sewage output is 6.58m3/d，2400m3/a.

According to feasibility study, the management staff number in plant trade market is 20 and the commercial space is 34704.73m2; in bonsai garden, there are 54 management staff and merchants; in nursery, the management staff number is 27. The water consumption norm for management staff and merchants is 150L/ (cap·d), the water consumption norm in commercial space is 6L/m2(cap·d), the pollution discharging coefficient is 0.8, and domestic sewage output is 178.68m3/d，53604m3/a (calculated as 300d).

After oil separation tank treatment, the oily wastewater in restaurant will be discharged into the municipal sewage pipe network after being treated in septic-tank with other domestic sewage and then enters into Huainan First Sewage Treatment Plant. The production and discharge of the main contaminants in subcomponent of regional development and utilization is showed in Table 9.4-5.

Production and Emission of Domestic Sewage Contaminants Table 9.4-5

Contaminant Name	Production density (mg/L)	Output （t/a)	Discharge density (mg/L)	Emission (t/a)	Reduction （t/a）
COD	200	11.2	50	2.80	8.40
BOD5	120	6.72	10	0.58	6.14
NH3-N	30	1.68	5	0.30	1.38
SS	100	5.60	10	0.58	5.02
Animal & vegetable oil	10	0.56	5	0.28	0.28

9.4.2.2 Air Pollution Source

The main air pollution sourcesin the operation period are mainly cooking lampblack from the roadside service point, plant trade market, bonsai garden and nursery.

The designed person flow-rate of roadside service point is 842 person-time/d and repast rate is calculated as 0.2. The kitchen in roadside service point restaurant is equipped with 2 double cooking range stoves using oil and gas as fuel. The oil consumption per person per year is 6.6kg/a, the volatilization coefficient of the lampblack is 5%, the item lampblack output is 55.77kg/a (number of dining people is 169). when the air output of each cooking range (there are 4 in all) is calculated as 2000m3/h, since the annual operating time is 330 days, and 4 hours one day , so the production density of lampblack is 5.28mg/m3.

The roadside service point, plant trade market, bonsai garden and nursery are all equipped with 2 single cooking range stove using oil and gas as fuel, with lampblack output respectively of 6.6kg/a (plant trade market: 20 people), 17.82kg/a (bonsai garden: 54 people), 8.91kg/a (nursery: 27 people). The air output of each cooking range (2 in all) is calculated as 2000m3/h, since the annual operation time is 330 days, and 4 hours one day, so the lampblack output density are 0.5mg/m3, 3.4mg/m3 and 1.7mg/m3 respectively.

9.4.2.3 Noise Pollution Source

The noise in operation period mainly comes from equipment noise of water pump of aerosol can, reclamation and cultivation etc, as well as the social noise from visitors at roadside service point.

The equipment noise source intensity is 70～85dB(A). Visitors' enjoying the sight at

roadside service point will cause certain social noise with lower noise level, 70～80dB(A) in general.

9.4.2.4 Solid Waste

In the subcomponent operation period, this solid waste mainly contains household garbage produced by visitors at roadside service point and household garbage from management staff and merchants in plant trade market, bonsai garden and nursery, as well as solid waste from partial areas inside the nursery.

According to feasibility study, the average people flow-rate at roadside service point is 822 people-time/d and the annual visitor capacity is controlled within about 300,000 people. In consideration of there is a dining center in the service point, the household garbage output is calculated as 0.3kg/(cap·d), it will be 246.6kg/d，90t/a.

There is 1205 management staff and merchants in plant trade market, bonsai garden and nursery. The household garbage output is calculated as 0.5kg/(cap·d), it will be 602.5kg/d，180.75t/a.

In the nursery, the introduction and domestication area, big seedling cultivation area and seedling transplant area will produce industrial solid waste like deadwood, dead tree etc. The output is 80kg/(mu·d). The three areas are 660.15mu in all, so the total output of industrial solid waste is 52.8t/d.

9.5 Environmental Impact & Mitigation Measures in Construction Period

9.5.1 Water Environment

9.5.1.1 Analysis on Water Environment Impact

Wastewater in construction period mainly contains construction wastewater and staff's domestic sewage.

(1). Construction Wastewater

The construction wastewater produced in construction period mainly include: the cooling and washing water with oil contamination produced by all kinds of construction machinery equipments etc. The contaminations in wastewater are different because of different construction activities. The main contamination in mud is suspended solids, which basically contains no harmful substance. The main contaminations in wastewater produced by machinery equipments are COD, SS and petroleum type, which should not be discharged directly and needs the hazard-free treatment. This subcomponent only washes transport vehicles and the washing wastewater output is 180m3/a. The content of main contaminations COD, SS and petroleum type is 100mg/L, 300 mg/L and 10 mg/L respectively.

The output of wastewater from washing vehicles is 6m3/d.

(2). Domestic Sewage

The main contamination of domestic sewage in construction camps areBOD5 and COD etc. In construction period, the total number of staff at construction site is 30. If daily water consumptionis calculated as 0.15m3 per person, then daily water consumption at construction site is 4.5m3. The pollution discharging coefficient is set as 0.8 and then the daily discharge of domestic sewage is about 3.6m3/d. As for the content of various contaminants in domestic sewage of construction staff, according to the similar projects monitoring values, the COD's density is 200mg/L;the BOD5's density is about 120mg/L.

9.5.1.2 Prevention and Controlling Measures of Water Pollution

(1). Oily Wastewater Treatment

In construction process, the main contaminant in oily wastewater is petroleum. Set a catch drain inside the maintenance site for construction machinery or vehicle to collect maintenance and washing wastewater and set oil separator to treat oily wastewater. Instead of being discharged outwards, the vehicle-washing wastewater should be used in recycles after being treated by the circulation processing system (oil-separation + sedimentation) that equipped at the entrance of the site.

(2). Treatment of Construction Staff's Domestic Sewage

Pit toilet is set at construction site, and the fecal wastewater is adopted as fertilizer by residents in this area. Construction staff's washing wastewater is used for dust-controlling after sedimentation (share the same treatment facility with vehicle-washing wastewater) and should not be discharged outwards.

9.5.2 Air Environment

9.5.2.1 Impact on Air Environment in Construction Period

(1). Land Leveling

In plant trade market, nursery, bonsai garden and eastern roadside service point construction, the existing land needs to be leveled or settled (e.g. in site-leveling of the plant trade market, the digging and filling engineering construction are 21505m3 and 42100m3 respectively). In the process of leveling and settling, all the existing weed or agricultural vegetation in the site will be removed, which will cause bare ground. When it is dry or the wind is strong, it will cause wind erosion dust as well as road dust etc in the process of transportation. If necessary prevention measures are not adopted, it will have certain impact on air environment in this area. The current situation: construction sites of both plant trade market and bonsai garden are in the north of Forest Road. There is no residential area within 300m in the north of Forest Road, and there are no environmental sensitive sites within 1000m in the east, west and south. There are no environmental sensitive sites within 500m of the nursery management housing construction area, so dust in the project construction period has little impact on air environment of sensitive point. In central area, the distances between roadside service point construction sites and environmental sensitive sites are all above 300m, so it also has little impact on environmental sensitive point. Eastern roadside service point is separated with Chongwen village by National Highway 206 and it is 148m far away from Chongwen village, in downwind direction of Chongwen village. Therefore, according to the evaluation, the construction dust will have little impact on air environment of Chongwen village after taking measures. The distance between central roadside service point and Nanshan Christan Church is 51m. The distance is short, so watering dust-controlling measures should be taken in construction period to reduce the impact on Nanshan Christan Church.

(2). Pipeline Construction

Grooves need to be excavated in pipeline construction. The backfills need to be piled on both sides of the groove. When it is dry and the wind is strong, the piled backfill will cause wind erosion dust and have certain impact on air environment. Therefore, measures must be taken to reduce the dust.

(3). Building Construction

In the construction process of plant trade market, nursery, bonsai garden and central and eastern roadside service points, the plant trade market occupies a relatively larger construction area, while nursery, bonsai garden and central and eastern roadside service points occupy a relatively smaller construction area. In building construction, the main air environment impact are the dusts produced in foundation excavation, backfill, sand material piling and material transportation etc. They will have certain impact on surrounding air environment without prevention and controlling measures.

9.5.2.2 Mitigation Measures of Environmental Impact

(1). Land Leveling or Settling

Land leveling is mainly in plant trade market, nursery and central and eastern roadside service points. The evaluation requires that when leveling land of nursery, the staff should take use of the existing terrain to prevent excavation and backfill in a large area. While leveling, staff should do it in plots. After a plot of land is leveled, the nursery plant should be used to recover this plot. In principle, each plot's area should not be larger than 1~2 hectare, in case of that a large area of bare ground may cause ground dust and influence surrounding air environmental quality. As for the plant trade market, an overall consideration of the while site should be taken before leveling. The evaluation requires that the site should be grinded throughcompaction. Level a plot and then grind it to prevent the formation of large area of bare and loose surface that will cause dust pollution.

Spray water to control the dust. Temporary watering pipe should be set within the site of plant trade market. Use city tap water to control the dust. If water-supply engineering is carried out before land leveling of the nursery, then the water-supply pipe and network can be used to do watering. Otherwise, a sprinkler should be equipped for water spraying to control the duct when when the nursery is under construction. The watering should be done according to the practical situation, and in proper times for the principle of not creating dust.

(2). Pipeline Construction

For water-supply pipe in the nursery, the staff should construct in sections. Construct a section and then backfill it timely. They should not excavate all pipe ditches, and bury pipes and then backfill in one time. As in the nursery, the main work iswater-supply pipe construction, cand the onstruction amount of groove excavation is small. When constructing in sections and backfilling timely, it will not influence the air environment of this area. The water-supply, water-drainage and rainwater pipeline in plant trade market should also be constructed in sections. Construct one section and backfill it to reduce the mound amount beside pipe ditch so as to reduce the dust. For the piling mud on both sides of pipe ditches, the staff should take watering measures or covering measures with plastic cloth or dust screen according to practical situation. For the mound is exposed for a long time on both sides of pipe ditch during construction period, the staff must take covering measure to minimize its impact on regional air environment. The construction amount of water supply and drainage pipelines in the bonsai garden is small. As long as adopt appropriate watering measures and covering measures when necessary, it won't impact the regional air environment.

(3). Building Construction

In order to reduce the effects of construction dust, the evaluation requires that the staff should shorten the piling time of mud of foundation ditch excavation as much as possible. When it is dry, water the mound to control dust and make the mound surface maintain certain humidity. If grooving mound is exposed for a long time, the staff should take dustproof covering measures. For all bulk materials used in construction, plastic or dust screen should be used to cover or build simple bulk material storage shed to reduce dust. For cement concrete for construction use, the commodity concrete should be used. it is forbidden to make cement concrete for construction at the construction site.

(4). Road Construction and Hardened Site Construction

According to the evaluation, in road construction of plant trade market, nursery, bonsai garden and central and eastern roadside service point, staff should maintain certain humidity while blending roadbed material. Conduct rolling at any time in construction of roadbed and hardened site construction. There should not be large area of loose soil on the road or hardened site. Do watering at the same time if necessary to reduce the road dust. For all road surface and hardened site material used in plant trade market, nursery and bonsai garden, such as cement concrete or bituminous concrete, should be commodity cement concrete or bituminous concrete. it is forbidden to set cement concrete or bituminous

concrete making station for road construction or hardened site at the construction site.

(5). Dustproof Measures for Transport Vehicles

When leaving construction site of plant trade market, nursery, bonsai and central and eastern roadside service point, all vehicles should be cleaned. Set a vehicle-cleaning field with hardened surface on which vehicles are washed at each site. No vehicles could leave construction site without being cleaned. All muck trucks going into or going out must be covered. Staff needs to make sure the muck won't fall down from the truck in order to reduce the dust blew by wind and the road surface dust while driving. With r these measures, vehicle transportation will not pollute the alongside air environment.

9.5.3 Acoustic environment

9.5.3.1 Environmental acoustic effect in construction period

(1) The construction noise source

The construction noise source and its effect range is shown in table9.5-1。

Main Equipments and Their Noise Effect Range in Construction Table 9.5-1

equipments which produce noises	Noise level [dB(A)]	range (m)	GB12523—2011standard	
			daytime	nighttime
			70 dB(A)	55 dB(A)
			Equipments noise range（m）	
Excavating machinery	82～90	5	60～100	135～175
Bulldozer	83～88	5	65～90	140～165
Concrete vibrator	88～92	5	75～100	150～175
Dump truck	82～90	5	60～100	135～175
Roller	80～90	5	50～100	126～175
Loader	90～95	5	100～125	175～199
Electric saw	101	1	21	37
Electric drill	102	1	22	37
Electric welding machine	90	1	10	35
Cutting machine	88	2	36	66
Commercial concrete mixing truck	85～90	5	75～100	150～175
Concrete pump	88～95	5	90～125	150～199
paver	80～90	5	50～100	126～175

Remarks: Electric saw, electric drill, electric welding machine, cutting machine are arranged indoor, and the sound insulation is expected to be about 20 dB (A) through the building envelope.

(2) Construction site noise effect on environmental sensitive points

There is no settlement in 200m range of current flowers trading market, the construction site of bonsai garden and nursery base. Therefore, the construction noise does not affect or pollute the environmental points. There is no sensitive point in 200m range of middle road service center. East service center is near the Nanshan Christ church, the Christians do worship only on Sunday. The project's eastern service site is 51m from the church. The evaluation requires that when the construction encounters church activities in weekends, equipments with high-noise should be stopped,, and mobile sound barrier and the mobile sound barrier should bearranged near the church.

(3) Nursery construction noise

Nursery construction mainly includes the tiding of current land, the road construction, and the laying of water supply pipeline. According to the design, the nursery is planned at two sides of Zhongxing Road. Through situation research, there are no environmental sensitive points within 200m around nursery construction. So the nursery construction noise won't affect or pollute the environment.

9.5.3.2 Mitigation measures

Though the land tidy work of flowers trading market, nursery and Bonsai garden, the service centers along middle road and east road and the construction in the site have no noise effect on environmental sensitive points, it is necessary to reasonably arrange the working sites to avoid loud noise equipment working near the site in night, and strictly implement the Emission Standard of Construction Site Environmental Noise （GB12523-2011）, which is 70 dB(A) in daytime and 55 dB(A) in nighttime.

9.5.4 Solid waste

9.5.4.1 The analysis of construction solid waste's effect

The solid waste of Huainan coal mining subsidence area's comprehensive treatment and utilization of regional land development and World Bank loan project during construction mainly includes the living garbage and construction waste of personnel.

(1)Living garbage

The project is expected to have 30 staff at peak. Assumed everybody has waste emission of 0.5kg per day, the construction period is 27 months, the project produce 10.125t living garbage in total. If the living garbage is not properly disposed, it will damage environment health and beauty. If discharged into river, it will pollute the water. Timely measures and treatment should be taken.

(2)construction waste

If scattered and discarded in the comprehensive disposal process of construction waste, the construction waste will damage the surrounding environment.

(3)abandoned earthwork

The construction has excavation of 23800 m3 and filling of 53000 m3. It transfers earthwork of 29200 m3. The specific earthwork balance is shown in table 5.5-3.

9.5.4.2 The control measures of solid waste pollution in construction period

According to the Solid Waste Pollution Prevention and Control of the People's Republic of China, the construction units in the project construction process should timely remove solid wastes produced in the course of construction, and use and dispose them in accordance with the provisions of the environmental sanitation administrative department .

The construction units should strengthen the management of living garbage in the construction area, classify the garbage, regularly remove and landfill them by commissioning the local sanitary department, spray medicine on the trash to avoid the flies breeding and other pests toavoid the damage to project water resource and the health of personnel.

Construction units will use the waste as building material, which includes broken steel head, broken steel pipe, packing tape, obsolete equipment for recycling. Soil and stone waste are sent to nearby village to use as road construction material. In construction, construction waste should be gathered and collected in time to fill foundation. All kinds of material's packing boxes should be classified and sent to recycling station. The disposal plan of the building waste of demolition should be reported to the relevant departments and then be implemented. The waste should be removed out of the construction site as soon as possible.

After the project, it is needed to dismantle the temporary facilities, clear the machinery parking field, stone material field, and warehouse and office area in time. It is important to remove the construction waste, all kinds of debris, living garbage, simple toilets. The sewage pit must be clean and flat, disinfected with carbolic acid and lime. Have good preparation for the restore of construction site.

9.6 Environmental impacts and mitigation measures during operation period

9.6.1 Water environment

9.6.1.1 The analysis and countermeasures of water pollution source and pollution prevention

The water pollution source of during the regional land development period of this subcomponent are mainly the living wastewater from the staff and sellers of flowers trading market, bonsai garden, nursery and the roadside service sites. According to the research report, flowers trading market have 20 management people, a business area of 34704.73m2. Bonsai garden have 54 management people and sellers in total. The nursery have 27 staff, a water quota of 150l/cap one day for staff and sellers, a water quota of 6l/cap one day for business area. The fold of the pollution coefficient is 0.8, and the amount of sewage discharge is 178.68m3/d. after being treated in grease traps, the restaurant wastewater will go into the municipal sewage pipe network after being treated with other sewage in septic tanks.

The amount of pollutants produced and reduced in table 9.6—2。

The amount of pollutants produced and discharged in regional land development sewage

Table 9.6-2

Pollutant name	concentration (mg/L)	production （t/a)	Emission concentration (mg/L)	emissions (t/a)	abatement （t/a）
COD	200	11.20	50	2.80	8.40
BOD5	120	6.72	10	0.58	6.14
NH3-N	30	1.68	5	0.30	1.38
SS	100	5.60	10	0.58	5.02
Animal and plant oil	10	0.56	5	0.28	0.28

According to the research, the roadside service site has an average flow of 822cap/d, with annual visitor capacity controlled at 300000 one time. Considering the restaurants in the service sites, the water quota is 10L/(cap·d), the sewage coefficient ois0.8, then the living

sewage emission is 6.58m3/d. after being treated in oil separating tank ,restaurant waste water will be sent to the municipal sewage pipe network after the treatment with other living wasterwater in the septic tank. It finally enters the Huainan No.1 sewage treatment plant without bad impact on surrounding surface water environment.

9.6.1.2 The analysis of nursery and bonsai garden's irrigation amount

(1) The analysis of nursery irrigation amount

The irrigation of nursery is particular, which is the imbalance of irrigation. In seedling, in order to ensure the survival of seedlings the water need is huge and stable. After the seedling having survived, normally, the natural precipitation and soil moisture on the roots are enough for seedling growth. It only needs daily water supply. In the dry season, for fear the seedling will not grow well and even die for the shortage of water, timely huge replenishment of water is needed.

According to the calculation formula of irrigation water:

Irrigation amount=irrigation area × soil wetted depth × field capacity× (soil bulk density—soil moisture before irrigation.

Field capacity is the limit of soil water holding capacity. The soil of environmental restoration area is clay. Its field capacity with the thickness of 40~60cm is 32.16%～33.12%. Usually the proper irrigation is 60％～80％ of the field maximum capacity. Taking the middle value 70%, it can be calculated it's time to irrigate when the soil moisture falls to 10%.

Thus, it can be calculated that the amount of irrigation water once for each square meters is:

1 ㎡×0.5m×1.1 kg/m³×（32.5%-10%）=0.124m³。

According to Huainan annual rainfall distribution, in normal years, the whole year needs 4 times irrigation, scheduled in March, April, October, and November. From this, the nursery's total annual water consumption is:

0.124m³×4×502300 ㎡=249141m³

The project's surface water resource includes the pond, the flood discharge trench. The analysis of pond and flood discharge trench is in table 9.6—3.

Water storage of project area analysis table

Table 9.6-3

Name	Catchment area（km2）	Storage area（m2）	Storage capacity（10,000m3）
lake1	4.89	32700	16.4
lake2	2.46	76500	30.6
lake3	5.1	271300	67.8
total	12.45	380500	114.8

We know from the above table that the water resource amount is 1148 thousand m³. Deducting the infiltration, evaporation, its annual water storage capacity is 753 thousand m³. The source of nursery irrigation is surface water, and the irrigation water is 24900 m³. The flat water can basically meet the requirement.

Therefore, the evaluation is that the environmental water storage is sufficient to support the nursery irrigation water use, without taking use of the municipal water. Underground pipelines are needed to be buried in the nursery to reach the neighboring water system. A

small pumping station is set up to transfer water to nursery internal irrigation pipe network.

For water-saving considerations, the nursery adopts the sprinkler irrigation. The director is DN150, with a total length of about 5200m; the branch is DN32, with a total length of about 9000m.

(2) Bonsai garden irrigation analysis

The domestic calculation formula commonly used fo for nursery and orchard irrigation water:

Irrigation amount=irrigation area × soil wetted depth ×field capacity × (soil bulk density—soil moisture before irrigation)

From this, we can calculate the irrigation water amount per square meters every time:

1 ㎡×0.5m×1.1 kg/m³×（32.5%-10%）=0.124m³

According to Huainan annual rainfall distribution, in normal years, the whole year needs 4times of irrigation, scheduled in March, April, October, November. From this, the bonsai garden's total annual water consumption is:

0.124m³×4×52400 ㎡=25990.4m³

Average day consumption: 25990.4/365 days =71.21m³/day

The irrigation water source comes from the municipal water supply, it needs to bury pipelines with 2~4 taps according to the different land scope of users within the construction land. We irrigate with hosepipes.

9.6.1.3 The analysis of the impact of nursery fertilizer, pesticideon water environment

The fertilizer amount in this project l is much lower than the currently planted crop fertilizer l, so fertilizer loses in a small amount. Therefore, the fertilizer loss will turn better after construction, and the loss of nitrogen and phosphorus will decrease.

The comments suggest using organic fertilizer. Organic fertilizer produces less pollution than other fertilizer. It has a lasting effect and small wastage rate. It can improve the soil, prevent soil compaction, and also improve the ecological environmentand reduce soil erosion.

There are many kinds of pesticides. We use them according to the situation of pests and diseases. We spray the plant when pesticides are on them. Otherwise, we don't use it. According to the Classified Proposal for Pesticides based on Harmfulness and Classification Guides (Geneva, WHO), the project will try to use low and middle toxic pesticides rather than highly toxic pesticides. We don't immediately irrigate after fertilization and pesticides, relaying 3~4 days. Therefore, less insecticide composition is contained in irrigation water, with less impact on surface water.

9.6.2 Air environment

There is no emission of air pollution in flowers trading markets, bonsai gardens and nurseries during the construction period.. So flowers trading markets, bonsai gardens and nurseries don't affect the air environment during the construction period.

9.6.3 Acoustic environment

In operation, flowers trading markets, bonsai gardens have no fixed sound source. The flowing sound source is a few flowers and seedling transportation vehicles, and there are no environmental sensitive points in the area. So it has little impact on acoustic environment. Since the smart greenhouse equipment, solar greenhouse equipment has little power, all belonging to interior low noise equipment. We can't make noise prediction. Only pump equipment has main effect on acoustic environment.

The nursery has two pump stations. One is in the wet of Jiukong Road, eastside of

nursery. The other is in the west of nursery. By analogy investigation, the noise 1 meter from the water pump is about 85dB (A), the water pump is arranged in the pump room, pump room building envelope insulation is about 12 dB (A), it is predicted the noise 15 from pump is 49.5 dB (A), the prediction results are shown in table 9.6-4. There is no environmental sensitive point around the pump house for 200m range. Pump houses stetted by nursery cannot generate noise on the environment noise sensitive points.

The prediction results of pump noise

Table9.6-4 **Unit：DB (A)**

Device name	Noise value	Pump house insulation	the noise value 15 from the pump house
Water pump	85	12	49.5

9.6.4 Solid waste

In operation period of this subcomponent, the solid wastes are mainly the living garbage of management personnel and merchants in flowers trading market, bonsai garden andnursery, as well as the deciduous, fertilizers, and insecticides packing bags in seedling processing.

According to the research, the production of this part is 602.5kg/d. It will be collected by sanitation department and sent to Huainan dumpsite of living garbage.

The broken branches in seedling process and the leaves of dead seedlings will be returned to field after crushing. Besides, the production of fertilizer and pesticides packing (bags) is about 0.1t/a. They are suggested to be collected in separately. The fertilizer packing bags are for recycled company use. Pesticides packing bags belong to hazardous waste, it should be sent to waste disposal center.

According to the research, the average flow of roadside service point is 822 times/d, annual visitors' capacity controlled at 300000 people. Considering the restaurants in the service sites, the production of living garbage is in 0.3kg/cap one day, then the living garbage is246.6kg/d, which will be collected by sanitation department and sent to Huainan east waste landfill.

Chapter X Ecological Environment Impact

10.1 Summary

This EIA mainly conducts the ecological environment assessment basing on The World Bank Loan Project for Comprehensive Treatment and Utilization of Coal Mining Subsidence Area of Resource Type City (Huainan city) Sustainable Development Engineering o. The main purpose is to improve the ecological environment, comprehensively manage the coal mining subsidence area, junk yard, quarry and drainage. We need to build the necessary infrastructure to improve the living environment of the surrounding residents. By reasonable planning, we can coordinate city development and with regional ecological environment. By reasonable exploitation and utilization, we can improve the rational use of land resources. The content of ecological environment evaluation is the ecological status investigation, the analysis of surface subsidence of Datong e and Jiu Longgang mining area. The analysis of

the project's impact on ecological environment, soil environment, landscape environment to raise suggestion on ecological protection and ecological corresponding recovery.

10.2 The investigation and evaluation of current situation of ecological environment

10.2.1 Natural situation

The Quanda area is located in the transition zone from the north subtropical zone to the south warm temperate zone. The soil formation has the obvious features of transition. The soil differing from the northern Huaihe river to the Southern Hill are yellow soil, yellow brown soil, lime soil, purple soil. From west to east covers Shajiang black soil, yellow brown soil. The soil type near the wetland is mainly yellow brown loam. The soil thickness is 190cm in average. The overlying clay is 80cm.

The region's vegetation belongs to the warm temperate deciduous, coniferous forests. The vegetation mainly includes rice, beans, wheat and other crops and trees artificial beside fields. The natural vegetation is mainly distributed in Shungeng Hill area and Datong area. It forms a large area of natural forest for species diversity, huge vegetation coverage. In the evaluation area, there is natural vegetation and wild shrubs, native trees scattered on both sides of the road.

10.2.2 The composition of regional ecological system

(1)Farmland ecological system

Agriculture is in the dominate position in the large area of Huainan, and the cultivated lands widely distribute as plaques. The farmland ecosystem is an artificial planting block with much artificial intervention. The agricultural vegetation is the main body, which includes wheat, rape, maize, beans.

(2) Forest ecosystem

Forest ecosystem mainly refers to the south Shungeng mount and pieces of woodlands in the construction area. The woodland is the artificial cultivation, having artificial vegetation. Shungeng mount is a natural forest, having natural vegetation. The project's ecosystem structure is relatively simple. With the natural succession, the artificial forest has developed into stable natural forests, with various species increasing significantly. There are farmland protection forests on the east side of the 206 National Road. A small amount of special sections or shoals have diverse tree species. The tree species are mainly poplar forest, oak forest and redwood forests.

(3) Settlement ecosystem

The settlement ecosystem is sporadically distributed in the assessment area. Less is located in the west of 206 National Road and Shungeng hill side. Most are located in the east of 206 National Road. Green plants are embedded in in patch or strip in the villages. There are many species, but the richness is small. Many are poplar.

(4) The water ecological system

Aquatic ecosystem combines farmland ecosystem, woodland and shrub land and settlement ecosystem, influencing each other. The main aquatic plants are common species such as water-peanuts,poly-grassand reeds. The dominant species vary in different waters.

10.2.3 The investigation and evaluation of current ecosystem

10.2.3.1 The investigation of current ecosystem

1. Investigation measures

On the basis of collecting and using the research results and literature resource, we take the methods of field investigation, map and geographic information analysis, ecological

process and mechanism analysis to evaluate the ecological area's vegetation, soil, current land utilization and soil erosion.

2. The research content

The investigation of ecosystem includes the type of ecosystem, vegetation situation, plant species, wild animal resources, landscapes, vegetation status, peats and diseases.

3. The scope of investigation

The project is located in the eastern part of Huainan Jiulonggang-Datong district (referred to the nine) subsidence area, belonging to the jurisdiction of Datong District. It covers an area of 9.3km2. The subsidence lies on Shungeng hill in the south, Linchang Road in the north. It stretches to Hefu Railway in the east, Huaishunnan Road in the west. The north-south width is 0.9~2.0km. The east-west length is 8.4km. The 206 National Road runs through the subsidence area from north to south, attaching to Hexu expressway. According to the ecological evaluation principles, the evaluation area must be bigger than the experiment area. So this evaluation area extends an area of 500m from the experiment area.

4. Research points and methods

This investigation divides the ecosystem into 3 representative districts according to vegetation, landscape and ecological environmental parameters. They are Shungeng hill district, Datong hill district, Jiulonggang hill district. Shungeng hill district mainly includes the Shungeng hill and its nearby areas, Datong district and Jiulonggang district.

(1)Vegetation investigation

The vegetation in the evaluation area mainly refers to the terrestrial vegetation. We select the typical vegetation communities as the scope of the investigation.

The investigation area is huge, which needs too much time to make a comprehensive investigation. So we mainly combine alongside with plot investigation to record species. We set sample sets as 30m× 30m forest, 4m × 4m shrub forest, 1m × 1m herbs. The investigation alongside mainly choose the LInchang Road in the north, the Shungeng hill in the south, the No.206 National Road in Anhui Province to do species investigation.

10.2.3.2 Investigation findings

1. Natural Vegetation

The natural vegetation in evaluation areas is in a wider range of distribution, especially in the Shungeng Mountainous Areas and the Datong District, which has been replaced by a large area of natural vegetation on the basis of the artificial forest. The specie richness is pretty high and the diversity of specie is pretty obvious. In the survey it is found that the main floristic composition of the evaluation areas is given priority to the North China Flora.The main vegetation types are the north subtropical evergreen broad-leaved forest and south warm temperate deciduous broad-leaved forest, the main arbors can be divided into 15 species of 10 families, such as Quercus variabilis, Quercus acutissima, Ulmus parvifolia, Celtis sinensis, Pistacia chinensis, Albizia kalkora, Catalpa bungei, which are distributed in areas which is less affected by the human activities. And there are also types in the district near the village such as Sophora japonica,Ulmus pumila, Melia azedarach, Ailanthus altissima, Broussonetia papyrifera, Buxus sinica, Paulownia elongate, P. tomentosa, which share the same warm temperate zone vegetation flora species.But some of the common tree species in North China have not been distributed in the district such as Quercus liaotungensis, Quercus mongolica, Betula. The types of Populus and coniferous forests are obviously fewer than those of North China。In terms of shrub species there are 12 species of 8 families, and there are small amounts of local distribution of species such as Ziziphus jujuba var. spinosa, Vitex negundo, Lespedeza bicolor, Crataegi cuneatae, Cudrania tricuspidata, which are basically the same with the species in North China. Since Huainan is

located in the southern margin of the warm temperate zone, there can also be some distribution of the northern subtropical flora such as China wingnut, Sapium sebiferum, Glochidion puberum, Ligustrum quihoui as well as the cultivated Osmanthus fragrans, Buxus Sinica and so on. The distribution of the vegetation fully reflects the transitional characteristics of vegetation in the district.

In the Project District west of 206 National Road, there are mainly herbaceous vegetation, mostly composed of common weeds, which mainly distribute on both sides of the roads, the fields and the forests. The herbaceous vegetation is rich with various types, and the majority of tnem are made up of compositae vegetation There are 86 species of 34 families herbs in the project area west of 206 National Road, of which the compositae families are of 24 kinds.

The common species are Kalimeris indica, Siegesbeckia orientalis, Kalimeris shimadai, Conyza Canadensis, Erigeron annuus, Carduusnutans, Artemisia capillaries as well as Cirsium setosum.

2. Artificial Vegetation

Regional forestry are featured by the greening of the farmland shelterbelts as well as roadside, canalside, waterside, villageside.The main greening tree species are: Arbor 17 species of 8 kinds，mainly characterized by Populus dakuaensis, Populus euramevicana, Populus×canadensis cv. 'Sacrau 79' , Salix matsudana, Salix babylonica, Ulmus pumila, Sophora japonica, Robinia pseudoacacia, Ailanthus altissima, Platanus acerifolia, Albizia julibrissin, China Wingnut, Melia toosendan, Melia ayedarach, Bischofia polycarpa, Firmiana simplex, Paulownia tomentosa and so on and so forth. Arbor coniferous forests are mainly composed of Pinus elliotti, Pinus taeda, Cedrus deodara, Platycladus orientalis, Cunninghamia Lanceolata, Metasequoia glyptostroboides and so on. The shrub are mainly Amorpha fruticosa, Periploca sepinum and Fraxinus chinensis.

10.2.4 Investigation Results and Evaluation of Current Ecological Situation

10.2.4.1 Findings of the Investigation

Combined with the situation of engineering district, this investigation is mainly the comprehensive evaluation of current ecological situation of terrestrial and aquatic organisms as well as fish survey. It is found the terrestrial organisms are 193 species of 106 families, including: 25 families, 44 species of arbors; 29 families, 43 species of shrubs ;43 families , 93 species of herbs, as well as 3 families , 3 species of vines and 6 families., 9 species of aquatic organisms. The investigation findings of terrestrial creatures within the range of the evaluationdistrict are shown in table 10.1-1. There are 11 vegetation quadrats in investigation, on the basis of dominant specie, they are divided into 11 types. The investigation findings are shown in table 10.2-2. At the same time of the evaluation, the animals within the evaluation scope are investigated. It is found that mammals are 11species of 4 families and amphilia of 1species of 1 family as well as reptilian of 8 species of 3 families.

10.2.4.2 The Evaluation of Current Ecological Environment Situation

It is found through the site survey and investment that, due to the long-term effects of human activities, t in the present vegetation types in evaluation district have already been changed a lot, and the original vegetation have been largely vanished or changed while the secondary vegetation and artificial vegetation are dramatically increased. These species are widely distributed in local places, and no precious wild plants protected by the nation and provinces have been found. Overall, the Shungeng Mountainous Area possesses high vegetation coverage and species richness, and its ecological environment foundation is pretty good.

The Evaluation District in the west of 206 National Road is mainly along the mass graves around education bases and the Huaishun South Road. The Mass Grave education

base is surrounded by vast stretches of forest vegetation and artificial orchard. Huaishun South Road is one of the main traffic arteries in Huainan city, greatly influenced by manual intervention, along which are mainly the artificial planting of border trees and the afforestation trees. Along the road terrestrial vegetation coverage is high, the growth is in good condition and the species is relatively abundant so that a good ecosystem is initially formed, we should reduce the disturbance in the construction as much as possible.

According to the investigation of vegetation and crops east of 206 National Road, it is found that the farmland ecosystem accounts for most of the district, and the native terrestrial plants are relatively small. The forest ecosystem is mainly in Shungeng Mountain, mostly is artificial vegetation, and plant species are common species that are locally andl widely distributed. Local plant species are very rich with rather high diversity of species. But the arbors and shrubs species are fewer with rather low biodiversity.

The investigation findings of terrestrial organism within the range of the evaluation district are shown in table 10.2-1.The investigation findings of the quadrat are shown in table 10.2-2.

The Investigation Findings of Terrestrial Organism within the Range of the Evaluation District

Table 10.2-1

Types	Scientific Name	Botanical Name	Osmamthus fragrans
Arbor	Lauraceae	香樟	Cinnamomum camphora
	Oleaceae	女贞	Ligustrum lucidum
	Simarubaceae	臭椿	Ailanthus altissima
		苦木	Picrasma quassioides
	Meliaceae	楝树	Melia azedarach
	Fagaceae	麻栎	Quercus acutissima
	Moraceae	桑树	Morus alba
		构树	Broussonetia papyrifera
	Ulmaceae	榆树	Ulmus pumila
		朴树	Celtis sinensis
	Taxodiaceae	水杉	Metasequoia glyptostroboides
	Anacardiaceae	盐肤木	Rhus chinensis
	Aceraceae	三角槭	Acer buergerianum
	Euphorbiaceae	乌桕	Sapium sebiferum
	Caprifoliaceae	日本珊瑚树	Viburnum awabuki
	Cupressaceae	龙柏	Sabina chinensis
		侧柏	Platycladus orientalis
	Pinaceae	雪松	Cedrus deodara

Types	Scientific Name	Botanical Name	Osmamthus fragrans
		马尾松	Pinus massoniana
		罗汉松	Podocarpus macrophyllus
	Magnoliaceae	广玉兰	Magnolia grandiflora
		马褂木	Liriodendron chinensis
		白玉兰	Magnolia denudata
		二乔木兰	Magnolia × soulangeana
	Rosaceae	枇杷	Eriobotrya japonica
		日本樱花	Cerasus yedoensis
		木瓜	Chaenomeles sinensis
		桃	Amygdalus persica
		樱花	Prunus serrulata
		紫叶李	Prunus ceraifera
	Scrophulariaceae	泡桐	Paulownia
	Sapindaceae	黄山栾树	Koelreuteria integrifoliola
		无患子	Sapindus mukurossi
	Leguminosae	刺槐	Robinia pseudoacacia
		国槐	Sophora japonica
		合欢	Albizia julibrissin
	Ebenaceae	柿子树	Diospyros kaki
	Palmae	棕榈	Trachycarpus fortunei
	Platanaceae	法国梧桐	Platanus acerifolia
		梧桐	Firmiana simplex
		悬铃木	Platanus acerifolia
	Juglandaceae	枫杨	China Wingnut
	Papilionaceae	龙爪槐	Sophora japonica var. pendula
	Hamamelidaceae	枫香	Liquidambar formosana
Shrub	Malvaceae	木芙蓉	Hibiscus mutabilis
	Verbenaceae	黄荆	Vitex negundo
		牡荆	Vitex negundo
	Rosaceae	粉花野蔷薇	Rosa multiflora var. cathayensis
		石楠	Photinia serrulata

Types	Scientific Name	Botanical Name	Osmamthus fragrans
		火棘	Pyracantha fortuneana
		月季	Rosa chinensis
		粉花绣线菊	Spiraea japonica
		垂丝海棠	Malus halliana
		梅花	Prunus mume
	Araliaceae	通脱木	Tetrapanax papyriferum
	Apocynaceae	夹竹桃	Nerium indicum
	Pittosporaceae	海桐	Pittosporum tobira
	Celastraceae	正木（大叶黄杨）	Euonymus japonicus
	Gramineae	水竹	Cyperus alternifolius
	Cornaceae	洒金桃叶珊瑚	Aucuba japonica var. variegata
	Caprifoliaceae	日本珊瑚树	Viburnum awabuki
		金银花	Lonicera Japonica
		水马桑（马桑果）	coriaria sinica
	Aquifoliaceae	构骨冬青	Ilex cornuta
	Hamamelidaceae	红花檵木	Loropetalum chinense
		蚊母树	Distylium myricoides
	Oleaceae	小腊树	Ligustrum sinense
		紫丁香	Syringa oblata
		桂花	Osmanthus fragrans
	Cuculidae	西洋杜鹃	Rhododendron hybridum
	Rubiaceae	栀子花	Gardenia jasminoide
	Vitaceae	乌蔹莓	Cayratia japonica
	Moraceae	柘木	Cudrania tricuspidata
	Lythraceae	紫薇	Lagerstroemia indica
	Rutaceae	枸桔	poncirus trifoliata
	Leguminosae	紫穗槐	Amorpha fruticosa
		紫荆	Cercis chinensis
	Salicaceae	旱柳	Salix matsudana
	Aceraceae	鸡爪槭	Acer palmatum
		五角枫	Acer mono

Types	Scientific Name	Botanical Name	Osmamthus fragrans
	Agavaceae	剑麻	Yucca gloriosa
	Theaceae	山茶	Camellia japomica
	Magnoliaceae	含笑	Michelia figo
	Tiliaceae	扁担杆	Grewia biloba
	Menispermaceae	木防己	Coculus trilobus
	Berberidaceae	南天竹	Nandina domestica
	Solanaceae	枸杞	Lycium chinensis
Terriherbosa	Boraginaceae	附地菜	Trigonotis peduncularis
	Cannabaceae	葎草	Humulus scandens
	Solanaceae	白英	Solanum lyratum
	Scrophulariaceae	直立婆婆纳	Veronica arvensis
		阿拉伯婆婆纳	Veronica persica
	Plantaginaceae	车前草	Plantago asiatica
	Amaranthaceae	牛漆	Lagenaria siceraria
	Rosaceae	茅莓	Rubus parvifolius
		蛇莓	Duchesnea indica
	Asclepiadaceae	牛皮消	Cynanchum auriculatum
	liliaceae	黄花菜	Hemerocallis citrina
		麦冬	Liriope platyphylla
		土麦冬	Liriopes Spicata
	Leguminosae	绿豆	Vigna radiata
		草木樨	Melilotus suaveolens
		白车轴草（三叶草）	Trifolium repens
	Gramineae	鹅观草	Roegneria kamoji
		白茅	Imperata cylindrica
		高羊茅	Festuca arundinacea
		白顶早熟禾	Poa acroleuca
		刺叶笔草	Pseudopogonatherum setifolium
		狗尾草	Setaira viridis
		狗牙根	Cynodon dactylon

Types	Scientific Name	Botanical Name	Osmamthus fragrans
	Cruciferae	球果葶菜	Rorippa globosa
	Iridaceae	射干	Belamcanda chinensis
	Smilacaceae	菝契	Smilax china
	Malvaceae	蜀葵	Althaea rosea
		萹蓄	Polygonum aviculare
	Polygonaceae	齿果酸模	Rumex dentatus
		羊蹄	Rumex dentatus
		长刺酸模	Rumex maritimus
	Araceae	云台天南星	Arisaema du-bois-reymondiae
		山苦荬	Ixeris denticulata
	Compositae	马兰	Kalimeris indica
		豨莶	Siegesbeckia orientalis
		毡毛马兰	Kalimeris shimadai
		小飞蓬	Conyza canadensis
		一年蓬	Erigeron annuus
		小蓟	Cirsium setosum
		钻叶紫菀	Aster subulatus
		黄鹌菜	Youngia japonica
		山莴苣	Lactuca indica
		红足蒿	Artemisia rubripes
		菊叶三七	Gynura japonica
		蒙古蒿	Artemisia mongolica
		碗苞麻花头	Serratula chanetii
		天名精	Carpesium abrotanoides
		野菊花	Dendranthema indicum
	Umbelliferae	天胡荽	Hydrocotyle sibthorpioides
		野胡萝卜	Daucus carota
		臭芹	Coronopus didymus
	Cruciferae	荠菜	Capsella bursa-pastoris
		印度葶菜	Rorippa indica
	Convolvulaceae	牵牛花	Pharbitis nil

Types	Scientific Name	Botanical Name	Osmamthus fragrans
		打碗花	Calystegia hederacea
	Geraniaceae	老鹳草	Geranium carolinianum
		商陆	Pokeberry root
	Phytolaccaceae	美洲商陆	Phytolacca americana
	Malvaceae	野葵	Malva verticillata
		荨麻	Urtica laetevirens
		龙牙草	Agrimonia pilosa
		蛇莓	Duchesnea indica
	Rosaceae	朝天委陵菜	Potentilla supina
		茅莓	Rubus parvifolius
		委陵菜	Potentilla aiscolor
		紫背金盘	Ajuga pantantha
	Labiatae	荔枝草	Saluia plebeia
	Crassulaceae	景天三七	Sedum aizoon
	Boraginaceae	麦家公	Lithospermum arvense
	Caprifoliaceae	接骨草	Sambucus chinensis
	Amaranthaceae	牛膝	Achyranthes bidentata
	Lythraceae	千屈菜	Lythrum salicaria
	Caryophyllaceae	牛繁缕	Malachium aquaticum
		地构叶	Speranskia tuberculata
		铁苋菜	Acalypha australis
	Euphorbiaceae	泽漆	Euphorbia helioscopia
		地锦草	Euphorbia humifusa
		斑地锦	Euphorbia maculata
	Iridaceae	鸢尾	Iris tectorum
		德国鸢尾	Iris germanica
	Urticaceae	苎麻	Boehmeria nivea
	Cannaceae	美人蕉	Canna indica
		箭叶堇菜	Viola betonicifolia
	Violaceae	紫花地丁	Viola philippica
		斑叶堇菜	Viola variegata
	Scrophulariaceae	婆婆纳	Veronica polita

Types	Scientific Name	Botanical Name	Osmamthus fragrans
	Chenopodiaceae	灰绿藜	Chenopodium glaucum
		土荆芥	Chenopodium ambrosioides
	Funariaceae	葫芦藓	Funaria hygrometrica
	Rubiaceae	猪殃殃	Galium aparine
	Campanulaceae	沙参	Adenophora stricta
		石沙参	Adenophora polyantha
	Aroideae	菖蒲	Acorus calamus Linn
Hydrophyte	Amaranthaceae	水花生	Alternanthera philoxeroides
	Gramineae	稗子	Echinochloa crusgalli
		芦竹	Arundo donaxl
		芦苇	Phragmites australis
		扁杆荆三棱	Bolboschoenus planiculmis
	Cyperaceae	水葱	Scirpus tabernaemontani
		香附	Rhizoma cyperi
	Trapaceae	菱角	Trapa bicornis
	Haloragaceae	狐尾藻	Myriophyllum verticillatum
	Ceratophyllaceae	金鱼藻	Ceratophyllum demersum
Vine	Asclepiadaceae	牛皮消	Cynanchum auriculatum
	Vitaceae	蛇葡萄	Vitaceae vitis
	Caprifoliaceae	金银花	Lonicera japonica

The Investigation Findings of the Quadrat

Table 10.2-2

Sampling Site	Types of Quadrat	Types of Sample Area	Size of Samples	Dominant Species	Coverage	Number of Plant（Quanifier）	Averge Diameter at Breast Height（cm）	Average Plant Height（m）
32°37.483′N 117°01.880′E	Arbor	Artificial Economic Forest	30mx30m	Metasequoia	80%	120	12.5cm	21.9m
32°37.492′N 117°01.889′E	Arbor	Afforestation Vegetation	10mx10m	Huangshan Goldenrain Tree	90%	18	17.1cm	7.4m

32°37.460′N 117°01.951′E	Arbor	The Vegetation around the Landfill	10mx10m	Wingnut	90%	7	21.9cm	17.1 m
32°37.166′N 116°59.754′E	Arbor	Artificial Economic Forest	10mx10m	Oriental Arborvitae	70%	11	16cm	10.7 m
32°37.561′N 117°01.921′E ）	Shrub	Artificial Economic Forest	10mx10m	Trident Maple	87%	40	4.2cm	5.65 m
32°37.562′N 117°01.896′E	Arbor	Artificial Restoration of Vegetation	30mx30m	Privet	85%	89	12.1cm	7.7m
32°37.530′N 117°01.965′E	Arbor	Purifying Herbal	1mx1m	Reed	94%	105	1cm	3.03 m
32°37.096′N 117°03.097′E	Shrub	Economic Orchard Forest	10mx10m	Pear	60%	4	4.6cm	4.71 m
32°37.087′N 117°03.093′E	Shrub	Economic Orchard Forest	4mx4m	Peach Tree	70%	6	4.7cm	4.76 m
32°36.038′N 117°06.188′E	Arbor	Natural Vegetation	30mx30m	Populus Tremula	85%	54	23.1cm	13.4 m
32°36.031′N 117°06.017′E	Farmland	Field Crops	1mx1m	Maize	87%	43	2.1cm	2.13 m
32°36.033′N 117°06.019′E	Farmland	Field Crops	1mx1m	Soybean	82%	34	0.76cm	0.62 m

10.2.4.3 The Investigation of Animals

The investigation findings of animals are shown in table 10.2-3. As the investigation findings show, in the project district, the mammals are of 10 species of 4 families and reptiles are of 6 species of 3 families. Apart from the investigation, we also consult the Forestry Bureau as well as relative parties of Huainan City and national and provincial wild protection animals have not been found in this project district.

List of Land Animals Table 10.2-3

Types of Animals	Scientific Name	Kinds of Animals
Mammalia	兔科 Leporidae	草兔 Lepus capensis*
	猬科 Erinaceidae	刺猬 Erinaceus europaeus
		东北刺猬 Erinaceus amurensis
	鼬科 Mustelidae	猪獾 Arctonyx collaris
	鼠科 muridae	小家鼠 Mus musculus Linnaeus

		大仓鼠 Tscheskia triton
		巢鼠 Micromys minutus
		黑线姬鼠 Apodemus agrarius
		黄胸鼠 Rattus tanezumi
		褐家鼠 Rattus norvegicus
Reptilia	游蛇科 Colubridae	虎斑颈槽蛇 Rhabdophis tigrina
		赤链蛇 Dinodon rufozonatum
		双斑锦蛇 Elaphe bimaculata
		红点锦蛇 Elaphe rufodorsata
	龟科 Chelonia	中华鳖 Trionyx sinensis
	蜥蜴科 Lacertian	北草蜥 Takydromus septentrionalis

10.2.5 Current Situation Analysis of the Protection of Rare and Endangered Plants and Animals

According to field investigation, combined with animals and flora records and other information to the district in Anhui province, rare and endangered plant species have not been found; Evaluation district is considered to be a place where activities are relatively frequent, which has multiple traffic roads extending to the foot of the Shungeng Mountain. Through field survey and reference to record data, there ais no national and provincial protection endangered wildlife distributed here.

10.2.6 Regional Landscape Current Situation

This area is located in the transition zone of the subtropical and warm temperate zone, belonging to the warm temperate semi-humid monsoon climate zone. There has mild climate, plenty of sunshine and moderate rainfall, and the four seasons are obvious. The light, heat, water resource is rich.. Forest vegetation coverage is less, most of the farmland. There are various types of land use,, in addition to the natural vegetation, there is also artificial secondary forest. The secondary forests mainly are the locust, elm, arborvitae, Mao Shan cherry and tallow. Understory shrub plants of main tree species for advantage, cultivated areas in parts of the greening shrubs, such as red Ji wood, wild rose. Forests herb are mainly common weed, dominant species mainly for goose, imperata, cynodon dactylon. There are vertical multi-vegetations with obvious difference while with a certain regularity. There also distributes low-lying reservoirs forming by subsidence in this area, man-made waterway, and seasonal river valley.

Shungeng Mountains is high with big elevation difference. it is mostly a limestone mountain, and its overall terrain slopes from southeast to northwest The mountain vegetation of south Shunheng is in good condition, as well as the planting condition.It has a high richness in species diversity, of which the main type is German oak trees, arborvitae and metasequoia, locust, elm, and poplar. Shun plow North Slope face steep mountains, the main is given priority to with side in Berlin, German oak forest and forest of acacia, in a small number of groove quassic, neem, wood son, such as large Chinese beech exist, there are also some ferns groove tree-lined, forests herb is less, basically have snake blackberry, wrap around needle moss grass, wild leek, hispid arthraxon in guizhou, rice straw and other kinds of Yin resistant plants. Because of artificial mining, the north slope is bare rock without vegetation. In addition to the natural reunite,, there are some artificial landscape, built the arbor basic for artificial planting, gentle forest mainly sequoia groves, German oak forest, black locust forest, poplar, and Berlin, abundant landscape resources, foundation is good,

although the artificial forest

The complexity of the overall terrain and environment in this region result in the different vegetation types. in addition to the long-term artificial afforestation, this region has slope forest community, abandoned mining area wilderness community, and low-lying wetland communities, providing a reference for the repair of diversity. When repairing, we should not only pay attention to protect the original landscape, bust also should take advantage of the local geographical features to construct the local landscape.

The project area is located in the north of Jianghuai undulating plain, the southern bank of the middle reaches of the HuaiHe river. Regional geomorphic types can be divided into two categories, hills and plains. Hill is given priority to with low hills, Shungeng mountains height above sea level the highest peak of 215.5 m. Plain consists of quaternary upper middle pleistocene series and holocene, distributed in other than hilly area, the ground elevation generally 18.70 60.00 m. Micro morphology from hill to plain followed by low hills, piedmont inclined slope land, flood land, hills as four types of landforms.

Project area land use types mainly include industrial land, residential land, garden land, forest land, cultivated land and road building, and there are a lot of open-pit mines and other special purposes, which can present respectively subsidence low-lying land, farmland, residential buildings, roads, land and other different landscape. There are mainly herbs in the subsidence low-lying land, of which are mainly reeds and cattails, and part of giant reed community. The subsidence areas form wetland. Area on the various types of landforms, and there are hills, piedmont inclined to valley, terrace, depression, and the coal mining subsidence, coal gangue heap, piedmont intercepting ditch, quarries and artificial landscape such as garbage. Hills around for tan conglomeratic silty clay, clay minerals are mainly illite; In addition to the hills in other parts of the mainly for further toner clay, clay minerals are mainly illite and montmorillonite, etc.

There is some certain regularity in farmland and residential distribution and there distributes groves, forest land and farmland. This area is the main road connecting the north and the south. In addition to the biome, the rest mainly distributes in the surroundings of residential areas. Plants with some certain width which are mainly cultivated are planted along the roads, such as goldenrain tree to huangshan, magnolia, camphor, meadow, purple Ye Li species of trees such as dominant species, heather, pittosporum, of the wood, hibiscus, crape myrtle Ji shrub species. The species richness is high, and with artificial breeding, over time, coupled with good hydrothermal conditions, there will be an evolution of cultivated plants along with native species , so as to achieve the goal of diversity, which has a high landscape value. And in the process of investigation we found that the selected species grows well, and attention should be paid to the current species in ecological restoration and landscape construction.

10.2.7 Vegetation Remote Sensing and Function Analysis

According to the obtained remote sensing images, the ENIV4.1 software is used to interpret and analyze the remote sensing image..Combining with the field survey, and based on the multiband synthetic processing of remote sensing images, the area has been divided into the supervised classification and unsupervised classification. After interpreting the remote sensing image, the evaluation area land use types are classified into five types: resident land, forest land, water and mining area . Various land use type distribution area and distribution area is shown in table 10-2-2.

Table10.2-2 Interpretation of Remote Sensing Image within Evaluation District

泉九功能区划图	Functions Area Planning of Quanjiu
老龙眼片区	Laolongyan District
洞山片区	Dongshan District
大通片区	Datong District
九龙岗片区	Jiulonggang District
区划	Functions Area
居民用地	Residential Land
林地	Forestry
水体	Water Body
矿区	Mine
耕地	Plowland

The nine regional environment evaluation in Huan Nan, An Hui province mainly based on the condition of vegetation coverage, species diversity and aquatic organisms, fish and other indicators in evaluation area. Combining the field investigation with related information, the evaluation is divided into three areas, namely: shun plow mountain area, Datong district, Jiu longgang district. Shun plow mountain areas in the three area high vegetation coverage, vegetation restoration situation is better, more natural vegetation survey area, especially the shun plow mountain natural vegetation grow thickly, self-renewal ability is higher, species richness is bigger, also is a man-made terrestrial vegetation restoration area, ideal is the best of the three area vegetation areas, and artificial restoration and natural update combined more closely. There are various types of natural landscape in this area, and the foundation is better, in the later repaired you can use this area as artificial restoration and natural update the repair mode of combining the demonstration project of promotion.。

The project area in the west of 206 National Road mainly located in the city traffic trunk, the vegetation restoration situation is also very good, especially the growth of selected greening trees is very flourishing, having a good effect of landscaping. It not only repairs the surface of coalmine subsided water area environment before, also changes the local ecological environment, which has a very obvious economic, social and ecological benefits. Should pay attention to when repair based on the experience of the local, especially in selecting tree species, should not only pay attention to the protection of existing species, also should pay attention to choose suitable species for cultivation. But the area is affected by artificial interference, and has relatively few species. Its diversity is lower than Shun Geng mountain, and is easily affected by man-made factors, so when repairing we must pay attention to the protection of the local species.

The project area east of 206 National Road is mainly agricultural ecosystem, most of the land use type is farmland, only with a few hills, and artificial fish ponds excavated in the subsidence areas. The vegetation coverage is lowin this area, and there are less trees and shrubs species, mainly distributing in the hills and the road on both sides, the edge of the residents, farmland behind the house. Common species of dominant species are mainly more tenacious vitality, such as Yang, neem tree and artificial cultivation of fruit trees, etc. The herbaceous species is more, more for common weeds. Ecosystems are greatly influenced by farming and farming habits. Fish pond area is relatively small, mainly for

mining subsidence formed fish ponds, due to the effect of artificial hurl food, the water quality is worsening, and is at a moderate eutrophication status. The ecological environment in this area was the poorer among the three areas, the repairing difficulty and engineering quantity is large. In the future, we must select the species according to the local conditions when repairing, and we must pay attention to the drainage problems in subsidence areas.

10.2.8 Comprehensive Analysis and Restrictive Suggestions of the Investigation of Plant Diseases and Insect Pests within Evaluation Area

10.2.8.1 Comprehensive Situation of the Investigation

In the Jiuonggang and Datong districts of Huainan boast city l - at present the advantage of planting plants mainly include: huangshan goldenrain tree, elm, poplar, magnolia, meadow, arborvitae, chongyang wood, heather, big leaf boxwood, crape myrtle, and firethorn plants. According to domestic and foreign related research reports, these plants after nursery FanYuQi and transplanting of growth and development process, there will be some of these diseases and insect pests, such as big leaf on huang Yang leaves yellow leaf spot, stem rot and medium pollution disease; Heather on leaf spot, and yu oyster (limacodidae shield pest; Firethorn of powdery mildew, aphids and turtle wax on the pest; Ziwei crape myrtle long spot on aphid; Chongyang wood stain on chongyang wood moth; Platanus side wing plane trees peels on the net bugs, etc. But in our plant diseases and insect pests in the area are in the process of investigation, did not find the above diseases, insect pests in the area of Huainan city nine longgang - chase widespread and popular, not cause harm to the region vegetation.

In the process of investigation, we have also consulted the forestry bureau of Huainan city, environmental protection bureau, forestry bureau and other relevant administrative departments and experts. We have learned that the region does not have serious plant diseases and insect pests on garden plant in recent decades. The current biological species diversity in the area is high, and the community structure is stable, the overall health level of the ecosystem is good. Some faint occurrence of pests and diseases can be resisted and inhibited by the adjustment ability of the ecosystem. In recent years, the Chinese county government pays high attention to the ecological environment problem. The management departments of all levels, especially Huan Nan administration of gardens has taken proper measures in all management,, the region ecological environment is in good condition, and the vegetation is rich, without a wide range of plant diseases and insect pests. So there is no large area has used , large doses of insecticides and fungicides and large dose of pesticide.

10.2.8.2 Restrictive Suggestions

(1)The occurrence and development of plant diseases and insect pests is influenced by various environmental factors, so situations of every year are dynamic processes. Therefore, according to the investigation findings of plant diseases and insect pests this year, aiming at climate change in the coming year, combined with the occurrence regularity and characteristics of diseases and pests, we can further improve the forecasting of the risk and the scale of forest diseases and insect pests of Huainan city so as to improve the quality of greening construction and maintenance within the evaluation district.

(2)In addition to the main plants of shrubs, herbaceous plants are also subject to the plant diseases and insect pests. Herb community of nine districts are mainly composed of gramineae, compositae, including reed, green bristlegrass, cogon, erigeron annuus, red feet and so on , and its possible pest groups mainly refers to othoptera, hmiptera and coleoptera groups, such as warts locust, the Chinese rice locust, the Chinese sword Angle of locust, stinkbug and aphids of hmiptera as well as middle family A coleopteran and dung beetles as important groups. Farmland type is the typical northern dry land, and farming methods adopted two ripe for a year, spring planting rape and wheat, mainly for the summer: sweet potato, peanut, soybean, corn, the vegetables that people grow are cucumbers, peppers, eggplant. In the roadside of the farmland there are mainly some common herbs, mainly including: oats, barnyard grass, crack samara, vicia bursapastois, peas, and wild oats,

among which rape, wheat, sweet potato, cucumber belong to the vulnerable groups of plant diseases and insect pests. Lepidoptera, orthoptera, coleoptera, hemiptera are the main insect communities which are harmful to farmland ecosystems. As for cabbage white pieridae, underground pests east mole cricket, scarabaeoidea groups, it is suggested to pay attention to the prevention of insects which may affect the growth and survival of the vegetation.

10.3 Ecological environment impact and mitigation measures

10.3.1 Project area land use status quo

According to FSR, the land use status quo in evaluation area is shown in Table 10.3-1. Project land use status quo mainly refers to the situation that for the waste land, green land and land for agricultural production, the area of which occupy 62.7% and 19.5 of the total area of the project area land respectively, and other lands cover a less area relatively, therefore, to conduct necessary renovation and ecological environment restoration to the area is very necessary for creating a good living environment for Huainan citizens.

Project Area Land Use Status Quo Table 10.3-1

No.	Current land use property	Occupied area （hm2）	Occupied land (%)
1	Residential land	56.13	4.9
2	Industrial land	62.67	5.5
3	Public service facility land	28.95	2.6
4	Historic preservation land	8.90	0.8
5	Green land and land for agricultural production	221.35	19.5
6	Waste land	710.69	62.7
7	Water system land	45.31	4.0
Total		1134.00	100

10.3.2 Land use situation analysis for comprehensive treatment of coal mining subsidence area

Evaluation area is the coal mining subsidence area comprehensive treatment project which mainly includes five categories of engineering of environment restoration, regional land development and utilization (including nursery garden, flower market, garden displaying potted landscape, middle and east roadside service points), infrastructure (four roads construction), water system renovation, Datong refuse landfill closure for renovation engineering. The land use situation for the five engineering is shown in Table 10.3-3. The environment restoration land is 411.91hm hm2, the road construction land is 13.33 hm2, the Flowers and trees trading market land is 8.35hm2, thenursery garden is 54.6 hm2, the middle and east roadside service points (including 3 courier stations occupying 1.9987 hm2, water system renovation occupying 58.81 hm2. From the table we can see that the vegetation restoration area accounts for 91% approximately, construction land accounts for 91% approximately (including green road and courier station)), Therefore this project is mainly for restoring the ecological environment of the project area. And the ecological environment of the project area will have great improvement through restoration of the

ecological environment.

10.3.3 Ecological environment impact analysis

10.3.3.1 Ecological environment impact in construction period

The main engineering of the project contains five engineerings of environment restoration (vegetation restoration, green road and courier station), regional land development and utilization (including nursery garden, flower market, garden displaying potted landscape, middle and east roadside service points), infrastructure (four roads construction), water system renovation, Datong refuse landfill closure for renovation engineering.

1. Soil restoration in environment restoration

(1) Datong old dumpsite

The impact of Datong old dumpsite closure to the ecological environment mainly refers to that the existing weed and parts of the crops will be removed, the impacted area is 10.92hm2. Due to limited removal area and poor ecological environment itself, the removal of weed and parts of the crops will not impact the regional ecological environment.

(2) Environment restoration

Excluding Datong old refuse landfill, there are six restoration engineering in environment restoration, which mainly include stone sloping land restoration, refuse landfill restoration, low land at thick soil layer restoration, sloping land at thick soil layer restoration, Inferior woodland restoration and retaining of Superior woodland, The analysis for the impact of the environment restoration construction period to the environment is as follows:

① Stone sloping land: the restoration method is to close the hills for reforestation ,to close the restoration area and realize the restoration and improvement of the ecological environment by the self restoration capability of the interior ecological environment in the field. Plant climbing ground cover plants in the places with soil currently to cover the surface of the exposed rock and accelerate the self-restoration of the ecological environment. Parts of the drought-enduring plants of shrub class suitable for the barren land can also be taken into consideration for partial planting.

In restoration of stone sloping land parcels, the leveling and finishing of the part of the rugged sloping land or swales might be conducted, the restoration of the land with poor ecological environment will have positive effect on the ecological environment. It will impact on the weed on the ground or few shrubs in the construction period, but the impact is limited in little area, having basically no impact on the ecological environment.

Land use situation of comprehensive treatment of coal mining subsidence area Table 10.3-2

No.	Restoration types	Engineering types	Engineering occupation (hm2)	Engineering proportion	Remarks
1	Environment restoration	Stone sloping land	12.27	2.98%	Slope terrain, exposed stone layer, partial surface covered with a few amount of soil, smooth drainage
		Refuse landfill closure and stock	10.92	2.65%	Status quo of land parcel is old refuse dump, having a certain degree of pollution to surrounding air and

					underground water
		Waste stock dump	28.26	6.86%	Production wastes such as coal gangue, coal ash, cinder, road metal, building rubble stacked on the surface of the land parcel, good drainage situation of the terrain
		Low land at thick soil layer	31.95	7.76%	Low-lying sloping land, unsmooth drainage
		Sloping land at thick soil layer	220.84	53.61%	Gentle slope distributed terrain, good drainage, few water logging, no wastes stacked on the land surface
		Inferior woodland	69.73	16.93%	Various forest lands, fruit-bearing forests planted on the land currently, but most trees are dead or in bad conditions
		Superior woodland	37.94	9.21%	Forest land and fruit-bearing forest in the land currently, in good condition, canopy density is higher, no need of additional labor supplement
		Total	411.91	100%	

2	Green road engineering	----	Project types	Quantity	
			#1 green road	L=5.7KM，W=4.5M，S=25650 ㎡	L- length of green road W- width of green road Total area of occupation: 10.765 hm2
			#2 green road	L=6.0KM，W=4.5M，S=26000 ㎡	
			#3 green road	L=3.2KM（status quo）	
			#4 green road	L=0.7KM，W=4.0M，S=28000 ㎡	
			#5 green road	L=0.8KM，W=3.5M，S=28000 ㎡	
			#1 courier station	Q=500 ㎡，S=280 ㎡	Q-Occupation area S-Building area Total area of occupation: 1.9987 hm2
			#2 courier station	Middle roadside: Q=8787 ㎡，S=2694 ㎡	
			#3 courier station	East roadside: Q=10300 ㎡，S=2487 ㎡	
			#4 courier station	Q=200 ㎡，S=100 ㎡	

			#5 courier station	Q=200 ㎡，S=100 ㎡	
			1 item of marked system		
			1 item of brighten system		
		Other engineering	I item of other engineering		
No,	Construction types	Engineering types		Engineering land occupation (hm2)	
3	Infrastructure	Land for road construction		13.33	
4	Water system renovation	Water system desilting and slope protection		Ecological protection: 3.26 Water surface: 55.55	8 clean ditches, length of 7.74km, area of 12.35 hm2, 3 lakebed bottom mud cleaning, including a small amount of water surface area of 43.20 hm2 approximately.
5	Land utilization and development	Environment construction	Flowers and trees trading market	8.35	
			Nursery garden base	54.6	Non production area: 3.95 hm2
			Garden displaying potted landscape	7.4	
3, 4, 5 in total				142.46	

② Waste yard: the restoration method is, firstly, level the waste yard, clean the debris on the surface of the yield; secondly, conduct shaping and land preparation, soil loosen and soil replacement etc after cleaning; finally, excavate the plant pits to plant.

③ Low land at thick soil layer: the restoration method for low land at thick soil layer: to conduct simple clean for the scattered stone on the surface of the land parcel then to conduct restoration planting. The planting can be carried out after loosening the soil if the topsoil is in compaction.

During the construction period, it is the scattered stone on the land parcel that should be scattered. The cleaning is mainly done by labor work which will have little impact on the ecological environment. When loosening the soil at the region where the topsoil is hard, the impact mainly comes from the loosening of soil for removing the weed on land surface. Because the soil loosening is carried out partially, the construction period has little impact on the ecological environment.

④ Sloping land at thick soil layer: the restoration method is, to conduct simple clean for the scattered stone on the surface of the land parcel then to conduct restoration planting. The planting can be carried out after loosening the soil if the soil on the parts of the region surface is hardened.

During the construction period, it is the scattered stone on the land parcel that should be scattered. The cleaning is mainly done by labor work which will have little impact on the ecological environment, when loosening the soil at the region where the topsoil is hard, the impact mainly comes from the loosening of soil for removing the weed on land surface. Because the soil loosening is carried out partially, the construction period has little impact

on the ecological environment.

⑤ Inferior woodland: the restoration method is, to conduct site cleaning firstly, after removing the dead plants and downed logs, to reseed the new plant according to the specific situation of the bottom space at the forest. Loosen the soil if necessary.

During the restoration for the Inferior woodland, the first thing is to remove the dead plants and downed logs, which shall be done dominated by labor work which has little impact on the ecological environment. When there is a need to loosen the soil, it only applies to partial region thuswill have very limited impact on the ecological environment.

⑥ Superior woodland: the superior woodland is in good condition, it is enough to maintain the status quo and to protect it. There is no need to seed supplementary plant and to interfere humanly. it will have no impact on ecological environment.

Environment construction mainly includes green road construction and three courier stations. According to design, this project will build four green roads, take use of one existed green road and construct three courier stations. The total area occupied by the four green roads is 10.765hm2, the area occupied by # 1, 4, 5 courier stations is 900m2, since the ecological environment in the project area is quite poor, the land occupied by the green road construction are basically deserted land with weeds on its surface which will be removed when constructing green road. The loss of the weed vegetation area is approximately 10.855hm2. Since it is weeds that should be removed, it is considered in the evaluation that the construction period has small impact on the ecological environment.

⑦ Impact and protection measures for Mount Shungeng scenic spot

According to the Regulations on Administration of Huainan City Mount Shungeng Scenic Spot, Mount Shungeng Scenic Spot is the scenic spot which was passed by the Fourteenth People's Congress Standing Committee in its 16th Conference of Huainan City on December 22, 2009 and approved by the Eleventh People's Congress Standing Committee in its 17th Conference of Anhui Province on February 25, 2010. For the range of the Mount Shungeng Scenic Spot, the east of which is bounded by Xiaodongshan Mountain in Jiulonggang Town, Datong District, the west of which is bounded by the Xiaohuoshan Mountain in Wangfenggang Town, Xiejiaji District, the south and north are bounded by the mountain road. The specific range of the Mount Shungeng Scenic Spot is determined by Special Plan of Mount Shungeng Scenic Spot approved by Municipal People's Government. According to the range of the Mount Shungeng Scenic Spot, the construction of the Yanshan Road and intercepting ditches in this project is located at the north edge of the Mount Shungeng Scenic Spot. It is stipulated in Article 12 of Regulations: "It is prohibited to construction buildings (constructions) other than landscape, leisure service supporting facilities and public infrastructure within Mount Shungeng Scenic Spot. In case other buildings (constructions) are indeed needed to be constructed, the examination and approval procedures for planning and construction shall be handled according to relevant provisions", the constructed Yanshan Road and intercepting ditches in this environment restoration belong to the landscape, leisure service supporting facilities and public infrastructure, complying the construction content prescribed by "Regulations".

It is stipulated in the Regulations that: "All construction activities conducted in the Mount Shungeng Scenic Spot shall take effective measures to strictly protect the landscape, vegetation, water body, terrain environment around the construction site in accordance with the relevant provisions of safety and civilized construction. In case of land is needed to be occupied temporarily by construction activities, the construction unit shall report to and approved by the management organization of Mount Shungeng Scenic Spot and handle the examination and approval procedures in the relevant departments. The damaged landscape, vegetation, water body, terrain environment shall be restored as required after completion of the engineering". Before the implementation of the project, the project department shall print and issue the Regulations on Administration of Huainan City Mount Shungeng Scenic Spot

to the construction unit, take strict restrictions on constructions within the planned red line, and request the construction unit to make propaganda on staff and workers so as to strictly protect the landscape, vegetation, water body, terrain environment around the construction site. Any unit or individual shall not damage the vegetation or scenery in the Mount Shungeng Scenic Spot besides the construction area.

(3) Water system comprehensive renovation

Water system comprehensive renovation mainly includes the dredging and finishing of eight ditches and the dredging of three lake regions. Itmainly exerts an influence on aquatic environment during the dredging process. Due to the disconnection of water system of this region in dry season, and the overflow in flood season, the aquatic organism is rather poor currently, therefore, there is small impact on aquatic organism during the ditches renovation and lake regions dredging processes. The impact on terrestrial vegetation mainly comes from the excavation of the ditches. The weeds around the ditches and few shrubs are removed, the weed removal area is approximately equal to the protective slope area, and the total area of protective slope is 3.26 hm2, the loss of the weed vegetation area is approximately 3.26 hm2, thus the construction period having little impact on the ecological environment.

(4) Regional infrastructure construction

The regional infrastructure construction mainly constructs Zhongxing Road, Jiukong Road, Wanxiang Road and Yanshan Road, the water supply, sewage and rainwater pipelines, one intercepting ditch, and two roadside service points, the total occupied area of the four roads is 13.33 hm2. The occupied area of the two roadside service points is 1.91 hm2. Wanxiang Road will be widen ed along the existing road, most of Zhongxing Road will be widened along the existing road, according to survey, Zhongxing Road passes the existing peach orchard, having a certain impact on peach trees, and Yanshan Road is a newly built road, dominated by shrubs along the road, except the influence of Yanshan Road to shrubs and that of Zhongxing Road to parts of peach trees, the vegetation impacted in other road segments and roadside service points are weeds and few parts of crops. That is to say, it will have a certain impact on ecological vegetation during the construction of Yanshan Road and Zhongxing Road, however, the vegetation influenced by Yanshan Road is very small comparing to the mountain vegetation area at the south side, and the influence is regional. Therefore, it is considered in the evaluation that, the construction of Yanshan Road will not have impact on the stability, sustainability of the regional ecology and diversity of organism.

(5) Regional land development and utilization

It mainly includes flowers and trees trading market, nursery garden and garden displaying potted landscape, the total land area of which is 70.35 hm2, wherein, the flowers and trees market takes advantage of Datong 1st Mining Industrial site, parts of the nursery garden is the existing peach orchard. Besides, there is a few amount of agricultural vegetation, but most of them is deserted land with weeds on its surface, a few part of crops and weeds on the deserted land will be removed during the project construction period, and the peach trees will be removed or transplanted, which will cause a certain degree of impact on the ecological environment under construction but the influence on regional ecological environment is very small.

10.3.3.2 Ecological environment impact in operation period

There is no impact on ecological environment during the operation period of the project, and the reflected impacts are mainly positive one.

Through the environment restoration and landscape construction, the landscape in the subsidence area can be reconstructed. Combine the relevant ecology principles and the landscape in the subsidence area, apply the modern technology, with the help of human power supporting and induce, to improve the landscape structure and layout in the

subsidence area and enhance the landscape ecological function in the subsidence area for the landscape and ecological environment whose structure is damaged and function is disordered in the long term coal mining in the subsidence area., So as to attempt to improve the surrounding human settlement environment quality and continue to satisfy the demands of the human production or living. Conduct ecological restoration and landscape reengineering for the waste land in the subsidence area, and enhance the mining area ecological environment protection and restoration treatment to make it integrated with the surrounding landscapes, the landscape in the region has been enhanced and the ecology has been improved through treatment which are mainly reflected in the following aspects:

Ecological restoration of subsidence area: the environment restoration of coal mining subsidence area takes the restoration of forest ecological system in the project area as objective, takes full use of various ecological functions of environment protection, conservation of water source, improvement of urban area microclimate of the project area during the urban sustainable development process to greatly improve its ecological environment and meet the urban green land standard naturally kept. In the general provisions of Huainan City, it is cleared that the main objective of the subsidence area treatment is to improve the soil conditions and partly recover the land use function; conduct land reclamation; recover the vegetation and biodiversity, and improve the initial productivity, enhance the land system self maintenance ability; realize the landscape integration, recover the aesthetic characteristics of the environment, comprehensively restore the service functions of the ecological system.

Restoration of water body: form the ditches and lakeside region within the planned scope by using the swags formed by coal mining subsidence though the convergence of the inlet from the upside of the Mount Shungeng. Then through the connection of Datong drainage ditch, Chenxiang drainage ditch, Jiulonggang drainage ditch, Sundian drainage ditch with the peripheral water network of the planned area, take fully advantages of these water systems to forge green waterside landscape belt, thus creating beautiful and ecological green landscape environment.

Road construction: it mainly provids traffic convenience for citizens, so as to create good traffic environment for citizens rapidly and quickly when citizens are watching the natural ecology and artificial ecological landscapes.

Green road construction: strengthen the green road green corridor system based on the restoration of the regional vegetation to satisfy the canopy density, coverage rate, green corridor width and other rigid conditions of the green corridor system required by suburb green road construction. The suburb type green road must be set with greening protection zone, which shall not be less than 10m. In the green road planning and design, take advantages of status quo of road and water system etc. within the region for connection to form a green corridor, connect in series with the parks (such as wetland park), ancient cultural relics (such as slaughter hole and gun turret), farmland, forest land, water area and other green blocks with large area to form a stable ecological space protection system. The green corridor planning and design has formed three patterns of green corridors of waterside green corridor, Yanshan green corridor, series connected green corridor as selected according to green road line type.

It is considered in the evaluation that, the ecological environment of the subsidence has greatly influenced the overall development positioning and appearance of Huainan City, restricted the mutual blending and development between new city and old city, reduced the overall living quality of Huainan City. A landscape site with natural ecology shall be constructed through comprehensive treatment to make the coal mining subsidence area recover well. In the planning especially the restoration of the ecological environment and proper construction of landscape such as green land construction, effective integration and utilization of natural resources provide a leisure and rest place with beautiful scenery for citizens so as to effectively improve the urban environment quality and maintain the ecological balance to make the city being the real “green heart”. Measures should be taken

according to local conditions for the implemented projects and conduct comprehensive treatment to make it reach the available status. The green space has been enlarged through treatment to provide a leisure and accommodation place for citizens and improve the living quality and taste. The final objective of the project area is to restore the original ecological system and environment styles and features i.e. landscapes. After implementation of the project, the ecological environment of the region will be improved significantly and perfected.

10.4 Ecological protection and ecological restoration measures

10.4.1 Construction period

10.4.1.1 General requirements for ecological protection during the construction period

(1) Any development and construction which will damage the natural environment of mountain and water development within the project area is not allowed, road construction, protection of the natural environment and the artificial building structures should be with unified planning, meticulous design, scientific construction, and coordination with the surrounding mountain environment to avoid damaging the overall environment.

(2) For land mass whose ecology is seriously damaged within the project, take a short-term closed system, and make it recover naturallyback to the quality level of the ecological environment before being damaged.

(3) If any precious geological landscape and environment is found in the project area, it should be protected by setting up signs, barriers and other methods.

(4) Strictly protect the living environment of wild animals, maintain their normal ecosystem. During the construction period of the project area, any behavior that interfere the living environment of wild animals or killing wild animals is not allowed.

(5) Properly handle the relationship between the development of the project construction and water quality protection, and we shall not worsen the water pollution. Construction wastewater discharged into the water body must be handled with necessary measures to avoid the pollution of water quality and to protect the water ecological environment.

(6) During the project construction period, the publicity column or showroom for ecological environmental protection should be set up to educate the construction personnel to improve the ecological protection consciousness, making the ecological environment within the project area be better protected.

(7) Firmly tackle the illegal activities of excessive excavating and selling the rare medicinal plants.

(8) Optimize the engineering design: the engineering should be designed to conform to the topography as possible, avoid filling and excavating the surface on a big scale; keep the original trees and green space as far as possible; for the non-engineering layout surface, the original vegetation on it should not be damaged whether during or after the construction, lest cause soil erosion.

(9) Optimize the earthwork construction plan: take the cut-and-fill construction way, reduce the vegetation deterioration and soil and water loss by reducing the excavated volume of earthwork, stacking volume and freight volume. Make reasonable arrangement on the construction period. Flat area in the entire site and the main project should be arranged with reasonable schedule; reduce the construction intensity of earthwork and make full use of the low water season to conduct the earthwork project construction, reducing the washing of surface runoff caused by the rain and the water and soil loss.

(10) Strengthen the management of earthwork and vegetation restoration: select the appropriate site to set up the temporary stacking yards for earthwork. Take proper temporary water conservation measures, such as sand-guide sill etc. in the temporary stacking yards;

timely conduct the ground vegetation restoration work in the temporary stacking yards after the construction period.

(11) Strengthen the management of earthwork construction: before the commencement of earthwork, firstly, arrange the construction of temporary drainage ditch and the sand basin at the end of the ditch to reduce the washout to the bare surface in the project area by surface runoff. Before leveling earthwork construction, enclosure or breast board should be built first in the surrounding low-lying areas to collect the surface runoff in the project area, and make centralized emission for them, preventing the sediment of the runoff from randomly flowing into the water in the project area. Ground level of the construction surface and subgrade construction shall be compacted as soon as have been filled to prevent the loose topsoil from being lost.

(12) Plant trees and grass on the land for ecological recovery and landscaping timely in accordance with the design requirements, and the various plants measure indexes must meet the design requirements.

(13) Measures for animal protection

In the project area, there are no wild animals protected according to the national and provincial level, but the project department should warn construction units that when they see the wild animals during construction period, strictly protect them and it is forbidden to catch and kill wild animals, keeping them away being hurt.

10.4.1.2 Ecological protection and ecological restoration measures of each sub-project during the construction period

1. Environmental modification

(1) Ecological protection measures

In the process of environmental restoration, major prevention and control of ecological protection measures are mainly for the greenway construction and post construction, they should be strictly controlled within the construction site; for vegetation outside the construction site, it should be forbidden to be damaged; loosening the soil in the inferior woodland, thick-soil slope and thick-soil lowland vegetation recovery area again is to keep the available vegetation as far as possible from being destroyed or affected; for waste in waste yard should be shipped in time, properly handle, and should not press the vegetation.

(2) Ecological restoration measures

For Stone sloping land and waste yard, they should be renovated by mass; one land should be recovered after being renovated, and the bare surface is not allowed to be exposed for long periods of time in the absence of vegetation recovery.

According to the design, main vegetation types for environmental modification are:

Rocky stone slope: Species with resistance to drought and barren, mainly for climber plants are suitable for such land mass, with collocation of shrubs. Arbors: acacia, Albizia kalkora, Melia azedarach, cocobolo; shrubs: firethorn, pomegranate, euonymus; coverplants: cynodon dactylon, alfalfa, wintercreeper, euphorbia humifusa, forsythia, procumbent juniper; planting model: firethorn + moor besom, euonymus - wintercreeper + euphorbia humifusa + forsythia + procumbent juniper + cynodon dactylon, alfalfa.

Waste yard: it mainly selects arbors: acacia, Zelkova serrata, German oak, pistacia, goldenrain tree, soapberry, paulownia, magnolia gradiflora, ginkgo; shrubs, oleander, pittosporum, hibiscus, False indigo, osmanthus, firethorn, moor besom; cover: procumbent juniper, alfalfa, cynodon dactylon, wintercreeper, oxalis rubra. Planting models, Model I: Acacia + goldenrain tree+ paulownia, German oak + ginkgo - hibiscus, oleander + False indigo + osmanthus - alfalfa+procumbent junipere+ wintercreeper; Model 2: pistacia + soapberry + Zelkova serrata + German oak, magnolia gradiflora-pittosporum + firethorn + False indigo + moor besom - cynodon dactylon+ procumbent juniper+ oxalis rubra.

Low land at thick soil layer : such land mass may be submerged by waterlogging in the rainy season, so the tree species with better water tolerance should be selected. For tree species selection, arbor, metasequoia, Chinese beech, camptotheca acuminata, Ascendens mucronatum, catalpa bungei, weeping willows, poplars, ulmus parvifolia, dryland willow, Chinese ash; shrub: purple willow, euonymus japonicus, hibiscus, oleander, False indigo; cover: fleur-de-lis, canna, Lysimachia christinae, wintercreeper, trachelospermum jasminoide. Planting models, Model I: metasequoia + Chinese beech, Ascendens mucronatum + weeping willows, poplars- purple willow + False indigo + euonymus japonicus - wintercreeper + trachelospermum jasminoide + canna; Model II: ulmus parvifolia + camptotheca acuminata + catalpa bungei + poplar + dryland willow + Chinese ash - oleander + False indigo + hibiscus- fleur-de-lis + Lysimachia christinae

Thick soil slopes: such land mass should follow the principle of matching species with the site, but without any special requirement for plant selection. For tree species, arbor: bischofia polycarpa, camphor, German oak, goldenrain tree, soapberry, ginkgo, Zelkova serrata, elm, cedar; shrubs: pittosporum, hibiscus, False indigo, osmanthus, moor besom; Cover: dwarf lilyturf, oxalis rubra, Pink Reineckea Herb, zephyranthes candida, fatsia japonica. For planting model, Model I: zelkova serrata+German oak+ soapberry + bischofia polycarpa+ginkgo- pittosporum + False indigo + osmanthus+dwarf lilyturf + zephyranthes candida + oxalis rubra; Model II: cedar + Cinnamomum camphora + privet + goldenrain tree + elm - moor besom + False indigo + hibiscus - Pink Reineckea Herb + fatsia japonica + dwarf lilyturf.

Inferior woodland: such land mass should follow the principle of matching species with the site, but without any special requirement for plant selection. The woodland has been in forest, for which some shade-tolerant tree species can be selected. For tree species, arbor: Zelkova serrata, German oak, soapberry, elm, goldenrain tree; Shrubs: pittosporum, False indigo, moor besom, peach; Cover: dwarf lilyturf, oxalis rubra, fatsia japonica. For planting model, Model I: zelkova serrata+German oak+ soapberry + elm- pittosporum + False indigo +moor besom-dwarf lilyturf+ fatsia japonica+ oxalis rubra; Model II: Peach/pear tree (specific to the orchard part of the inferior woodland)

Dumpsite: greening tree species for closure of landfill are mainly for shallow-rootedness trees and Shrubs to avoid the engineering cover material in the dumping site being damaged due to the too deep root system of trees. For species selection, arbor: privet, poplar, acacia, oriental arborvitae, holly, Melia azedarach, Photinia davidsoniae; shrub: pittosporum, wahoo, lobular privet, firethorn; cover: procumbent juniper, cynodon dactylon, dwarf lilyturf, oxalis rubra, alfalfa. The planting model is: privet + poplar + acacia+ Melia azedarach + holly + Photinia davidsoniae, oriental arborvitae, euonymus + lobular privet + firethorn, pittosporum-dwarf lilyturf + cynodon dactylon, oxalis rubra + procumbent juniper + alfalfa.

The area of ecological restoration model related to the environment restoration see Table 10.4-4.

Statistical Table of Ecological Restoration Model Table 10.4-4

No.	Restoration types	Model types	Area (hm2)	Percentage
1	Stone sloping land	Model I	12.27	2.98%
2	Refuse landfill closure and stock	Model I	10.92	2.65%
3	Waste stock dump	Model I	18.13	4.40%
		Model II	10.13	2.46%
4	Low land at thick soil layer	Model I	21.20	5.15%
		Model II	10.75	2.61%

5	Sloping land at thick soil layer	Model I	100.84	24.48%
		Model II	120	29.13%
6	Inferior woodland	Model I	42.43	10.30%
		Model II	27.30	6.63%
7	Superior woodland	/	37.94	9.21%
Total			411.91	100%

According to the design, strengthen the green road pergola system based on the restoration of the regional vegetation to satisfy the canopy density, coverage rate, green corridor width and other rigid conditions of the green corridor system required by suburb green road construction. The suburb type green road must be set with greening protection zone, which shall not be less than 10m. In the green road planning and design, take advantages of status quo of road and water system etc. within the region for connection to form a green corridor, connect in series with the parks (such as wetland park), ancient cultural relics (such as slaughter hole and gun turret), farmland, forest land, water area and other green blocks with large area to form a stable ecological space protection system. The green corridor planning and design has formed three patterns of green corridors of waterside green corridor, Yanshan green corridor, series connected green corridor as selected according to green road line type.

It is considered in the evaluation that, the local forestry experts shall be consulted for the selection of trees and grass seeds for the project considering both the urban landscape effects and the harmony with the current species in the project area. The selected seeds of trees are all common local species of Huainan City without any foreign ones. In the implementation of the project, it must be implemented according to the arbor, shrub, and herbage suggested by FSR which shall not be changed at will. After implementation according to the vegetation specifies selected by FSR, the project area will not be impacted by the foreign specifies attack nor the invasion of the foreign specifies, thus no invasion of the foreign diseases and insect pests hidden by the foreign specifies, which is therefore beneficial for the ecological environment inside or outside the project area. It is considered in the evaluation that, the selection of the above vegetation types will not have adverse impact on the vegetation in the project area, and the designed ecological restoration measures are feasible, the selection and matching of the seeds of trees are reasonably, which can satisfy the requirements of ecology restoration and environment protection.

2. Water system comprehensive renovation

(1) Ecological protection measures

Water system comprehensive renovation engineering mainly includes the widening and desilting work of Datong drainage ditch, Chenxiang drainage ditch, Jiulonggang drainage ditch, Sundian drainage ditch, and the desilting work and excavation and renovation engineering of transverse connected water system of # 1, 2, 3 lake. In order to protect the ecological environment, the construction unit shall construct according to the red line of the ditches renovation planning. Transplant the arbor that can be transplanted within the excavation range, do not cut down the arbor out the excavation range at will. Because the excavation is apparently larger than the fill in the water system treatment engineering, the proper low lying land shall be selected for the stacking of residue earthwork and sludge to reduce the occupation and compression of the existing vegetation and level it after completion of the engineering and restore the ecological environment synchronously.

(2) Ecological restoration measures

In the design, ecological slope protection measures are taken for all the shore side of

eight ditches and three lake regions, the total area of the ecological protective slope is 3.26hm2, and ecological slope protection for the ditch bank and lake shore is conducted in the design and is considered as reasonable and feasible by the evaluation. It is required by the evaluation that it shall construct and timely protect the slope section by sections as far as possible according to the construction situation during the comprehensive renovation construction for the ditches, and timely restore the ecological vegetation environment of the ditch bank and lake shore.

3. Regional infrastructure construction

(1) Ecological protection measures

During the road construction, especially the construction of the Yanshan Road and intercepting ditch, it will impact the vegetation of the mountain forest. It shall be constructed strictly according to the road red line and the planned red line of the intercepting ditch and the residue earthwork shall be carted out and shall not occupy the land outside the road red line and planned red line of the intercepting ditch. Meanwhile, for the vegetation outside the planned red line, it shall not be cut and chopped down in the construction causing the loss of the vegetation. The construction camps shall be set in the urban or the nearby villages as far as possible, and shall not be set in the project area as far as possible. Conduct balance computation for the excavation and fill to reach the balance of the excavation and fill as far as possible, use the excavated earthwork for the deficiency as far as possible,. It shall not set the excavation and earth borrowing site within the project area so as to protect the ecological vegetation within the project area. The water supply engineering and the drainage engineering are all under the road newly built this time therefore the construction of the water supply and drainage pipelines has no impact on the ecological environment.

(2) Ecological restoration measures

A four –meter wide green belt is designed to be set in the Zhongxing Road construction, which is considered as reasonable and feasible by the evaluation. However, there is no green belt on the Wanxiang Road, Jiukong Road, and Yanshan Road. The evaluation considers that at least 1 row of road border trees shall be planted on the Wanxiang Road and Jiukong Road. For Yanshan Road, it shall depend on the specific situation. Border trees shall be configured in the road segments with relatively poor vegetation and shall not be configured in the road segments with the relatively good vegetation. Meanwhile, it is required that the intercepting ditch and the Yanshan Road shall be constructed synchronously to reduce the ecological environment impact caused by the construction out of sync.

4. Regional land development and utilization

(1) Ecological protection measures

To protect the ecological environment, the red line scope shall not be exceeded and the ecological environment shall not be damaged during the project construction process, the temporary sites and construction camps and other temporary land shall not be set outside the project area. All construction activities shall be implemented within the red lines for the land occupation to ensure the surrounding ecological environment not to be impacted.

(2) Ecological restoration measures

According to the design: ① for middle service points, the green area is 3867m2,accounting for 44.0% of land area,② for east service points, the green area is 3279.00 m2,accounting for 31.8% of land area, ③ for flowers and trees trading market, land occupation area is 8.35 hm2,green area is 3.04 m2 which accounts for 36.41% of the land occupation area, ④ the land occupation area of nursery garden base management area is 0.48hm2 , the surrounding is all nursery garden base, ⑤ garden displaying potted landscape, the land for open ground production is 5.24hm2, land for management of building is 0.12 hm2, ecological protection and greening is1.13hm2.

It is considered in the evaluation that, the index of greening land occupation in the construction area under the land development and utilization are all above 30%, complying with the ecological environment requirements, more complying with the theme thought of comprehensive renovation for subsidence area.

10.4.2 Ecological protective measures in operation period

10.4.2.1 Ecological environment impact in operation period

This project belongs to the ecological project, the ecological impact of which in the project operation period is the increase of regional green land area and biomass, and the improvement of environment. The possible ecological adverse impact is the formation of local inundated area in # lake 3in flood period.

The terrain in # lake 3 is relatively low, the elevation of which is 31-34m. The inlet in the current lake region mainly comes from the # 2 transverse furrow and # 4 longitudinal furrow，drained through Chenxiang drain ditch and one box culvert, wherein, the flow capacity of Chenxiang drain ditch is approximately 11m3/s currently; the flow capacity of the box culvert at the lake region is less than 10m3/s, the peak discharge once thirty years of upstream inlet area reaches 78m3/s. Therefore, the flow capacity of # lake 3 is insufficient seriously, which will produce a certain area of inundated area.

When the regulation and storage capacity of # lake 3 reaches the maximum value, the inundated area of it reaches the maximum value, and the maximum inundated range line is 33.87m, and the inundated range is mainly shown in Table 10.4-1. When the flood is gone, it will take 10.5 hours for the water in the lake area to drain to the normal water level of 32 m.

According to the design, when the # 3 lake is at the normal pool level of 32.0m, the water storage area of the lake region is 27.13hm2, when the inundated range line is 33.87m, the area of lake area is 39.5hm2, the impacted area of the inundated area is 12.37hm2, all the inundated area belongs to the planned forest land in the environment restoration, which has a certain degree of water resisting property, the ecological environment of which will not be impacted seriously within a short time. But the necessary measure shall be taken for prevention.

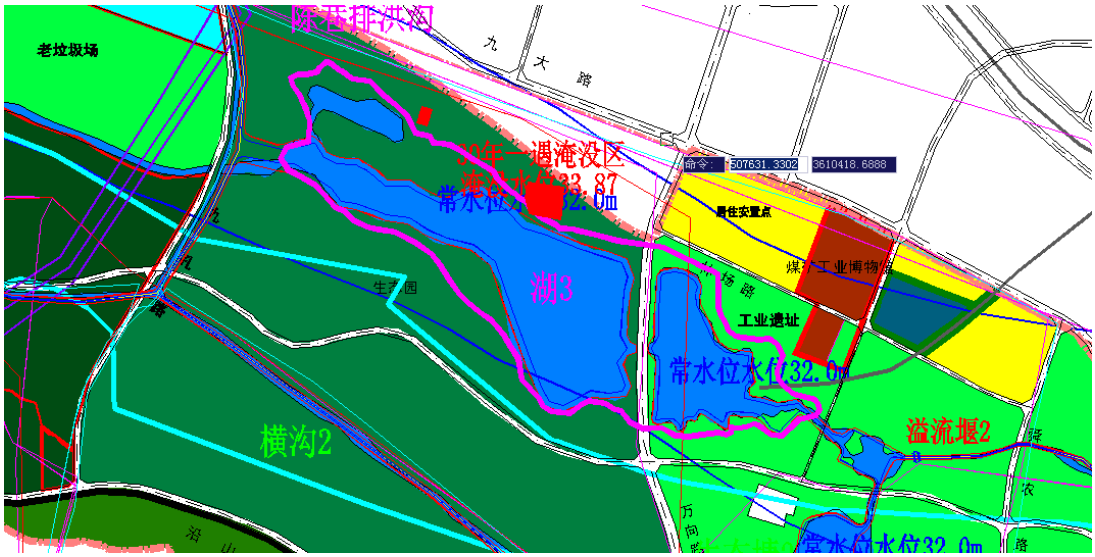


Table 10.4-1 # Lake Inundated Range Map

陈巷排洪沟	Chenxiang Drainage Ditch
30 年一遇淹没区	Inundated area once 30 years
淹没水位	Inundated water level

常水位	Normal water level
横沟 2	# 2 Transverse furrow
老垃圾场	Old refuse landfill
湖 3	# 3 lake
溢流堰 2	# 2 Down-flow weir
居住安置点	Residence relocation sites
林场路	Linchang Road
舜农路	Shunnong Road
煤矿	Coal mine
工业博物馆	Museum of Science & Industry
九大路	Jiuda Road

Table 10.4-1 # Lake Inundated Range Map

10.4.2.2 Protective measures in operation period

1. Ecological protective measures in inundated area

In the environment restoration, water resisting property shall be properly considered for the seeds of the trees in the inundated area, such as weeping willow, Saliz matsudana (commonly known as Salix magnifica), metasequoia, Robinia pseudoacacia, meanwhile, the arbor shall be planted in the inundated area primarily, while the plant number of shrubs shall be reduced as far as possible, when the arbor reaches 2m, the inundated area will have little impact on the forest land. After the water recedes in the inundated area, the aslant trees due to the water immersion shall be timely centralized and taken necessary supporting measures to prevent the trees lodging and causing damages to forest land.

2. Insect disease prevention

Strengthen the insect disease prevention, as well as the observation and predication of the diseases and insect pests for the tree, equip the necessary deinsectization equipment and deinsectization tools, monitor the diseases and insect pests at proper time, and select proper pesticide for prevention once diseases and insect pests is found according to the features and endanger degree through market purchase.

3. Forest land fire prevention

Strengthen the fire prevention work for the man-made forest and natural forest. To prevent the forest fire, dispatch specially-assigned personnel for patrol inspection in the project operation period to completely eradicate all fire risks. If the forest land fire happen, the fire brigades of Huainan City or the surrounding cities can be available for extinguishment.

10.5 The analysis of the effect of the project implementation on the Shungeng Mountain Scenic Area

10.5.1 The planning area of the Shungeng Mountain Scenic Area

According to the article 2 of the Shungeng Mountain Scenic Area Management Regulations, the scope of the Shungeng Mountain Scenic Area is as follows: the east is bounded by the Small East Mountain of Jiulonggang Town in Datong District, the west is bounded by the small volcano of Wangfenggang Town in Xiejiaji District and the south and

north sides are bounded by the along mountain roads. The specified scope of the Shungeng Mountain Scenic Area will be confirmed by the specialized planning of Shungeng Mountain Scenic Area approved by the city government. The article 18 stipulates that “the following activities shall not be allowed in Shungeng Mountain Scenic Area: (1) constructing the facilities that are used for storing explosive, inflammable, radioactive, toxic and corrosive materials; (2) mountain quarrying, dig sand and soil, mining, and so on; (3) building tombs; (4) hunting wild animals and grazing animals illegally; (5) cooking a meal in the open air and smoking, letting off firecrackers, burning paper and candles in the fire banning area; (6) dumping; (7) destroying the landscape facility, the public utility and other public utilities; (8) other behaviors of sabotage to the resources and environment of Shungeng Mountain Scenic Area”. The article 11 stipulates that “the scenic spots and infrastruction construction of the specialized planning of Shungeng Mountain Scenic Area should be listed in the city annual construction plan and executed gradually. All sectors of society are encouraged to invest and contribute money to build the scenic spots and the infrastructure according to the specialized planning of Shungeng Mountain Scenic Area.

According to the specialized planning of Shungeng Mountain Scenic Area, the south and north of the Shungeng Mountain Scenic Area are bounded by the along mountain roads including the old Longyan reservoir, the east is bounded by the Small East Mountain (the Small East Mountain is in the east of the 206 national road) of Jiulonggang Town in Datong District, the west is bounded by the small volcano of Wangfenggang Town in Xiejiaji District, and it locates between the Shannan new Ditrict and the main urban area Dongcheng. The planning area of the scenic is 19.11km2 and the caves and mountains are the center of the whole scenic area.

10.5.2 The effect of the construction on the ecological environment of the Shungeng Mountain Scenic Area

(1) The ecological environment effect

The Yan Shanroad built in this project is part of the north along mountain road of the Shungeng Mountain Scenic Area and confirms to the road construction planning of the Shungeng Mountain Scenic Area. The total length of the construction section is 4.07km, including the forest land of about 2.3 km and the deserted land of 1.77km. The area of the damaged forest land of the road construction is about 1.61hm2 and is 0.08% of the total scenic area, so the damaged area of vegetation is very small and the effect to the Shungeng Mountain Scenic Area ecological environment is very little.

The construction of the Yan Shan road provides the inhabitants of Huainan with a favorable recreational environment to enjoy the scenery of the mountain and the beauty spot. Only by constructing the appropriate road can the scenic area give play to its viewing value and leisure value.

(2) The effect of the project area vegetation restoration to the vegetation species in the Shungeng Mountain

The selected tree and grass species are reproduced by the native species, after the restoration of the vegetation in the project area, the artificial cultivated vegetation will integrate with the native vegetation in the Shungeng Mountain and will not have any influence to the vegetation of Shungeng Mountain Scenic Area. The “mass pits” in the project area has become an obvious artificial forest and it has not had any influence to the forest land vegetation of the Shungeng Mountain Scenic Area. People has evaluated that the selected native tree and grass species to make the artificial environmental modification will not have any influence to the vegetation of Shungeng Mountain Scenic Area.

(3) The effect of the construction of the Yan Shan road to the Shungeng Mountain Scenic Area and the protecting measures

The construction of the Yan Shan road will destroy the vegetation of the forest land for road, so the construction organization should be in strict accordance with the planed road to

construct and should not construct out of the planned red line to destroy the environment. The construction organization should take practical measures to protect the vegetation out of the red line. If the construction is in strict accordance with the red line, then the construction of the along mountain road will has very little effect to the ecological environment of the Shungeng Mountain Scenic Area. According to the research design, the along mountain road will not set up the green belts and it will take the nature mountain forest as the ecological vegetation along the sides of the road. Therefore, there is no problem of invasion of alien species and invasion of the alien plant diseases and insect pests in the construction of the along mountain road.

10.5.3 The effect of the visitors on the ecological environment of Shungeng Mountain Scenic Area in the operating period

It is mainly the relaxation outskirt travel of the inhabitant in Huainan in the operating project. The inhabitant will take a leisure and sightseeing along the along mountain road and the scenic spot road and will not have any effect to the ecological environment.

However, the administrative department of the Shungeng Mountain Scenic Area should equip the necessary dustbins, toilets, relaxing seats and so on to give tourists the convenience to go to the toilet, throw rubbish and relax. Meanwhile, the administrative department should set up some warning signs to stop the tourists from treading the grass, littering, damaging the vegetation, deflowering and fruiting. Smoking and cooking in the air in the scenic spot is prohibited in case of the forest land fire and hunting animals is also inhibitory.

It is evaluated that the operating period will not have any effect to the ecological environment of the Shungeng Mountain Scenic Area after taking the above measures. The construction of the along mountain road will obviously promote the travel value and the traffic condition of the scenic area.

10.5.4 The prevention and cure of the plant diseases and insect pests

The project is not included in the duty of the Shungeng Mountain Scenic Area and the administrative department of the Shungeng Mountain Scenic Area will in charge of the prevention and cure of the plant diseases and insect pests.

10.6 The effect of using the insecticide and the pest control

10.6.1 The pest control

1. The basic principal

The pest integrated management (IPM) is the core content of the insect disease integrated control and is the significant measures of the plant diseases and insect pests prevention and control.

The pest integrated management (IPM) was the modified pest control strategy in 1972 and was based on the integrated pest control (TPC) suggested by the United Nations Food and Agriculture Organization in 1966. The pest integrated management emphasizes the dominated control of nature controlling and the cooperation of other prevention measures with nature controlling. The IPM will be in accordance with the feature and habit of different bionts to firstly enhance monitoring and emphasize the using of quarantine act, forestry building, physical and mechanical method and biological method to prevent insect disease. Only in the condition that the above method cannot efficiently prevent the insect disease can the chemical method of using the chemical insecticide of high efficiency and low toxicity be used.

In the pest control strategy making, we should consider not only the economic benefit, but also the ecological balance and the society security. Based on this theory, the prevention should be first and the forest building measures should be the base in the forest pest control project. Meanwhile taking full use of the nature’s control to the pest disease and creating the

adverse conditions to the generation and development of the pests. Adjusting measures to local conditions and applying the biological, mechanical, chemical and other measures to supplement and coordinate each other in the control of the pest disease. Trying to avoid killing or hurting the pest's natural enemy and avoid polluting the environment, and controlling the pest disease to an endurable level.

Sticking to the localization management, government responsible and each department performs its own functions to practice the responsibility system of protect and develop the nursery stock resources. Sticking to the measure of prevention first and prevention and treatment integrated, and strictly control the spread of the epidemic situation. Sticking to comprehensive prevention and focused treatment to make sure the security of the key region. Sticking to compartment reasonably and take classifying management measures to increase the efficiency of the prevention. Sticking to the prevention measures that are in accordance with the law and sticking to the standard management to promote the scientific prevention level.

2. Goal of the prevention and cure

To popularize and demonstrate the plant diseases and insect pests nuisanceless control technology. The unallowable insecticide by the nation is strictly prohibited in using so that to avoid the unnecessary bad influence and losses to the nursery stock in the project area.

3. Plant quarantine

The project area should strengthen the plant quarantine. They should execute the producing area quarantine, the transportation quarantine and the rechecking to ensure the efficient quarantine treatment. Forbidding to buying the vegetation from the area where there are quarantine objects and serious quarantine. To manage the forest in the registration certificate system and conduct the "nursery stock production certificate", "nursery stock quality inspection certificate" and "nursery stock production and management certificate" so that to standard the production and sales behavior of the nursery stock. To strengthen the quarantine work to the import wood and woodwork and when find the quarantine object destroy it on the spot to prevent the quarantine object from spreading into the project area.

4. Forecast and prediction

The plant protection department of the project area should timely announce the occurrence dynamics and occurrence trend of the plant diseases and insect pests according to its occurrence, the biology ecological characteristic and the occurrence and development law. The forecast content includes the emergence period, the occurrence amount, the occurrence scope and the endanger degree and so on.

5. The responsibility of the construction unit

(1) The construction unit should employ the pest control expert to cultivate the manager in the project area to make the plant diseases and insect pests monitoring plan and also make right evaluation in the management of the plant diseases and insect pests. Meanwhile, to ensure the manager can take the right the plant diseases and insect pests integrated control technique in the execution of the project.

(2) The construction unit should appoint specialized full-time staff to supervise the implementation process of the pest control method.

(3) The construction should build long-term regular contact relationship with the Institute of Plant Protection in Anhui Agricultural University, the prevention and control of forest diseases and insect pests quarantine station in Anhui province, the rural plant protection master station in Anhui province and the academy of agricultural sciences plant protection organization to accumulate the pest control prevention and treatment knowledge in the project area, so that to increase the integrated management ability to the plant diseases and insect pests.

(4) The construction should keep intimate contact with individual operating agency or self employment venture and timely grasp the occurrence and treatment of the plant diseases and insect pests to prevent the large area of plant diseases and insect pests. If there is a large area of plant diseases and insect pests, the exploiting work unit should employ the expert to guide the prevention and cure work of the plant diseases and insect pests.

10.6.2 The effect and requirement of using the insecticide

10.6.2.1 The effect of using the insecticide

The largely using of the insecticide resulted in the pollution of the atmosphere, the water, the soil and so on. The insecticide and the degradation production of it in the nature environment will result in the pollution of the atmosphere, the water and the soil, so this is the way they destroy the ecosystem. Moreover, they may cause the acute or chronic intoxication in human beings and the animals.

The insecticide pollution to the atmosphere is mainly from a large number of suspended solids formed by the spraying of the pesticide. The suspended solids will be absorbed by the floating dust in the atmosphere or suspend in the air in the state of gas-aerosol. The concentration of the insecticide is very low in the air and will not have any harmful effect. The harm of it mainly manifested in the following two aspects. Firstly it may have harmful effect to the drug delivery person and the surrounding sensitive living bodies. Secondly, it may damage the health condition of the production personnel of the pesticide. The insecticide pollution to the water is mainly from the following aspects. The particle of the pesticide moved to the water and the soil with the wind in the spraying of the pesticide. In the natural world, the injurious insect and its enemy is keeping a fixed ecology balance. The largely using of the poisonous pesticide will seriously affect the balance. The drug-fast of the pest will increase the application rate of the pesticide, thus cause the adverse effect to the forestry production and the environment.

In consideration of the adverse effect of the pesticide to the atmospheric environment, the water environment, the soil environment and the human health, the project area should take the prevention as the principal measure to the plant diseases and insect pests and should forecast early and prevent and cure early. So that to prevent the large occurrence of the pests and the extensive using of the pesticide. Meanwhile, the using of the pesticide should be targeted to prevent the abuse and result in the bad effect to the environment. In the using of the pesticide, people should choose the pesticide with low toxicity to lower the effect of it to the environment.

10.6.2.2 The requirement of using the insecticide

1. The overall goals of implementing the PMP (PMP-pest management plan)

(1) The high-toxic chemical pesticide is banned for the nursery stock operator to use;

(2) Reducing the selling amount of the chemical pesticides that are inappropriately or incompletely tagged to the forest workers.

(3) Increasing the awareness, understanding and applying ability concern the plant diseases and insect pests integrated management.

(4) Increase the ability of safe handing and management to the chemicals.

2. Management measures

(1) To establish the project area plant diseases and insect pests management center. The management center should regularly examine the using pesticides in the project area to ensure the safety of the chemicals used by the project beneficiary. The examining content includes the following:

i The production, packaging, tag, transportation, storing, application and treatment are according with the standards of the World Bank.

ii The unallowable pesticides to preparation are the IA and IB kind production stipulated by the World Health Organization, or the concentration of the active ingredients in kind II pesticide surpass the standard of the World Health Organization.

(2) Any pesticide that the project beneficiary bought should pass the following exams:

i To examine the kind and degree of the danger resulted from the usage and user;

ii To examine the reliability of the usage and the use ability of the user;

iii To examine the grade and preparation of the pesticide on the basis of The Pesticides Classification Method and Regulation According to the Suggested Risk (Geneva: WHO2004-05）and the latest classification date;

(3) The selection of the pesticide must meet the need of the operation policy (OP 4.09) standard of the World Bank. These pesticides:

i should have little harm to human health;

ii must be proved to be effective to the prevention goal;

iii must have the least effect to the non-target specie and the natural environment. The choice of the using method, time and frequency must have the least effect to the natural enemy. The pesticide that used for the public health plan must be proved to be safe to the inhabitant in the applying area, the local species and the applying person.

3. To observe the following regulation strickly

(1) The standard (or the relevant criteria of China) about the pesticide regulation, distribution and usage of the FAO (FAO-the United Nations Food and Agriculture Organization);

(2) The standard (or the relevant criteria of China) of FAO about the pesticide packaging and storing;

(3) The standard (or the relevant criteria of China) of FAO about the external packing tag of the pesticide;

(4) The standard (or the relevant criteria of China) of FAO about the residual pesticide on the spot and the disposition of the pesticide packaging container;

(5) To observe the discharge standard of the pesticide pollutants formulate by the State Environmental Protection Administration (SEPA).

4. The pesticides that are recommended to use in the project

In order to further promote the nuisanceless control to the forestry pests, and protect the ecological environment and the biodiversity, the State Forestry Bureau recommends a batch of pesticide products that are of high efficiency, low toxicity and low residue according to the current pesticides development level of our nation.

Among them, the biologics and the natural enemy are: agritol (Bt), the pine moth virus, the gypsy moth virus, the spring inchworm virus, the fall webworm virus, the tea geometrid virus, sophocarpidine, azadirachtin, nicotine, rotenone, the celastrus angulatus, avermectins, spinosad, beauveria bassiana, green muscardine fungus, micro sporozoan, pyrethrin and the scleroderma guani, the trichogramma, the chouioia cunea Yang, the coccobius azumai Tachikawa, ladybird and other parasitic and predatory natural enemies.

The attractant are: the monochamus alternatus hope attractant, the dendroctonus valens attractant, the parathrene tabaniformis rottenberg attractant, the sex pheromone of pine caterpillar, the fall webworm attractant, the holcocerus hippophaecolus attractant and so on.

The combination drugs (chemical pesticide) are: deltamethrin, cyfluthrin, cypermethrin,

chlorpyrifos, chlorbenzuron, triflumuron, hexaflumuron, diflubenzuron, tebufenozide, imidacloprid, methylamine abamectin, acetamiprid, fipronil, chlorfenapyr, lime sulphur, mancozeb, carbendazim, chlorothalonil, triadimefon, myclobutanil, iprodione, flumorph and flocoumafen, bromadiolone, chemosterilant, repellent.

The equipments for plant protection are: the engine driven sprayer-duster (to give pesticide evenly, the electrostatic machine), the engine driven sprayer-duster, the vehicle-mounted high range sprayer, aerosol sprayer, the motor punch injection machine, the forest injection sampler and the insecticidal lamp.

Recommend to use pesticide and use the pesticide of low toxicity, in principle. Only when the injurious insects such as the phylloxera and the limb pest occur can the poisonous pesticide be used. We should try to avoid using the medium toxicity pesticide in other plant diseases and insect pests. In the using the medium toxicity pesticides, strict control should be made to prevent the immoderate usage in a large scale and also to decrease the effect of the pesticides to human beings and the ecological environment.

5. The supervising content of the World Bank supervising group

The operation of the following work should be field monitored in the process of the World Bank supervising group inspect the project:

(1) The register condition (the documentary evidence) of the pesticide;

(2) Whether or not used the pesticide of class I;

(3) The implement of the related policies;

(4) The executive condition of the field monitoring plan and the subsidy measures of the analysis result.

6. The specific supervising and checking content of the exploiting work unit

(1) The service condition of the pesticide;

(2) To check if the pesticides that the dealer sold and the farmers used are registered and recommended by the plant diseases and insect pests management agency;

(3) To check if the class I pesticides are selling or using in the project area;

(4) To check the pesticide registries to see the register condition of the new pesticide;

(5) To check if the farmers take the safeguard measures in the using of the pesticide;

(6) To check the farmers' disposition condition to the abandoned pesticide and package.

Chapter XI Environmental Management Plan

11.1 Purposes of environmental management plan

The purpose of environmental management plan is to formulate a set of technically feasible, financially sustainable and operable environment countermeasures aiming at the inevitable impact on the environment in the project, and clear the environmental impact mitigation, environmental management, and institution-building measures and arrangements conducted by the project contractor, supervisor party, operator, and the environmental management department during the project construction and operation period, so as to eliminate or compensate as much as possible the negative impact on society and environment caused by the project, and reduce the negative impact to the acceptable level.

The specific objectives of the Environmental Management Plan include:

1. Clear the environmental management obligations of the contractor and the operator

Conduct the detailed on-site check on environment protection targets, and put forward the effective environmental mitigation measures, which shall be included into the engineering design as the contractual obligation of the contractor and operator.

2. Operating instruction for environmental management

The environmental monitoring plan during the construction period and operation period proposed by the Environmental Management Plan can ensure the effective implementation of environmental mitigation measures, and it will be offered to the construction supervising unit, environmental supervision unit, and other related units during the construction period and operation period as the environmental protection text, to clear the responsibilities and roles of related functional departments and regulatory agencies, and propose the communication channels and ways between different departments.

3. Guarantee the expenditure of environmental management activities

The expenditure of environmental management, environmental supervision and capacity building shall be estimated in the Environmental Management Plan, and state the funding source, so as to ensure the implementation of all environmental management activities, among which, the administration expenses include personnel wages, office allowance, and travelling expenses.

The Environmental Management Plan is used to avoid and control the environmental impact in the process of project implementation and operation; thereby put forward the supporting measures needing to be conducted that influence the mitigation measures, monitoring measures, legal supervision means, and the above-mentioned measures; meanwhile, it is also the key link of connecting the environmental impact and the mitigation measures and alternative measures detailed in the environmental impact assessment. As for each of the environmental management measures, the environmental management will stipulate its technical connotation, investment estimation, implementation plan, functions of the government institutions, sources of funding, and monitoring scheme.

11.2 Designs of environmental management plan

In order to describe the environmental management, environmental supervision and environmental monitoring, etc. in details, the established environmental management plan is the guidance document for environmental management during the project implementation, and the action plan mainly includes the following five parts:

1. Environmental influence and mitigation measures: environmental influences during the project construction period and operation period, and the engineering measures and management measures adopted to prevent or mitigate the adverse environmental influences caused by this project.

2. Environmental management and supervision plan: environmental supervision actions taken in order to guarantee the synchronous implementation of environmental protection measures and engineering construction.

3. Environmental monitoring plan: environmental monitoring actions adopted in order to eliminate the environmental pollution during the construction period and operation period, and guarantee the safe operation of the project and the improvement of the environmental conditions in the project area.

4. Ability building (personnel training) plan: knowledge and skill training for the managers, environmental supervision personnel, full time or part time environmental management personnel, and etc. launched during the project implementation period in order to guarantee the implementation of environmental management plan.

5. Expenses and institutional arrangement: certain fund support shall be guaranteed in order to guarantee the implementation of the environmental management plan, and shall be implemented by the corresponding institution.

11.3 Environmental Management System

11.3.1 Environmental Management Organizations

Due to the large differences between the contents of environmental management in construction period and operation period, as well as the difference of provisionality and persistence of the work time, the separate organization shall be set up respectively, and the method of taking charge by phases shall be adopted. When the construction period is finished, the corresponding management agencies shall be revoked, and the management agencies of the operation period shall be started; the intersection of a certain period of time is allowed according to the specific situation of the work. See figure 3-1 and figure 3-2 for the environmental management organizations setting of this project.

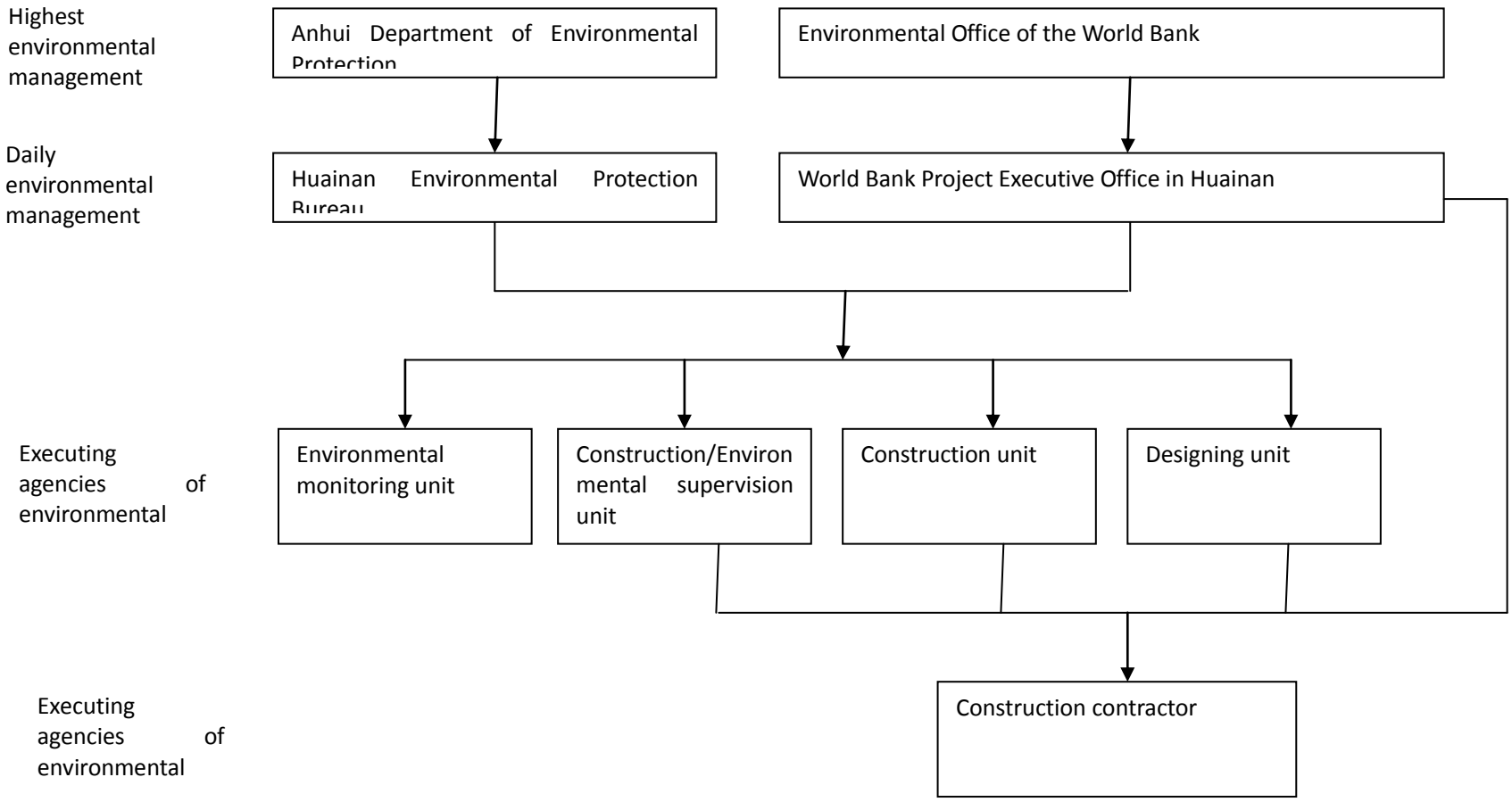


Figure 11-1 Figure of environmental management agencies in the construction period

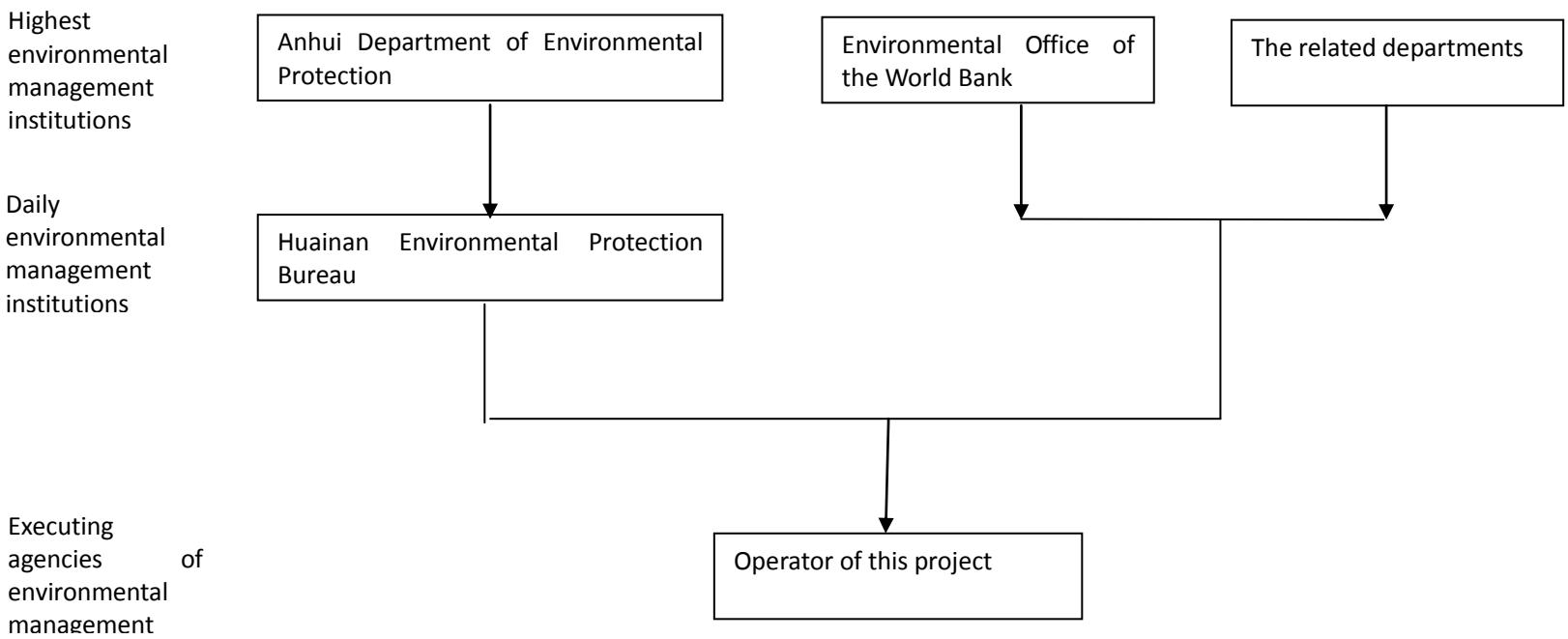


Figure 11-2 Figure of environmental management agencies in the operation period

During the operation period of this project, the operator of the environmental modification and regional land exploitation and utilization subprojects is Huainan Agricultural Water Conservancy Investment Development Co., Ltd., the operator of the water system comprehensive improvement subproject is Huainan Water Conservancy Bureau, the operator of the closure of the old Datong old refuse landfill is the Environmental Sanitation Department subordinate to Huainan City Appearance Bureau, and the operator of the regional infrastructures after being constructed is Huainan Municipal Administration Department.

11.3.2 Environmental Management Responsibilities and Contents

11.3.2.1 Responsibilities

The main responsibilities of the each related environmental management organization are as follows:

1. Project Office

Assist the Environmental Department of the World Bank in the environment supervision of this project.

2. Huainan Environmental Protection Bureau

According to the requirements of the related domestic laws and regulations, Huainan Environmental Protection Bureau shall be responsible for supervising the whole process of this project, put forward requirements for the environmental protection of this project, and shall be responsible for the “three-simultaneity” completion acceptance of this project.

3. Environmental Supervisor

Assist the owner in the supervision of the environmental protection measures implementation in the construction site, and raising remedial measures for the environmental problems generated during the construction period.

Formulate detailed management plan according to the construction plan of this project, inspect and revise (if necessary) this plan monthly. The head shall report such work to the project leader, report the environmental management and inspection results at regular intervals every month, and put forward targeted solutions for the potential environmental problems found in the inspection.

4. Designing and Environmental Assessment Units

Compile environmental management plan and the implementation plan for each environmental protection measure, and guide the execution of the environmental management plan.

5. Huainan Agriculture Water Conservancy Investment and Development Co., Ltd.

Guarantee the implementation of the related environmental management measures taken by the environmental management department and the environment division of World Bank, and at the same time, assist the environmental management department in the daily environment inspection. In addition, set specialized agency (Environmental Protection Section) and full-time personnel in charge of environmental management.

6. Construction Contractor

Specifically carry out each environmental protection measure and job.

7. Operating Agency

Be responsible for executing the environmental protection measures during the operation period.

11.3.2.2 Contents

See Table 11.3-1 for the phased environmental management contents and personnel allocation conditions of each environmental management organization.

Phased Environmental Management Contents Table 11.3-1

Phase	Project Related Party	Main Environmental Management Contents	Personnel Allocation
Design and Preparation	Project Office	Be responsible for contacting and coordinating the implementation of environmental management issues with the government competent department for environment.	1
	Agricultural Investment Unit	1. Be responsible for a series of environmental protection and management work in the project designing and preparation phases; 2. Implement the environmental protection work expenditure; 3. Be responsible for coordinating the implementation of environmental management issues with the government competent department for environment;	2
	Designing Unit	1. Incorporate the environmental protection measures into the designing scheme and budget; 2. Incorporate the mitigation measures in the environmental management plan into the technical specification of the biding document.	2
	Environmental Assessment Unit	1. Provide technical support for the environmental protection work of the engineering design; 2. Compile environmental impact assessment document; 3. Formulate environmental management plan.	4
Construction Period	Project Office	Be responsible for contacting and coordinating the implementation of environmental management issues with the government competent department for environment.	1
	Agricultural Investment Unit	1. Be responsible for a series of environmental protection and management work in the project construction phases, and implement the environmental protection work expenditure; 2. Manage and supervise the environmental protection work during the construction period, investigate and dispose the residents disturbance or pollution problems generated during the construction process; 3. Be responsible for coordinating the implementation of environmental management issues with the government competent department for environment; 4. Track the implementation of environmental management plan, report to the competent department at the same level, provincial project office and World Bank at regular intervals. 5. Accept and dispose the public complaints.	2
	Contractor	1. Launch and implement the environmental protection measures and jobs during the construction period according to the bidding documents, contract agreement	2

		and this environmental management plan; 2. Accept the guidance and supervision of the project owner's environmental managers, environmental supervising engineers and the related government functional departments. 3. Accept the technical support provided by the environmental protection consultation agency; 4. Take safety protection measures, such as setting informatory signs in the construction site and enclosing the boundary of the construction site; establish communication channel with the public, and guarantee safe construction. 5. Execute the environmental management plan.	
	Project/ Environment Supervisor	1. Supervise the contractor to execute the environmental management plan, perform the environment mitigation measures specified in the contract agreement; 2. Supervise the implementation of the contractor on the site; 3. Cooperate with the construction unit to execute the environmental management; 4. Record the implementation of the environmental management plan, form a report and submit to the owner periodically.	5
	Environmental Monitoring Unit	1. Accomplish the environmental monitoring work during the project construction period and operating period according to the delegation of the owner and the environmental monitoring plan raised in this evaluation; 2. If abnormity is found during the construction period, monitor as entrusted by the owner.	To be determined according to the entrusted task scope
	Local environmental protection agency	1. Supervise and inspect the environmental protection measures of the owner and construction units; 2. Receive the environmental management plan executing condition report submitted by the owner and project office, and carry out administrative management according to the report; 3. Arrange emergency measures if abnormal environmental conditions arising during the construction; 4. Accept the public complaints, and coordinate and dispose such complaints.	1
	Technical assistance/ consultant	1. Provide technical support to the environmental protection work during the project construction period according to the delegation of the owner, this environmental impact statement and environmental protection designing achievements; 2. Provide technical guidance for the contractor's environmental protection work, and accomplish the environmental protection training work during the project construction period.	Unlimited

		3. Report on the implementation of the environmental management measures.	
Operation Period	Project Office	Be responsible for contacting and coordinating the implementation of environmental management issues with the government competent department for environment.	1
	Agricultural Investment Unit, Environmental Sanitation Administration Agency, Forestry Bureau and Municipal Department	1. Be responsible for the environmental protection and management work after operating, implement the mitigation measures and monitoring work during the environmental management plan operation period; 2. Be responsible for contacting and coordinating the implementation of environmental management issues with the government competent department for environment; 3. Emergency treatment for environmental accidents; 4. Train the workers periodically to improve their abilities, and in the meantime, actively carry out environmental protection technology and experience exchange activities to further improve the environmental management work.	2
	Environmental monitoring unit	1. Accomplish the environmental monitoring work during the project operation period according to the delegation of the project owner and the environmental monitoring plan; 2. Carry out routine monitoring related to this project.	To be determined according to the entrusted task scope
	Local environmental protection agency	1. Inspect the environmental protection engineering for acceptance; 2. Manage and supervise the environmental protection compliance during the operation period; 3. Supervise and inspect the running conditions of the built environmental protection facilities.	2

11.3.3 Environmental Supervision Measures

11.3.3.1 Environmental supervision work modes

1. Put environmental supervision into the category of engineering supervision, which shall be managed by the supervision and management departments of the project headquarters. Participate in monthly meeting of the project director and report the weekly and monthly reports to the director office, etc.

2. Regularly hold environmental supervision work meeting, solve the existing problems and put forward work plans for the next phase according to the recent environmental supervision work.

3. Each environmental supervision division shall hold regular monthly meetings of environmental supervision.

4. Form a sound spot environmental protection management system. Set up environmental protection leading group in each construction project department in charge of the environmental protection leading work. Organization extends to each construction team and group. Divide the responsible area and arrange the responsible person.

11.3.3.2 The environment supervision work content

1. The environment supervision in the period of construction preparation

Examine the environment protective provisions in the Project Construction Organization Plan formulated and submitted by the construction unit, examine whether the environmental protection system built by the construction organization is rational, participate in the examination and approval of the submitted application the Commencement Report of Unit Project, and supervise the construction and implement of the construction of each pollutant disposal project.

2. The environment supervision in construction period

Compile Key Jobs of Environmental Protection according to the construction organization design of each section, and publicize the environmental protection work to the construction unit, point out the environmental pollution sensitive points for the construction unit, put forward specific environmental protection measures according to the major pollutants exist in the construction process, review the Engineering Construction Environmental Protection Scheme submitted by the construction unit, inspect whether the construction unit's environmental protection system operates normally, and inspect the implementing conditions of the environmental protection measures, etc.; as well as supervise the construction of water and soil conservation measures. Supervise the implementing conditions of the environmental monitoring plan, as well as the monitoring results.

3. Environmental supervision during the project operation stage: review the Final Report of Project Construction Environmental Protection Work formulated and submitted by the construction unit, settle the environmental protection completion documents, engineering project environmental protection acceptance inspection, and compile the Final Report of Environmental Supervision Work, etc.

11.3.3.3 Responsibilities of environmental supervision work

1. The supervisory personnel shall strictly perform the supervision responsibilities, practically exert the role of supervision and management, effectively execute all the environmental protection measures which shall be taken for each construction technology on site, and guarantee the effective execution of the environmental protection work.

2. Accomplish the publicizing and implementing work of the environmental protection laws and regulations, enhance the environmental protection awareness of all the participating personnel, and make such personnel conscientiously participate in and accomplish the environmental protection work.

3. Formulate staged environmental supervision acceptance inspection planning, inspect and accept the environmental supervision work for the completion of unit project, thus guaranteeing that the project possesses complete environmental protection procedures and intact data after completion.

4. For the construction projects which do not invite tenders, conclude and sign environmental protection terms in the contract, check the environmental protection contents in the construction organization design; the construction organization design shall be added with environmental protection section and the related content shall be specific.

5. Record in details the implementing conditions of the project environmental management, compile weekly report and monthly report, and timely submit to the local project office and environmental protection agency.

11.3.3.4 Environment supervision during the construction period

During the construction process, the project engineer will supervise the implementing conditions of this specification; in case multiple terms are not executed, the project engineer will require the construction unit to stop construction or take other punitive measures, until

the illegal behaviors being solved. In the meantime, the project engineer will also require the construction unit to observe the relevant national or local environment, public health and safety rules and regulations during the construction period.

11.3.3 Environmental Protection Supervision Plan

Based on the characteristics of this project, the environmental protection implementation of this project shall accept the supervision of Environmental Protection Department of Anhui Province and Huainan Environmental Protection, as well as the supervision of the related departments of the World Bank; therefore, during the project construction period, set environmental supervisors to assist the construction party in the site supervision, and set Environmental Protection Section to supervise the project during the operation period.

Table 11.3-2 The project environmental protection supervision plan.

Table 11.3-2 Project Environmental Protection Supervision Plan

Phase	Organization	Supervision Contents	Supervision Purposes
Feasibility Study Phase	Municipal environmental protection bureau, World Bank	1. Check the environmental assessment outline 2. Check the environmental impact statement 3. Check the EMP	1. Guarantee that the environmental assessment is of comprehensive contents, proper subjects setting, and prominent key points 2. Guarantee that the significant and potential problems which may generate in this project have been reflected 3. Guarantee that measures which mitigate the environmental influence have been provided with specific and feasible implementation plan
Design and Construction Phase	Municipal government Municipal environmental protection bureau Municipal culture and tourism bureau	1. Check the environmental protection preliminary design and EMP 2. Inspect the restoration of the temporarily occupied land for construction, the restoration of vegetation, and the recovery of the environment 3. Inspect the dust and noise pollution control measures, and determine the construction time 4. Inspect the emission of air pollutants 5. Inspect the discharge and dispose of domestic wastewater and used oil in the construction site 6. Recovery and dispose of the borrowing area and spoil ground 7. Inspect the disposing conditions of the sludge	1. Strictly execute the “Three Simultaneities” 2. Guarantee that such sites satisfy the environmental protection requirements 3. Reduce the influences of the construction on the surrounding environment, and execute the relevant environmental protection laws, regulations and standards 4. Guarantee that the water qualities of the inland rivers are not polluted 5. Guarantee that landscapes and land resources are not badly damaged, so as to avoid water and soil loss 6. Guarantee that the sludge has been properly disposed 7. Protect the cultural relic resources from being damaged

Operation Phase	Municipal environmental protection bureau Municipal public security and fire department	1. Inspect the implementation of EMP during the operation period 2. Inspect the implementation of monitoring plan 3. Inspect the sensitive spots which require further environmental protection measures (environmental problems which are not estimated may occur) 4. Inspect whether the environmental quality of the sensitive spot satisfies the corresponding quality standard requirements 5. Strengthen the supervision to avoid sudden accidents, formulate emergency accident treatment scheme in advance, timely eliminate the dangers once an accident occurs	1. Implement the environmental management plan 2. Implement the monitoring plan 3. Faithfully protect the environment 4. Strengthen the environmental management, faithfully protect people's health 5. Guarantee that the pollutant emission satisfies the emission standards

11.4 Overview of the potential impacts and the corresponding mitigation measures

The impacts of the construction of this project on environment mainly focus on the construction phase the influencing factors mainly include construction layout, external transportation, construction machinery, land occupation, construction personnel activities, and waste slag processing, etc. The construction will produce the waste water, noise, exhaust gas, and solid wastes, which will influence the water environment, acoustic environment, ambient air, water and soil loss, population health, and ecological environment, etc. in the construction area and the surrounding areas. This construction activity is the comprehensive treatment project based on the original project, so it has only a small impact on the ecological stability in the area. After the completion of construction, the regional ecological environment affected in the construction period will be gradually restored with the passage of time. The environmental mitigation measures in the feasibility study/design stage of the projectis shown in Table 11.4-1; and the environmental mitigation measures to clear the current waste yard in the project area and to dismantle the factory in Table 11.4-2, the clearing quantity and the direction where to go of the current waste heap in Table 5.1-3; the generic environmental impact in the construction period and mitigation measures in Table 11.4-3 and the characteristic environmental impact of parts of the sub-projects in the construction period and mitigation measures in Table 11.4-4, Table 11.4-5, Table 11.4-6, Table 11.4-7 and Table 11.4-8.

The influencing factors of the operation period to environment mainly include the sanitary sewage, garbage and other pollutants made by people living in the project area. The sanitary sewage will be collected by the municipal sewage pipes and sent to the sewage treatment plant for processing, and the household garbage will be uniformly disposed by the environmental sanitation department, so they have only the small negative influence on the environment. This project belongs to the non-ecological-impact type, there is no emission of “waste water, waste gas, and solid waste” in the operation period of the project, creating only the small negative impact on the environment. This project belongs to a non-ecological influence type project, which has small negative impact on the environment. See Table 11.4-9, Table 11.4-10, Table 11.4-11, and Table 11.4-12 for the environmental impacts and mitigation measures of each sub-project during the operation period.

Environmental Mitigation Measures in the Feasibility Study/Design Stage Table 11.4-1

Subcomponent composition	Feasibility Study/Design Measures
Environmental modification	(1)The choice of the vegetation: choose local species and prevent the effects of alien species invasion. The species chosen in this project are all from Huainan City and its surrounding cities, which are local species. (2)Choose the species with disease and insect pest-resistant ability to prevent the risk of large-scale plant diseases and insect pests as far as possible. (3)Consider the impact of inundation: the nursery-grown plant around the No. 3 lake shall be the types with inundation-resistant ability and the nursery-grown plant size to be planted shall be in accordance with calculated depth and range of the inundating water. (4)Landfill closure afforestation: choose the tree species whose root system is shallow and avoid the damage to the closure covering layer.
Comprehensive improvement of water system	(1)Considering that the downstream drainage ability is insufficient, floodwater storage demand shall be taken into account in the design and water level shall be designed appropriately; (2)The bottom sludge in desilting is in good quality, so it is considered to fill

	the bottomland in design and be used as afforestation earth rather than being disposed as polluted spoil.
Closure of the old Datong old refuse landfill	(1)Heap shaping: compact, control slope gradient, increase the stability of the heap and leave enough safe distance to the above high-tension cable; reduce the heap size, avoid the mined-out area to the north and the karst area to the south and prevent leachate from polluting the underground water. (2)Rubbish embanking: guarantee the stability of the heap and prevent rainwater entering into the rubbish heap. (3)Vertical impervious curtain: prevent the leachate leaking around the heap. (4)Leachate collecting and storage system. (5)Landfill gas collecting and combustion system. (6)The discharge guiding system of surface rainwater: prevent rainwater entering into the heap and keep the stability of the heap. (7)Closure covering system: prevent rainwater entering into the heap and organize the overflow of landfill gas.
Regional infrastructure	(1)Consider the sedimentation risk: although the sedimentation is basically stable, a little sedimentation still can be happened to the road after completion under the load of vehicles. The road in the structure of bituminous concrete, which is convenient for the road repair and reinforcement in the future. (2)Road safety design: the design of “separating pedestrians and vehicles” in road intersection.
Regional development and utilization	(1)Protection of Shungeng Mountain scenic area: design service point to provide service to the scenic area and reduce destruction to the environment. (2)Choose local tree species and avoid the invasion of alien species.

Environmental Mitigation Measures to Clear the Current Waste Yard in the Project Area and to Dismantle the Factory Table11.4-2

Subcomponent composition	Environmental impact and mitigation measures
Clearing current waste heap	(1)Provide all workers with protective equipments, such as protective goggles, face guard, helmet and safety shoes, etc. (2) Keep cleanliness in the process of transportation and prevent road surface and air pollution caused by waste slipping off from excessive load vehicle; (3)Construct casing around the waste yard before being cleaned up and set drainage ditch and settling tank to prevent water and soil loss and polluting nearby water; cover the waste yard in windy weather to prevent flowing dust pollution. (4)Send different waste to different receiving unit for comprehensive utilization, see Table 4-3.
Dismantle factory	(1)Make field investigation/ estimate by specially-assigned person before demolition,for example, the suspicious waste found in the process shall be entrusted to be supervised by professional institute; (2)Collect the waste that can be recycled in the process of demolition and send to reclamation depot; transport construction waste to Huainan Jinke Renewable Resources Using Co., Ltd. (3)The dangerous solid waste found through supervision shall be reported to

	the project office and be unifiedly transported to Wushan dangerous Waste Disposal Center; (4)Project office carries out demolition of factory and makes the overall plan and arrangements of expense; (5)Pay attention to construction safety and provide all workers with protective equipments, such as protective goggles, edge shield, face guard, helmet and safety shoes, etc. (6) Keep clean in the process of transportation and prevent road surface and air pollution caused by waste slipping off from excessive load vehicle.

List of Generic Environmental Impact and Mitigation Measures in the Construction Period Table 11.4-3

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Water environment	Construction wastewater	Pollutants get into underground during the construction	After oil removal and sedimentation, the wastewater will be used as the construction again without discharging.	Contractor	Project supervisor and executing agency	19.1
	Sanitary sewage of construction personnel		Try to rent the farmhouses or hotels as the construction camp, so the sanitary sewage can be discharged through the existing discharging facilities or the urban sewage pipe network. If there is no sewage pipe network, the sanitary sewage shall be discharged to the wastewater equalization pond after the pretreatment in the oil separator and septic tank, and then transported to the sewage treatment plant for processing with the tank trucks. The pit toilets are adopted, so there is no fecal sewage.			
	Surface runoff		Set up the enclosure, drainage ditches, and sedimentation tanks around the construction site, and use the water as the construction water after sedimentation.			
Atmospheric environment	Construction dust	Mainly influences the air quality in the construction area, as well as the construction personnel, residents and plants and animals along the road for transportation.	(1) Avoid the air storage of materials, if the air storage is needed, the materials shall be covered by the tarpaulin. (2) The excavated earthwork shall be timely backfilled, if not, the measures of surface compaction, regular water spray, and coverage shall be adopted. The needless slag of building materials shall be moved away timely, and shall not be stacked for a long time; if the slag is stacked, the coverage or curing measures shall be adopted. (3) Conduct closed transportation for vehicles of transporting garbage, residue and gravel; when the			104.1

			vehicles leave the site, they must be flushed, and then they can leave without mud. The vehicles for transporting earth and building materials shall be covered with tarpaulin, the canopy or other things for avoiding falling, and the vehicles shall not be over loaded; the earth that falls on the road in the process of transportation shall be timely cleaned, so as to reduce the dust in transportation. (4) Plan the routes and time for transport vehicles to reduce the impact of dust on the environment. Spray water to the road on a regular basis for dust suppression.			
	Exhaust of vehicles	Influences the environmental air quality in the construction area	If diesel oil is used as the fuel for construction machineries and transport vehicles, the construction unit must choose the construction machineries and transport vehicles conforming to the national health protection standard, so as to ensure that the exhaust emission meet the relevant national standards, and ensure that the vehicle exhaust completely reach the standard.			
Acoustic environment	Noise of construction machineries	It increases the noise level in the construction area and the surrounding area, and influences people's auditory sense	(1) Reduce the sound level of equipments, and choose the equipments and process with low noise to radically reduce the noise intensity; meanwhile, strengthen the inspection, maintain the equipments to reduce the operation noise. (2) Adopt the personal protective measures, and reasonably arrange the staff to operate the construction equipments by turns to reduce the duration of exposure, and standard the operation as required. The staff of operating the high noise equipments shall wear the earmuffs and other protective equipments to reduce the harm of noise. (3) Reasonably arrange the site and working hours, and make the construction plan to avoid the simultaneous construction of lots of high noise equipments as far as possible, so as to avoid the excessive noise level in			21

			some areas, and the high noise equipments shall be used in the daytime. (4) When the construction unit constructs in the area near the sensitive points, it shall set up the mobile sound barriers to reduce the noise effect; meanwhile, prohibit the nighttime construction; if the continuous operation is needed under special circumstances, the construction unit shall adopt noise reduction measures, inform the surrounding residents the specific construction time and place, and the construction can be conducted after submitting to the Huainan Environmental Protection Bureau for filing.			
	Noise of transport vehicles		The vehicles shall slow down and shall not whistle when passing the residential areas.			

Solid waste	Construction waste	Affect the surrounding landscape	Conduct the classified processing, use the construction waste, such as stones, concrete blocks, bricks and tiles, yellow sand, and lime, etc. for land grading or sub-grade construction; specially-assigned persons classify and store the packing containers and bags, which will be transported to the salvage station for recycling.	Contractor	Project supervisor and executing agency	20
	Household garbage of construction personnel	Affect the human health	Arrange the trash cans to collect the garbage, and then the local sanitation department shall be entrusted to make the disposal of garbage.			5
Ecological environment	Construction and excavation, transport vehicles	Change the land use pattern	Strictly stipulate the makeshift road for transportation vehicles to reduce the destruction and occupation of vegetations.			
		Affect the animals and plants	(1) After the construction, recover the vegetation on the temporarily occupied land; as for the permanently occupied land, compensate the loss of biomass with greening space.			

			(2) Wild animals have the instinct of avoiding danger, so they can temporarily move to another place with the similar environment. After the completion of the project, those animals will gradually come back with the gradual recovery of the vegetation, the improvement of the ecological environment, and the reduction of human disturbance. (3) Increase the protection consciousness of the construction personnel, and strictly prohibit them from hunting wild animals. Construction personnel must abide by Law of the People's Republic of China on the Protection of wildlife.			
Cultural relics	Construction and excavation	Find cultural relics	In the excavation or construction period, if the cultural relics and historic sites are found or suspected, the construction unit shall protect the scene immediately according to the requirements of Cultural Relics Protection Law of the People's Republic of China (December 29, 2007). And it shall report the situation to the local Bureau of Cultural Relics for identification and processing, and the construction can only be restarted after the approval of the local Bureau of Cultural Relics.			/
	Construction activities	Influence of equipment noise to Nanshan Christian Church	Construction site is prohibited to use strong noise equipment, which shall mainly not affect the church activities when there are performing Salat or other important activities in Nanshan Christian Church.			/
Social environment	Construction activities	Affected people's dissatisfaction and complaints	Persistent public participation project implementation period.	Project office	Leading group	/

List of Characteristic Environmental Impact and Mitigation Measures in the Construction Period of Subcomponent 1 Environmental Modification

Table 11.4-4

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Ecological environment (afforestation)	Forest land clearing	Improper methods may result in water and soil loss or damaging natural vegetation of fragile areas	(1)Clear away the shrub and herbaceous plant obstructing forest planting activities in bulk or strip, pile up for natural decomposition; (2) Keep well the native vegetation	Contractor	Project supervisor and executing agency	30
	Soil preparation	Improper methods of slope soil preparation may lead to local soil and water loss	(1)Select the cave cultivation, strip cultivation and full cultivation according to gradient of the planted land and control the break ground within 25%; (2)Reserve vegetation protection zone with a width of 10m between planted land edge and the farmland; (3)Cover the land surface with deadwood and grass timely after soil preparation to prevent surface soil being exposed.			
	Tending of young growth	Disturbing surface soil and result in new water and soil loss, which will affect the environment in and around the project area.	(1)Adopt local nurturing method in slope land and reserve the natural vegetation in young growth land; the residues of vegetation after weeding shall be left in the land as coverings; (2)Forbid collecting dry branches and fallen leaves of understory.			

	Layout of forest management road	For example, excessive excavation surface will lead to certain water and soil loss	(1)Make use of the existing forest path to lay forest management road as far as possible; (2)Conduct the construction of forest management road along the contour line as far as possible; (3)The width of the forest road is 0.8~1m to reduce break ground to the greatest extent.			
	Construction activities	Occupation of land and vegetation deterioration	(1)Greenway and stage construction shall be strictly controlled within the construction site and the vegetation outside of the construction site is forbidden to be damaged; the waste materials in waste heap shall be hauled away timely and properly handled without occupying vegetation. (2)For the rocky slope land, wasteyard shall be consolidated and recovered with blocking, and the naked land surface shall not be exposed without vegetation recovery.			
Shungeng Mountain scenic area	Construction activities	Construction activities may have influence to the vegetation and landscape in Shungeng Mountain scenic area	(1)Construction activities within Shungeng Mountain scenic area shall take effective measures according to relevant regulation of safe and civilized construction and strictly protect the scenery, vegetation, water body and landscape environment around the construction site. After the approval of management organization of Shungeng Mountain scenic area, the construction unit shall take approval process with related departments. Recover the damaged scenery, vegetation, water body and landscape environment according to requirements after construction completion. (2)Before the project implementation, the Project Office shall print and issue the Huainan Shungeng Mount Scenic Area Management Regulations to the construction unit, closely restrict to construct within the planned bed line and requires the construction unit to make propaganda to its staff, strictly protect the scenery, vegetation, water body and landscape environment and any unit or individual shall not damage the vegetation or scenery in Shungeng Mountain scenic area that outside of the construction area.			

Drainage Comprehensive Improvement

Table 11.4-5

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Water environment	Residual water in the sludge storage yard	Affect the surrounding water environment	(1)The sludge storage yard shall take some anti-seepage measures before piling up the bottom mud, fill the bottom with clay and pun and build cofferdam all around. In design and construction of the cofferdam, it is recommended to set anti-sliding pile and use different construction materials to improve the overall stability of the cofferdam. Build the sedimentation basins and the flocculating agent can be appropriately added to speed up the sedimentation, the residual water after sedimentation will be drained to the surrounding channels. (2)Take soil and water conservation measures in sludge storage yard, including engineering measures, vegetation measure, land reclamation measures and temporary measure. Cover earth and afforest immediately after yard drying to prevent and control water and soil loss	Contractor	Project supervisor and executing agency	4.4
	Sediment dredging	Affect water body	Avoid excavation in rainy day, and if the project must be excavated in rainy day, the working surface shall not be too excessive and shall be completed by stages. Earth excavation shall be successively conducted from top to bottom in separate layers and segments, made certain slope to discharge water and shall not affect water gathering within slope stability.			/
Atmospheric environment	Stink in dredging	Affect the Construction personnel	Construction personnel shall wear masks when dredging.			0.5
Solid waste	Household garbage floating on the water	Affect the surrounding landscape	Uniformly collect with the household garbage after picking up from water, and then is transported to Datong old refuse landfill.			2

	Sludge		(1) Transport the sludge outward timely after dredging with enclosed carrier vehicle to prevent scattering along the road; the construction unit shall consult with the environmental sanitation department to add sanitation workers in the sludge transporting road segment to clean up the sludge fell on the road and reduce its influence to the road and landscape. (2) The sludge shall be transported to the nearby bottom land in the environmental modification project area, and be used in the environmental modification sub-project.			4
	Spoil		162,500 m3 spoil will not be stacked, instead, it will be used in environmental modification and Closure of Datong Old Landfill sub-projects. Avoid sprinkling during the transportation process, timely clean and water on time.			1
Ecological environment	Construction activities	Occupation of land, vegetation deterioration	(1) Construct in strict accordance with the red lines planned in the trench renovation. Transplant the trees within the scope of excavation as far as possible, and do not fell trees outside the excavation scope at will. (2) During the trench comprehensive improvement construction, construct and protect the slopes by section as far as possible according to the construction situations, and timely recover the ecological vegetation environment around the trench embankment and lake region sides.			/

List of Characteristic Environmental Impact and Mitigation Measures in the Construction Period of Subcomponent 3 Closure of Datong Old Landfill

Table 11.4-6

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)

Surface water	Drain the leachate in ditch	Affect surface water environment	Transport to Chengdong Leachate Treatment Station with suction -type sewer scavenger for processing.	Contractor	Project supervisor and executing agency	1.0
Atmospheric environment	Stink produced when turning over the garbage	Affect the construction personnel	When turning over the garbage, the construction personnel shall wear masks or other protection devices.			0.5

List of Characteristic Environmental Impacts and Mitigation Measures in the Construction Period of Subcomponent 4 regional infrastructure

Table 11.4-7

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Atmospheric environment	Asphalt smoke	Affect the atmospheric environment around the site and the health of the construction personnel	Use the commodity asphalt; when paving the asphalt, the construction personnel shall wear masks or other protection devices.	Contractor	Project supervisor and executing	0.5

Social environment	Road safety	Influence to public safety	(1)Section construction, complete excavation and backfill as soon as possible; (2)Set casing and temporary shortcut when constructing, inform the public with the construction time and segment and set traffic warning signs; (3)In traffic peak time, dredged and dispatched by traffic police to ensure flow of pedestrian and vehicle and reduce urban traffic pressure; (4)The transport of building materials and abandoned earth and stone shall avoid the traffic peak time, or conducted at night to reduce traffic congestion and influence to residents.		agency	1
Ecological environment	Construction activities	Occupation of land, vegetation deterioration	(1)Carry out construction strictly according to boundary lines of roads and planning red line, transport the unnecessary earth and stone away timely and not allowed to occupy the land outside of the boundary lines of roads and planning red line, at the same time, vegetation outside of the boundary lines of roads and planning red line shall not be cut to result in vegetation loss. The camp buildings shall be set in the city or nearby village rather than in the project area as far as possible. Make balance calculation of excavation and fill and reach the balance as far as possible; for the lacking, it shall use the excavation earth and stone of water system repair, and set the excavation soil field in the project area is forbidden to protect the ecological vegetation in the project area; (2)Set green belt in Zhongxing Road with a width of 4m, plant at least one line border trees in Wanxiang Road and Jiukong Road, and Yanshan Road shall depend on the particular facts. The road whose vegetation is relatively poor can be set with border trees and the road whose vegetation is relatively good may not be set with border trees. The flood ditch shall be constructed synchronously with Yanshan Road to reduce the ecological and environmental impact brought by synchronous construction.			30

List of Characteristic Environmental Impacts and Mitigation Measures in the Construction Period of Subcomponent 5 development and utilization

Table 11.4-8

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Ecological environment	Construction activities	Occupation of land, vegetation deterioration	(1)Shall not destroy the ecological environment beyond the scope of the red line and set temporary site and camp buildings outside of the project area. All construction activities shall be carried out within the land occupation red line to prevent affecting surrounding ecological environment; (2)The land occupation indexes of afforestation in construction area are all over 30%.	Contractor	Project supervisor and executing agency	/

List of Environmental Impact and Mitigation Measures in the Operation Period of Subcomponent 1 Environmental Modification

Table 11.4-9

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Ecological environment	Plant diseases and insect pests	Use of insecticide affects the surrounding ecological environment, the surface water environment and human health	(1)Establish plant diseases and insect pests management center in the project area, which will conduct periodical inspection to the pesticide used in the project area to ensure the production, packaging, labels, transportation, storage, use and processing of the chemicals used by the project beneficiaries are all conforming to the world bank's standard; avoid the prepared pesticide to be the IA or IB products of the World Health Organization, or the active ingredients in II pesticide exceeds the standard regulated by the World Health Organization; (2)Purchase of any pesticide by the project beneficiaries shall pass the following examination and approval: types and level of danger resulted from method of application and users; The reliability of the method of use and the user's application level; examine the grade and preparation of the pesticide according to Pesticide Classification Method and Classification Rules Regulated According to Risks (Geneva:WHO2004-05) and the latest categorical data; (3)Choice of the pesticide must meet the standard of the world bank business policy (OP 4.09). These pesticides: The damage to human body health must be minimal; must prove its effectiveness in prevention and control of target; the influence to non-target species and natural environment must be minimal. The choice of the pesticide application method, time and frequency shall have the minimum damage to natural enemy. The pesticide used in public health plan must be proven safe to the residents, local species and users in the application areas.	Huainan Agricultural Water Conservancy Investment Development Co., Ltd.	Huainan Environmental Protection Bureau	7

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
	Pesticide /fertilizer applicatio n	1.Unreasonable use of pesticides may kill the natural enemy of the injurious insect, resulting in biodiversity loss and imbalance of species in the forest region; 2. Improper application methods of pesticides or fertilizers may result in pollution of nearby water body; 3. Long-term application of chemical fertilizer will lead to the change of physicochemical property, soil hardening, soil degradation and soil fertility decline; 4. If the pesticide container is improperly cleaned and handled, water body and soil will be affected.	(1)Depend on prevention and biological control method and use as less chemical insecticide as possible; (2)Use the III and U type insecticide regulated by the the World Health Organization; (3)Use the scientific and reasonable formula fertilization and the fertilizer shall be applied in the uphill direction of the cave and cover with soil immediately; spreading fertilizer over the fields is forbidden; (4)Container of pesticide and fertilizer shall be collected uniformly and cleaning container in source of water is forbidden; (5)Train the forest farmers or workers on safe use of pesticides and fertilizers.			2

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
	Forest fire prevention	Endanger the safety of state property and people	Set fire barrier; send specially-assigned person to patrol to completely eradicate various fire hazards and put out the fire with the help of Huainan City fire brigade if there is a forest fire.			0.5
	Forestry management	Guarantee the effect of ecological restoration and reach the index requirements of the designed ecological restoration	Strengthen the scientific management, reasonable development and utilization of forestry resources, manage and protect the forest land by full-time staff, which mainly includes the management and protection of nursery-grown plant and afforestation for ecological restoration and ensures that all kinds of nursery-grown plants are be damaged due to water shortage and human disturbance; Ecological vegetation damaged by natural cause or human factor shall be replanted timely.			
Solid waste	Domestic waste	Harm the human health	Arrange the trash cans to collect the garbage, and then entrust the local sanitation department for uniform processing.			2

List of Environmental Impact and Mitigation Measures in the Operation Period of Subcomponent 3 Closure of Datong Old Refuse Landfill

Table 11.4-10

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Water environment	Percolate	The discharge of percolate without processing affects the quality of underground water	(1) The collected percolate shall be sent to the existing percolate treatment station of the landfill in the east of the city with the suction-type sewer scavenger for processing, and then drained to Huainan No.1 sewage treatment plant. (2) Establish wasteyard underground water supervision and control system, timely master the water quality change conditions. Timely control the underground water quality pollution found. Once the underground water pollution accident occurs, immediately initiate the emergency plan and emergency disposal methods, control the underground water pollution. (3) on the basis of timely verifying the data from long-term observation well, convert the long-term observation well to pumping well in real time, so as to timely pump the polluted underground water out and transport to the waste water treatment station for treatment.	Huainan Environmental Sanitation Department	Huainan Environmental Protection Bureau	20
	Sanitary sewage	The discharge of sanitary sewage without processing will affect the quality of surface water	Collect the sanitary sewage through the municipal sewage pipe network to Huainan No.1 sewage treatment plant, and then rain the water after treatment			2
Atmospheric environment	Landfill gas	Explosion will occur if the concentration is too high	After collected with pipes, light it for combustion			10
	Cooking fumes	Affect the surrounding atmospheric environment	A smoke exhaust ventilator shall be equipped for each gas stove			1

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Acoustic environment	Noise of transport vehicles	Affect the acoustic environment of People living along the road for transportation	The vehicles shall slow down and shall not whistle when passing the residential areas.			/
Solid waste	Domestic waste	Harm the human health	Arrange the trash cans to collect the garbage, and then entrust the local sanitation department for uniform processing.			0.2

List of Environmental Impact and Mitigation Measures in the Operation Period of Subcomponent 4 Regional Infrastructure

Table 11.4-11

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Atmospheric environment	Vehicle exhaust	Affect the atmospheric environment along the road	The exhaust of vehicle used by the project shall meet the national standards.	Huainan Municipal Administration Department	Huainan Environmental Protection Bureau	/
Acoustic environment	Traffic noise	Affect the acoustic environment of People living along the road for transportation	The vehicles shall not whistle when passing the residential areas.			/

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Social environment	Road safety	Affect the public safety	Four roads are designed with road safety sign system		Huainan Transport Administration	/

List of Environmental Impact and Mitigation Measures in the Operation Period of Subcomponent 5 Regional Land Development and Utilization

Table 11.4-12

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Acoustic environment	Equipment noise	Affect the people living in the project area	All equipments adopt the normal noise elimination and sound insulation measures.	Huainan Agricultural Water Conservancy Investment Development Co., Ltd.	Huainan Environmental Protection Bureau	5
Water environment	Sanitary sewage	The discharge of sanitary sewage without processing will affect the quality of surface water	Collect the sanitary sewage through the municipal sewage pipe network to Huainan No.1 sewage treatment plant, and then rain the water after treatment			8
Atmospheric environment	Cooking fumes	Affect the surrounding atmospheric environment	A smoke exhaust ventilator shall be equipped for each gas stove			10
Solid waste	Domestic waste	Harm the human health	Arrange the trash cans to collect the garbage, and then entrust the local sanitation department for uniform processing.			12
	Production solid waste	Affect the surrounding ecological environment	Clear the dead trees and sticks in a timely manner.			

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
Ecological environment 320	plant diseases and insect pests	Use of insecticide will affect the surrounding ecological environment, the surface water environment, and human health	(1) establish project area plant diseases and insect pests management center, which will periodically inspect the pesticides used in the project area, guarantee that the chemicals used by project beneficiary: production, packaging, label, transportation, storage, application and treatment all meet the standards of world bank; avoid that the prepared pesticides are IA and IB products specified by WHO, or the concentration of active ingredients in the Class II pesticides exceeds standard specified by WHO. (2) any pesticide purchased by the project beneficiary shall pass the following examinations and verifications: types and degrees of dangers caused by application method and users; reliability of application method, and application level of user; examine and verify the grade and preparation of pesticides based on Pesticides Classification Method and Classification Regulation by Risk Suggestion (Geneva: WHO2004-05) and the latest categorical data; (3) Selection of pesticides must satisfy the standards of the World Bank business policies (OP 4.09). These pesticides: shall have very little damage to human health; must be proved to be effective for the objective control; must have smallest influence on the non-target species and natural environment. The selection of application method, time and frequency of pesticide must have smallest injury to the natural enemy. Pesticides used for public health plan must be proved to be safe for the residents, local species and applicator in the application area.			12

Affecting factors	Source of pollution	Main environmental impacts	Mitigation measures	Implementer	Supervisor	Budget (ten thousand yuan)
	Use of insecticide and chemical fertilizer	1. improper use of pesticides may kill the natural enemy of the injurious insects, resulting in reduction of biodiversity and species imbalance in forest region; 2. improper application method of pesticides or chemical fertilizers, which may cause pollution of the surrounding water body; 3. long-term application of chemical fertilizer may result in physicochemical property changes of the soil, causing soil hardening, soil property degeneration and soil fertility decline; 4. Improper cleaning and treatment of pesticides vessels will influence the water body and soil.	(1) Rely on prevention and biological control methods and minimize the use of chemical insecticides. (2) Use Class III and Class U pesticides specified by WHO. (3) adopt scientific and reasonable formula fertilization, the fertilizer should be applied to the upslope direction of the hole, cover with soil after applying; broadcasting fertilizer is strictly prohibited; (4) vessels of pesticides and fertilizers shall be collected uniformly, and cleaning the vessels in the source of water is strictly prohibited; (5) Train the foresters or workers on the safe use of pesticides and chemical fertilizer.			6

The environmental risks and precautionary measures of this project in the operation period are shown in Table 11.4-13.

Environmental risks and mitigation measures Table 11.4-13

No.	Subcomponent composition	Precautionary measure
1	dumpsitepercolate leakage	Water pollution is mainly caused by percolate from the dumpsite . In order to prevent water pollution, dumpsite area has taken manual seepage-proofing, rain sewage diversion, percolate collecting, guiding and draining, etc. (1) manual seepage-proofing: use HDPE membrane on the landfill area top to intercept the seepage, the entire original landfill area surafce is covered with manual impervious bed. (2) rain sewage diversion: drain the earth surface rain into the flood intercepting trench to the greatest extent, reduce the rainfall capacity received by the rubbish storage area, thus dramatically reducing the percolate quantity. (3)percolate collecting, guiding and draining: collect the percolate and then convey in to the percolate regulating reservoir through percolate transmission pipes; transport to the percolate treatment station in the sanitary landfill through suction-type sewer scavenger, drain after reaching the standards. After collecting, guiding and draining, the percolate will enter into the percolate regulating reservoir, and then be transported to the percolate treatment station in the eastern household garbage sanitary landfill through suction-type sewer scavenger for disposing. This percolate treatment station is designed with a daily treatment scale of 200m³/d, the treatment process adopts “coagulating sedimentation+ MBR membrane bioreactor + nanofiltration (NF) + reverse osmosis (RO)”, the effluent will implement Pollution Control Standards for Household Garbage Landfill (GB 16889-2008), Table 2: Water Pollutants Discharge Mass Concentration Limits For Existing And Newly Built Household Garbage Landfill. (4) strengthen rainwater discharge capacity; complete the renovation of flood intercepting trench before the flood season each year, and guarantee it is unobstructed;
2	Rubbish dam break	In order to prevent water and soil loss of covering soil due to erosion of rainwater, wind, and ice and snow, which will further impact the stability of refuse dump, this project finishes the slope of the refuse dumps which has not been operated according to the sanitary dumpsite standard originally, which satisfies the side slope control value of 1: 3.5~1:4. The peak of the reservoir area slopes down to all directions, and the average gradient is not less than 5%. After being finished, the refuse dump slopes down from the middle to all directions by 5% of gradient; due to such a small gradient, the refuse dump is unlikely to slip, so thah the refuse dump is stable.
3	dumpsite fire explosion	(1) Set up isolation belt, provide emergency fire extinguishing system: in consideration that the main source of fire occurring in the landfill operating area is landfill gas, water is not suitable for extingiushment; therefore, set up a fire barrier with a width of 8 meters, surrounding the dumpsite, and provide a certain number of fire prevention sandy soil and 2 watering carts, so as to meet emergencies. (2) No Open Flames, provide monitoring facilities: no smoking or open

		fire in thedumpsite. Provide combustible gas detection and alarming apparatus; pay attention to the calibration and maintenance of the apparatus at ordinary times, and periodically monitor the gas concentrations (such as methane) in and around the wasteyard. Provide dry powder extinguisher for the vehicles and other operation machines operating in the dumpsite. (3) gas guiding and exhausting, long-term monitoring: in order to prevent the explosion and fire accidents of methane gas, in this project, the ldumpsite is designed with complete gas educing and processing system. Totally 65 landfill gas collecting shafts and 6 gas gathering stations are planned to be set up in this project; DN 90 HDPE gas transmission branch pipe 1742m, DN 110 HDPE gas transmission branch pipe 1014m，DN 200 HDPE gas transmission main pipe 630m; in the meantime, there is also a set of air exhaust and torch combustion system with a processing capacity of 500Nm³/h. It is also equipped with methane gas concentration automatic monitoring and alarming system, which can effectively prevent the occurrence of explosion and fire accidents. (4) Personnel training: it is suggested that the workers in the dumpsite should be trained with the fire protection knowledge and operation, and manoeuvre should be periodically launched. (5) Strictly follow the rules and regulations: thedumpsiteshall formulate fire protection rules and regulations, which shall be inspected by specially-assigned person. Fire prohibition area, fire zone, and emergency exit marks, as well as schematic diagram plate , etc, are set up in the dumpsite
4	Geological disaster	In this project, the rubbish shaping construction fully condisers the danger boundary of project area, the limestone boundaries on the south of refuse dump all locate outside the refuse dump; rubbishes in the karst collapse are reversed and shaped, thereby guaranteeing that no karst collapse wind direction exists in the refuse dump. Keep away from dangerous zone boundaries of air shaft, main shaft and emergency exit shaft on the north of the refuse dump.
5	Plant diseases and insect pests	Apply the advanced concepts and methods of plant diseases and insect pests integrated management to the control work guidance, use the national and local complete plant diseases and insect pests monitoring network to correctly forecast the plant diseases and insect pests of the forest land and nursery in this project. Always use improved variety of strong seedling without quarantine objects, select and breed good indigenous tree species, varieties and fine clones with strong disease resistance for afforestation; strengthen the forest culture and management measures, improve the disease resistance of forests themselves, energetically popularize physical control and biological control methods, strictly use efficient, and low-toxicity pesticides for chemical control, and realize the prevention and control of plant diseases and insect pests in this project.
6	Forest Fire	(1) Build the fire barrier in strict accordance with the regulation. (2) Enhance the forest fire prevention publicity effort, implement the forest fire prevention system, effectively protect the forests and prevent fire. (3) Each afforestation entity must formulate forest protection and fire prevention plans, village regulation and agreement, and designate fire prevention zone of responsibility; and shall equip forest protection personnel according to the forest area, and report to the Forestry Bureau

		and forest protection and fire prevention organization on time.

Formulate underground water risk accident emergency response plan, define the closing and interception measures which shall be taken under risk accident state, and put forward specific schemes for polluted underground water diffusion prevention and polluted underground water control.

I. Emergency plan

On the basis of formulating factory-wide safety management system, formulate emergency measures for specialized underground water pollution accident, and coordinate with the other emergency plans. See Table 4-15 for the contents of underground water emergency plan.

(1) Daily coordination and command organization of emergency plan;

(2) Responsibilities and division of labor of relevant departments in the emergency plan;

(3) Determination of underground water environment protection objectives, emergency treatment measures taken, and assessment of potential source of pollution;

(4) Organization conditions, personnel and equipment conditions of extra serious accident emergency rescue, regular training and manoeuvre;

(5) Social support and assistance of extra serious accident, fund guarantee of emergency rescue.

II. Emergency disposal

Once abnormal conditions of underground water are found, emergency measures must be taken according to the emergency plan immediately:

(1) when abnormal condition of underground water is confirmed, based on the formulated underground water emergency plan, report to the company's competent leaders as soon as possible, inform the neighboring underground water users, and pay close attention to the underground water quality change conditions.

(2) organize specialized personnel to investigate and monitor the accident site, search the accident location, analyze the accident reason, localize the emergency to the greatest extent, eliminate if possible; take all measures, including cutting off production equipments or facilities, to prevent accident diffusion, spread and chain reaction, and minimize the influences of underground water pollution accident to people and properties to the greatest extent.

(3) when the surrounding underground water is found polluted through monitoring, based on the feedback information of the observation well, manually extract the underground water in the polluted area and form underground water depression cone, control the underground water flow field in the polluted area, and prevent the pollutants diffusion.

(4) Evaluate the accident consequence, and formulate the measures which can prevent similar events from occurring.

(5) Request the social emergency forces to assist and dispose if necessary.

Table 11.4-14 Underground water pollution emergency plan contents

No.	Item	Contents and requirements
1	general rules	

No.	Item	Contents and requirements
2	Overview of pollution sources	Detail the type, quantity and distribution of pollution sources, including production equipments, auxiliary facilities and public works
3	contingency plan area	List the dangerous objectives: production equipments area, auxiliary facilities, public works area, and environmental protection objectives; mark the positions in the general drawing of factory.
4	emergency organization	Factory: the factory emergency headquarters-- be responsible for onsite comprehensive commanding; professional rescue team-- be responsible for accident control, rescue and rehabilitation treatment; Region: headquarters-- be responsible for the comprehensive commanding, rescue, control and evacuation of the neighborhood of the factory; professional rescue team--be responsible for supporting the factory's professional rescue team; professional monitoring team, be responsible for supporting the factory's monitoring station; local hospitals, be responsible for receiving and curing the injured and poisoned personnel;
5	Emergency state classification and emergency response procedures	Specify the levels of underground water pollution accidents, and the corresponding emergency classification response procedures
6	Emergency facilities, equipments and materials	Emergency facilities, equipments and materials which can prevent poisonous and harmful substances from overflowing or diffusing
7	emergency communication, communication and traffic	Stipulate the communication mode, notification mode, traffic management support and control under emergency state
8	Emergency environmental monitoring and post-accident evaluation	The environmental monitoring station will monitor underground water environment. Evaluate the accident nature and consequence, and provide decision basis for the commanding department.
9	Emergency protective measures, leakage eliminating measures, methods, and equipments	Accident site: control accident, prevent enlargement, spreading and chain reaction. Eliminate the onsite leakage substance; reduce harm; the corresponding facilities and equipments provided. Adjacent area: control the polluted area, control and eliminate pollution measures and the corresponding equipments.

No.	Item	Contents and requirements
10	Emergency concentration discharge control, evacuation organizing plan, medical aid and public health	Accident site: accident disposing personnel shall formulate the emergency control concentration and discharge of pollutants, as well as the evacuation organization planning and rescue for the personnel onsite and near the equipment. Environmentally sensitive objectives: personnel and general public in the adjacent area of the accident affected area stipulate the pollutant emergency control concentration and discharge, and evacuation organization planning and rescue.
11	Emergency state termination and restoration measures	Stipulate the termination procedures of emergency state. Accident site rehabilitation, dispose, and restoration measures. Accident alert termination, and rehabilitation and restoration measures for the adjacent area.
12	personnel training and manoeuvre	After formulating the emergency plan, arrange relevant personnel to train and manoeuvre at ordinary times
13	public education and information	Launch public education, training, and release relevant information to the neighborhood.
14	Record and report	Set up specialized records of emergency accident, establish file and special report system, and arrange special department to manage.
15	Attachment	Preparation and formation of various kinds of appurtenant materials related to the emergency accident.

11.5. Environmental Monitoring Plan

11.5.1 Monitoring purpose

Environmental monitoring includes two periods: the construction period and operation period. Its purpose is to comprehensively and timely master the dynamic condition of pollution of the project to be constructed, understand the degree of changing the environment quality in the construction area, the sphere of influence and the dynamic condition of environment quality in the operation period, and timely submit the feedback to the competent authorities for providing scientific basis for the environmental management of the project.

11.5.2 Environmental monitoring organizations

The environment monitoring in the construction period and operation period shall be undertaken by the environmental monitoring station of Huainan or other qualified monitoring agencies entrusted by the contractor or operator of the project. The monitoring agencies shall be those with the national environmental quality monitoring certification, complete equipments, and strong technical strength that can finish better the task of environmental monitoring.

Predict the result according to environmental impact, and regard the sensitive points that may be obviously polluted as the monitoring points, to track the pollution situation of the project in the construction period and operation period. The monitoring factors shall be determined according to the engineering pollution characteristic factors. The monitoring and analyzing methods shall adopt those of the corresponding projects in the Technical Specifications for Environmental Monitoring issued by the State Environmental Protection Administration. The evaluation criterion executes the national standard determined by the

environmental impact assessment of each sub-project.

11.5.3 The detailed environmental monitoring plan

The detailed environmental monitoring plan and expense budget of the sub-projects is shown in Table 11.5-1, Table 11.5-2, Table 11.5-3, Table 11.5-4, Table 11.5-5 and Table 11.5-6.

Monitoring Plan for Subcomponent 1 Environmental Modification

Table 11.5-1

Monitoring period	Environmental elements	Monitoring points layout	Monitoring factors	Frequency	Expenses (yuan/a)	Total (yuan)	Monitoring agencies
Construction period (Three years and seven months)	Atmosphere	Set up an atmospheric monitoring point at each construction site	TSP	2 periods/year, 2 days/period, 1 time/day	9,400	183,600	Qualified monitoring agencies
	Water quality	Set up a monitoring point at the discharge point of sanitary sewage at site	pH, COD, BOD5, suspended solids, petroleum	2 periods/year, 1 day/period, 1 time/day	4,500		
	Noise	Set up a monitoring point at each of the locations at east, south, west and north	LeqdB(A)	2 periods/year, 1 day/period, 2 times/day, one in the daytime and the other in the night	32,000		
Construction period	Collect the situation of the construction period of environmental modification in the survey and the monitoring data at regular intervals, and submit them to higher authorities on time.						

Monitoring Plan for Subcomponent 2 Drainage Comprehensive Improvement

Table 11.5-2

Monitoring period	Environmental elements	Monitoring points layout	Monitoring factors	Frequency	Expenses(yuan/a)	Total (yuan)	Monitoring agencies
Construction period (Three years)	Water quality	Arrange the corresponding water quality monitoring sections at Datong discharge ditch, Chenxiang discharge ditch, Jiulonggang discharge ditch, Kongdian discharge ditch, and the construction areas of Lake 1, Lake 2, and Lake 3	Temperature, pH, DO, COD, BOD5, ammonia nitrogen, total phosphorus, total nitrogen, escherichia coli	2 periods/year, 2 days/period, 1 time/day	10,300	103,800	Qualified monitoring agencies
		Set up a monitoring point at the discharge	pH, COD, BOD5,	2 periods/year, 1	5,500		

		point of sanitary sewage at site	suspended solids, petroleum	day/period, 1 time/day			
	Atmosphere	Set up a monitoring point at each construction area	TSP	2 periods/year, 2 days/period, 1 time/day	9,300		
	Noise	Set up a monitoring point at each construction area	LeqdB(A)	2 periods/year, 1 day/period, 2 times/day, one in the daytime and the other in the night	9,500		
Operation period	Water quality	Arrange water quality monitoring sections at Datong discharge ditch, Chenxiang discharge ditch, Jiulonggang discharge ditch, Kongdian discharge ditch, Lake 1, Lake 2, and Lake 3	Temperature, pH, DO, COD, BOD5, ammonia nitrogen, total phosphorus, total nitrogen, escherichia coli	2 periods/year, 2 days/period, 1 time/day	10,300	10,300yuan/year	
Construction period and Operation period	Collect the situation of drainage operation in the survey and the monitoring data at regular intervals, and submit them to higher authorities on time.						

Monitoring Plan for Subcomponent 3 Closure of Datong Old Refuse Landfill

Table 5-3

Monitoring period	Environmental elements	Monitoring points layout	Monitoring factors	Frequency	Expenses (yuan/a)	Total (yuan)	Monitoring agencies
Construction	Atmosphere	Set up a monitoring point at the upwind direction and downwind	TSP	4 periods/year, 2 days/period, 1 time/day	9,600	167,375	Qualified monitoring

period (Two years and two months)		direction of the Datong Old Refuse Landfill respectively	Stink	4 periods/year, 1 day/period, 2 times/day	34,000		agencies
	Water quality	Set up five monitoring points, respectively the background well, pollution monitoring well, and pollution diffusion well around the old landfill.	9 items of PH, total hardness, chloride, ammonia nitrogen, volatile phenol, mercury, nitrite, total bacteria, and total coliforms, and at the same time monitor the water level	2 periods/year, 2 days/period, 1 time/day (each in the dry season and the wet season, namely the period from January to March, and the period from July to September)	14,600		
		Set up a monitoring point at the discharge point of sanitary sewage at site	pH, COD, BOD5, suspended solids, petroleum	2 periods/year, 1 day/period, 1 time/day	750		
	Noise	Set up a monitoring point at each of the boundaries at east, south, west and north	LeqdB(A)	2 periods/year, 1 day/period, 2 times/day, one in the daytime and the other in the night	8,000		
Operation period	Underground water	Set up five monitoring points, respectively the background well, pollution monitoring well, and pollution diffusion well around the old landfill.	9 items of PH, total hardness, chloride, ammonia nitrogen, volatile phenol, mercury, nitrite, total bacteria, and total coliforms, and at the same time monitor the water level	2 periods/year, 2 days/period, 1 time/day (each in the dry season and the wet season, namely the period from January to March, and the period from July to September)	14,600	61,000 yuan/year	
	Percolate	Set up a monitoring point at the percolate regulating reservoir	SS, COD, BOD5, NH4-N, total nitrogen, total phosphorus	2 periods/year, 2 days/period, 1 time/day	8,800		
		Periodically collect the running state of percolate treatment station in the eastern household garbage sanitary landfill, and the percolate concentrations in the inlet and outlet of	SS, COD, BOD5, NH4-N, total nitrogen, total phosphorus	2 periods/year	/		

		the treatment station					
	Atmosphere	Set up a monitoring point at the upwind direction and downwind direction of the Datong Old Refuse Landfill respectively	TSP, stink degree, ammonia, hydrogen sulfide, methyl mercaptan	2 periods/year, 2 days/period, 1 time/day	29,600		
	Noise	Set up a monitoring point at each of the boundaries at east, south, west and north	LeqdB(A)	2 periods/year, 1 day/period, 2 times/day, one in the daytime and the other in the night	8,000		
Construction period and Operation period	Collect the situation of the situation of the landfill in construction period and after the closure in the survey and the monitoring data at regular intervals, and submit them to higher authorities on time.						

Monitoring Plan for Subcomponent 4 Regional Infrastructure

Table 11.5-4

Monitoring period	Environmental elements	Monitoring points layout	Monitoring factors	Frequency	Expenses (yuan/a)	Total (yuan)	Monitoring agencies
Construction period (one and a half year)	Atmosphere	Set up a monitoring point at each of the construction areas of the four roads	TSP	2 periods/year, 2 days/period, 1 time/day	7,600	29,400	Qualified monitoring agencies
	Water quality	Set up a monitoring point at each of the sanitary sewage discharge points of the four construction areas	pH, COD, BOD5, suspended solids, petroleum	2 periods/year, 1 day/period, 1 time/day	4,000		
	Noise	Set up a monitoring point at each of the four construction areas	LeqdB(A)	2 periods/year, 1 day/period, 2 times/day, one in the daytime and	8,000		

				the other in the night			
Operation period	Atmosphere	Set up a monitoring point at each of the four roads	TSP	1 period/year, 2 days/period, 1 time/day	3,800	7,800 yuan/year	
	Noise	Set up a monitoring point at each of the four roads	LeqdB(A)	1 period/year, 1 day/period, 2 times/day, one in the daytime and the other in the night	4,000		
Construction period and Operation period	Collect the operation situation of the four roads in the survey and the monitoring data at regular intervals, and submit them to higher authorities on time.						

Monitoring Plan for Subcomponent 5 Roadside Service Points

Table 11.5-5

Monitoring period	Environmental elements	Monitoring points layout	Monitoring factors	Frequency	Expenses (yuan/a)	Total (yuan)	Monitoring agencies
Construction period (one year and three months)	Atmosphere	Set up a monitoring point at the construction areas of middle and eastern roadside service points respectively	TSP	2 periods/year, 2 days/period, 1 time/day	5,800	20,700	Qualified monitoring agencies
	Water quality	Set up a monitoring point at the sanitary sewage discharge point of the construction areas of middle and eastern roadside service points respectively	pH, COD, BOD5, suspended solids, petroleum	2 periods/year, 1 day/period, 1 time/day	3,000		
	Noise	Set up a monitoring point at each of the four boundaries of the construction areas of middle and eastern roadside service points	LeqdB(A)	2 periods/year, 1 day/period, 2 times/day, one in the daytime and the other in the night	5,000		
Operation period	Atmosphere	Set up a monitoring point at the dining centers of the middle and eastern roadside	TSP	1 period/year, 2 days/period, 1 time/day	2,900	5,400 yuan/year	

		service points respectively					
	Noise	Set up a monitoring point at the middle and eastern roadside service points respectively	LeqdB(A)	1 period/year, 1 day/period, 1 time/day, once in the daytime	2,500		
Construction period and Operation period	Collect the operation situation of the middle and eastern roadside service points in the survey and the monitoring data at regular intervals, and submit them to higher authorities on time.						

Monitoring Plan for Subcomponent6 Flowers and Trees Trading Market, Garden Displaying Potted Landscape, and Nursery Base

Table 11.5-6

Monitoring period	Environmental elements	Monitoring points layout	Monitoring factors	Frequency	Expenses (yuan/a)	Total (yuan)	Monitoring agencies
Construction period (two year and three months)	Atmosphere	Set up a monitoring point at each of the construction areas	TSP	2 periods/year, 2 days/period, 1 time/day	6,700	41,750	Qualified monitoring agencies
	Water quality	Set up a monitoring point at each of the sanitary sewage discharge points of the construction areas	pH, COD, BOD5, suspended solids, petroleum	2 periods/year, 1 day/period, 1 time/day	3,500		
	Noise	Set up a monitoring point at each of the four boundaries of the construction areas	LeqdB(A)	2 periods/year, 1 day/period, 2 times/day, one in the daytime and the other in the night	6,500		
Construction period	Collect the situation of the flowers and trees market, garden displaying potted landscape, and nursery base in the survey and the monitoring data at regular intervals, and submit them to higher authorities on time.						

11.5.4 Types and contents of monitoring reports

Monitoring reports are divided into the construction period monitoring reports and operation period monitoring reports.

The contents include: Monitoring points, sampling time, description of monitoring factors; the analysis and evaluation of the monitoring results in the corresponding construction period and operation period in comparison with the relevant standards.

11.5.5 The submission time and receiving units of the monitoring reports

Submit staged monitoring reports during the construction period, and submit a report once a year during the operation period. The receiving units of the monitoring reports are the municipal project office, the superior competent departments, and the relevant departments of the World Bank.

11.5.6 Requirements for the feedback of the monitoring reports

The receiving units shall make the feedback within one month after receiving the monitoring reports. The receiving units shall analyze and evaluate the contents of the monitoring reports; confirm whether the environmental mitigation measures are reasonable and effective; make arrangements for the next step work, and put forward the corresponding requirements.

11.6. Environmental Training Plan

11.6.1 Training requirements

Environmental training is one of the parts of the technical support to this project; it is to ensure the smooth and effective implementation of the Environmental Management Plan, the training about the Environmental Management Plan, and other relevant knowledge and skills shall be offered to the owner, construction unit, operation unit, contractor, supervisor, personnel of the local project office, and other staff of related parties; different trainings shall also be given aiming at different positions.

11.6.2 Target audience

1. Project Owner

2. Environmental management personnel and environmental supervising engineers

The training shall be organized by the project office a year before the implementation of the project for environmental management professionals, environmental supervising engineers, and other related personnel; the specific training is conducted by the environmental technology experts.

3. Contractor

Through the construction of the project office, the contractor organizes personnel to receive the training given by the environmental management experts or the trained environmental management professionals at the location of the project before the implementation of the project. It can be concretely carried out.

4. Operator

Organize the personnel through the project office or the owner to receive the training at the location of the project before the implementation of the project. The training can be given by the environmental management experts or the trained environmental management professionals.

11.6.3 Training contents

1) Master and utilize the World Bank’s environmental policies, and domestic environmental protection laws and regulations, and environmental standards;

2) Environmental management mode in the World Bank loan projects, and the environment clauses in the loan agreements;

3) Environmental management plan of each project;

4) Environmental management regulations of each project;

5) Responsibilities of environmental management personnel, environmental supervision personnel, environmental monitoring personnel and contractor, and their mutual relations;

6) Preparation of environmental management work report, environmental supervision work report, environmental monitoring report, and the contractor's log, monthly report, interim report, and annual report.

11.6.4 Training plan and budget

Reference is made to Table 6-1 for the training plan, personnel, schedule and budget.

11.7. Environmental Management Cost Estimate and Fund Source

11.7.1 Budget distribution

The implementation of the Environmental Management Plan involves many units, so there are many different channels of source of funds. Most of the environmental activities are engineering measures; therefore, the expenses shall be provided by the construction unit and operation unit of the project, and included in the project cost.

Expenses stated in the Environmental Management Plan are mainly used for environmental management in the construction period and operation period, mainly including: environmental measures costs, environmental monitoring cost, staff training expenses and the operating expense of environmental management institutions.

11.7.2 Source of funds and EMP budget

Table 11.7-1 is the summary of environmental protection measures, environmental monitoring, staff training and environmental management expenses in the construction period and operation period of this project.

According to the duration of the project implementation, for each construction period, the annual budget must be guaranteed.

Training Contents, Time and Budget

Table 11.6-1

Training Time	Training Theme	Training Object	Specific Training Content	Times	Number of days/times	Number of people /times in each subproject	Budget (ten thousand yuan)
Construction period	Environmental protection laws and regulations, and policies	Municipal project office, construction unit, supervising unit	1) Environmental protection laws and regulations	3	0.5	15	22.5
			2) Environmental policies and plan		0.5	15	
			3) Environmental management of World Bank		0.5	15	
	Implementing environment management plan	Construction unit, supervising unit	1) Environmental protection responsibility during project construction period	1	0.5	10	16
			2) Main tasks of environmental protection during project construction period	1	0.5	10	
			3) Main contents of environmental protection during project construction period	2	0.5	10	
			4) Various kinds of reports in the environmental management plan	2	0.5	10	
			5) Improvement or amendment of environmental management plan	1	0.5	10	
			6) Internal monitoring methods and data collection and processing, etc.	1	0.5	10	
	Emergency processing	Construction unit	Emergency processing measures	1	0.5	8	1.5
	Total of construction period (yearly)						40
Operation	Environmental monitoring inspection	Operating unit	Inspection of environmental protection facilities, etc., environmental quality	4	1.0	10	10

Training Time	Training Theme	Training Object	Specific Training Content	Times	Number of days/times	Number of people /times in each subproject	Budget (ten thousand yuan)
period	and report		monitoring, and report preparation				
	Environmental protection facilities, and environmental protection measures		1) Rules and regulations on environmental safety	4	0.5	10	12
			2) Emergency plan	4	0.5	10	
	Total of operation period (yearly)						22

Table 11.7-1 Summary of the environmental management cost estimate of the project

Unit: ten thousand yuan

No.	Name	Construction Period	Operation Period (Yearly)
1	environmental protection measures costs	244.1	100.2
2	environmental monitoring costs	55.0	8.5
3	environmental protection training costs	200	22
4	Daily management costs of environmental protection institution	241	70
5	soil and water conservation measures	34,790.54	/
6	Total	35,530.64	200.7

11.8. Information Management of Environmental Management Plan

11.8.1 Information exchange

Environmental management requires making the necessary information exchange between different departments and positions of the Project Office, owner, contractor and operator, and informing the external parties (the related parties, and the social public, etc.) the relevant information.

Internal information exchange can be carried out with a variety of ways such as meetings and internal presentation, but one formal meeting must be held every month, and all the information shall be recorded and archived. External exchange can be held once every six months or one year, the information exchange with cooperative units shall form the summary and be archived.

11.8.2 Recording mechanism

For the effective operation of the environmental management system, the organization must establish a perfect system of record, and keep the following several aspects of records:

(1) Requirements of laws and regulations;

(2) Administrative licensing;

(3) Environmental factors and the related environmental impact documents, and the EMP report;

(4) Training records;

(5) Record of the checking, verifying, and maintaining of the activities;

(6) Monitoring data;

(7) The effectiveness of corrective and preventive actions;

(8) Information of the related parties; complaints and handling process, and the record of results.

In addition, the various kinds of records that are mentioned above shall be attached with the necessary control, including: identification, collection, cataloging, archiving, storage,

management, maintenance, query, retention time and disposal, etc. of the records.

11.8.3 Reporting mechanism

The contractor, operator, monitoring unit, environmental supervising engineers and the project office shall record the project progress, implementation of environmental 11.8.3 Reporting mechanism

The contractor, operator, monitoring unit, environmental supervising engineers and the project office shall record the project progress, implementation of environmental management plan, and environmental monitoring results, etc. in the implementation process of the project, and report promptly to the relevant authorities. The monitoring record of operational condition of the landfill and sewage treatment plant involved in the associated engineering and due survey shall also be learned and collected on a regular basis. The relevant requirements are included in the monitoring plan, and mainly include the following six parts:

1. The project environmental supervising engineers make the detailed record of the EMP executive conditions by month, and timely submit the weekly report and monthly report to the project owner and the municipal project office; the weekly report and monthly report shall include the executive conditions of environmental protection measures, the conduct situation of environment monitoring, and the monitoring data.

2. The contractor and operator shall make the detailed record of the project progress and EMP executive conditions - quarterly, and timely submit the quarterly report to the project office-.

3. After completing the entrusted task, the monitoring unit shall timely submit the Monitoring Report to the contractor (operator) and the environmental supervising engineers.

4. The contractor shall timely submit the environmental monitoring report of this project to the agricultural investment project office. The agricultural investment project office shall also timely submit the monthly, quarterly and annual reports of the progress and effects of environmental management plan to the World Bank.

5. When special incidents in violation of the environmental protection occur, the environmental supervising engineers and the project office will report to the local competent administrative departments for environmental protection, and report to the higher level if necessary.

6. Submit one environmental management plan executive report to the World Bank every six months, and the environmental management plan executive report can include the following contents:

(1) Implementation situation of the training plan;

(2) Project progress, such as the progress of the environmental remediation, the closure of Datong old dumpsite, -water improvement -, site infrastructure construction - and and the progress of site utilization -, etc.;

(3) The implementation situation of environmental protection measures, the conduct situation of environmental monitoring, and the main monitoring results;

(4) Whether there is any public complaint, if there is, record the main content of the complaint, the solution, and public satisfaction index;

(5) The environmental management plan executive plan of the second half of the year.

11.9 Continuous Public Participation Plan and Dispute Complaint Channel

11.9.1 Continuous Public Participation Plan

In order to know about the opinions and suggestions of the people around the project area on the project construction, the project will carry out continuous public participation plan according to requirements of the World Bank. During the construction period and within 3 years after operating, pay a return visit and inspect the environmentally sensitive targets once every season, and hold an on-site investigation meeting in the areas where environmentally sensitive targets are concentrated once a year; such meeting shall have the public participated. See concrete arrangement in Table 11.9-1.

Continuous Public Participation Plan
Table 11.9-1

Organizer	Mode	Number of times	Theme	Participant
A. Project construction period				
Huainan Project Management Office, Project Implementation Agency	Public participation and site inspection	- Once per quarter	When required, adjust the mitigation plan; construction influence; opinions and suggestions	Residents living in the project area, representatives from all sectors of society
Huainan - Project Management Office, Project Implementation Agency	Expert discussion or press conference	Once per year	Opinions and suggestions on the mitigation measures; public opinions.	Experts in various fields, media
Huainan -Project Management Office, Project Implementation Agency	Resettlement survey	According to the need of resettlement plan	Opinions on migration settlement, living conditions improvement, livelihood improvement and poverty reduction; opinions and suggestions.	People affected by migration settlement and removal
B. Project operation period				
Huainan -Project Management Office, Project Implementation Agency, Operating Unit	Public participation and site inspection	Once at the first two years	Effects of the mitigation measures; operation influences; opinions and suggestions.	Residents living around the project location; resident representatives, and representatives from all sectors of society.
Huainan -Project Management Office, Project Implementation Agency, Operating Unit	Expert discussion or press conference	Once at the first two years	Opinions and suggestions on the operation influences; public opinions.	Residents living around the project location; resident representatives, and representatives from all sectors of society.

11.9.2 Dispute complaint channel

1. Establishment and composition of the complaint institutions

In order to better ensure the legal rights of the affected people, a kind of complaint mechanism will be established for offering the affected people a convenient, transparent, fair

and effective complaint way; thus the complaint acceptance leading group of environmental impact is established, the group leader is the related personnel of Huainan Environmental Protection Bureau, and the group members come from the project office, Huainan environmental monitor station, environmental impact assessment unit and the owner unit, etc. The environmental influence complaint acceptance leading group consists of a complaint acceptance office, which is set up in the owner's unit; the daily complaints shall be collected and sorted by the complaint acceptance office, which shall propose the treatment suggestions after negotiating with the relevant responsible units.

2. Complaint procedures

The complaint acceptance leading group and office will start accepting complaints within one week after the commencement of the construction, and the special line and e-mail for complaints will also be set up. Detailed complaint procedures are as follows:

The affected person, who thinks his rights in any aspect of the environmental protection are violated, can first go to the complaint acceptance office set up by the owner unit to make the written or oral complaint, and the owner shall negotiate with the complainants to solve the problem according to the complaint situation; the owner shall keep the detailed record of the complaint and its handling information, and then regularly report the record to the leading group.

If the complaint cannot be solved through negotiation, the complainant can continue to make the written or oral complaint to the complaint acceptance office of the environmental protection bureau.

11.9.3 Public feedback

Establish a feedback mechanism; the environmental impact assessment unit, builder or construction unit shall immediately organize the visiting and investigation together with the design and other related departments after receiving the complaint or the rectification notice issued by the administrative department; make corrections according to actual situations, and publicize the rectification program for solving the environmental disputes.

The feedback mechanism is divided into two phases.

Phase 1: During the environmental impact assessment of the project, after the publicity of relevant information, the construction unit and environmental impact assessment unit can collect the residents' opinions through holding the symposium, showing announcement, and Internet publicity; the public can make feedback through the symposium, or view the draft of the environmental impact assessment of the project and give opinions. The residents can give opinions to the construction unit or its entrusted environmental impact assessment institution with the means of letter, telegram, fax, and e-mail, etc. They can also submit the written opinions to the competent administrative department for environmental protection that is responsible for the examination and approval of the environmental impact statement. The construction unit or its entrusted environmental impact assessment institution, and the competent administrative department for environmental protection shall file the source materials of the feedback they collect for future reference.

Phase 2: In the construction period or the operation period of the project, the public give opinions to the construction unit or builder with the means of letter, telegram, fax, and e-mail, etc.; and they can also submit the feedback to Huainan Environmental Protection Bureau and the Office for Letters and Calls.

According to the feedback of the public, the environmental monitoring report, and the inspection report of the supervision department, the Environmental Management Plan will make the targeted adjustment of mitigation measures, and further improve the environmental management activities.

If there is a major deviation from the contents of the Environmental Management Plan

during inspection, or the changing of the project causes a great negative impact on the environment, or the number of the people affected by the negative environmental impact increases significantly, the project office will immediately consult the environment agencies and the World Bank to form an environmental assessment team to make the additional environmental assessment; if necessary, the additional public consultation shall also be made. The revised Environmental Management Plan shall also be informed to the implementing agencies; the contractor shall conduct the construction in accordance with the modified contents.

Chapter XII The environment economic gain and loss

12.1 The investment of the environmental engineering

The investment of the environmental engineering means the sum of the pollution management and prevention capital expenditure. It includes the facility expenses for pollution control and environment protection, and also the infrastructure investment expanses for the need of production or living, for the convenience of the pollution control, and for the best concern of the environment enhancement. The sustainable development project of the comprehensive treatment to the coal mining subsidence area of the resource-oriented city (Huainan) will make use of the World Bank loan project. This project belongs to the public utility and urban infrastructure construction project and it's an environmental protection project with a total investment of about RMB1.0181837 billion -n and the environmental protection investment proportion is 100%. The environmental management investment caused by the engineering construction is RMB 33.7262 million - and accounts for about 3.50% of the total investment of the construction project. The investment estimation of each subcomponent environmental engineering can be seen respectively in form 12.1-1to form 12.1—6.

Environmental protection engineering investment estimation
Table 12.1-1

	Contents		Investment RMB(ten thousand -)	
			Estimation	Total
Construction period	Social environment	Media and notice to reassure the public	16	64
		Construction site billboard	8	
		Auxiliary bridge and enclosure with dense net	40	
	Atmosphere	Construction site hardening treatment	27	106.2
		Clean the wheels	20	
		Watering	40	
		Construction site enclosure with colour plate	8	
		Monitoring	11.2	
	Noise	Equipment sound boarding, temporary housing and others	20	21
		Monitoring	1	
	Waste water	Wastewater treatment of	24	24

		construction engineering		
	Solid waste	Engineering spoil and dregs disposal	20	28
		Domestic rubbish disposal	8	
	Costs of soil and water conservation		34790.54	34790.54
	Total		1475.92	
Operation period	Ecological compensation	Replant flowers and grass, transplant trees	1465	1465
		Domestic garbage collection and disposal	18	18
	Waste water	Leachate collection and disposal	390	390
	Training		22	22
	Monitoring		1.7	1.7
	Total		1896.7	
Total			3372.62	

Subcomponent1 Investment Estimation of the Environmental Protection Engineering

Table 12.1-2

	Contents		Investment RMB(ten thousand -)	
			Estimation	Estimation
Construction period	Atmosphere	Construction site road hardening treatment	10	27.8
		Clean the wheels	4	
		Watering cart	10	
		Construction site enclosure with colour plate	2	
		Monitoring	1.8	
	Noise	Equipment sound boarding, temporary housing and others	3	3.2
		Monitoring	0.2	
	Waste water	Wastewater treatment of construction engineering	5	5
	Solid waste	Engineering spoil and dregs disposal	8	10
		Domestic rubbish disposal	2	
	Costs of soil and water conservation		29319.45	29319.45
	Total		297.27	
Operation period	Replant flowers and grass, transplant trees		579	579
	Domestic garbage collection		10	10
	Training		4.4	4.4
	Total		593.40	

Total	890.67

Subcomponent 2 Investment Estimation of the Environmental Protection Engineering

Table 12.1-3

	Contents		Investment RMB(ten thousand -)	
			Estimation	Estimation
Construction period	Social environment	Media and notice to reassure the public	3	12
		Construction site billboard	1	
		Auxiliary bridge and enclosure with dense net	8	
	Atmosphere	Construction site road hardening treatment	3	20.8
		Clean the wheels	4	
		Watering cart	10	
		Construction site enclosure with colour plate	2	
		Monitoring	1.8	
	Noise	Equipment sound boarding, temporary housing and others	3	3.2
		Monitoring	0.2	
	Waste water	Wastewater treatment of construction engineering	5	5
	Solid waste	Engineering spoil and dregs disposal	3	5
		Domestic rubbish disposal	2	
	Costs of soil and water conservation		2150.94	2150.94
	Total		359.14	
Operation period	Replant flowers and grass, transplant trees		386	386
	Domestic garbage collection		2	2
	Training		4.4	4.4
	Total		392.4	
Total			751.54	

Subcomponent 3 Investment Estimation of the Environmental Protection

Engineering
Table 12.1-4

	Contents		Investment RMB(ten thousand -)	
			Estimation	Estimation
Construction period	Social environment	Media and notice to reassure the public	4	14
		Construction site billboard	2	
		Auxiliary bridge and enclosure with dense net	8	
	Atmosphere	Construction site road hardening treatment	6	19
		Clean the wheels	4	
		Watering cart	5	
		Construction site enclosure with colour plate	2	
		Monitoring	2.0	
	Noise	Equipment sound boarding, temporary housing and others	8	8.2
		Monitoring	0.2	
	Waste water	Wastewater treatment of construction engineering	6	6
	Solid waste	Engineering spoil and dregs disposal	3	5
		Domestic rubbish disposal	2	
	Costs of soil and water conservation		1196.32	1196.32
	Total		244.9	
Operation period	Replant flowers and grass, transplant trees		230	230
	Domestic garbage collection		2	2
	Leachate collection		390	390
	Monitoring		1.7	1.7
	Training		4.4	4.4
	Total		628.1	
Total			873.00	

Subcomponent 4 Investment Estimation of the Environmental Protection

Engineering
Table 12.1-5

	Contents		Investment RMB(ten thousand -)	
			Estimation	Estimation
Construction period	Social environment	Media and notice to reassure the public	3	13
		Construction site billboard	2	
		Auxiliary bridge and enclosure with dense net	8	
	Atmosphere	Construction site road hardening treatment	4	16.8
		Clean the wheels	4	
		Watering cart	5	
		Construction site enclosure with colour plate	1	
		Monitoring	2.8	
	Noise	Equipment sound boarding, temporary housing and others	3	3.2
		Monitoring	0.2	
	Waste water	Wastewater treatment of construction engineering	4	4
	Solid waste	Engineering spoil and dregs disposal	3	4
		Domestic rubbish disposal	1	
	Costs of soil and water conservation		1522.19	1522.19
	Total		276.3	
Operation period	Replant flowers and grass, transplant trees		120	120
	Domestic garbage collection		2	2
	Training		4.4	4.4
	Total		126.4	
Total			402.7	

Subcomponent 5 Investment Estimation of the Environmental Protection Engineering
Table 12.1-6

	Contents		Investment RMB(ten thousand -)	
			Estimation	Estimation
Construction period	Social environment	Media and notice to reassure the public	3	13
		Construction site billboard	2	
		Auxiliary bridge and enclosure with dense net	8	
	Atmosphere	Construction site road hardening treatment	4	21.8
		Clean the wheels	4	
		Watering cart	10	
		Construction site enclosure with colour plate	1	
		Monitoring	2.8	
	Noise	Equipment sound boarding, temporary housing and others	3	3.2
		Monitoring	0.2	
	Waste water	Wastewater treatment of construction engineering	4	4
	Solid waste	Engineering spoil and dregs disposal	3	4
		Domestic rubbish disposal	1	
	Costs of soil and water conservation		601.64	601.64
	Total		298.31	
Operation period	Replant flowers and grass, transplant trees		150	150
	Domestic garbage collection		2	2
	Training		4.4	4.4
	Total		157.4	
Total			453.71	

12.2 The environment economic gain and loss

12.2.1 The estimate to the environment economic loss

1. The direct loss

The investment cost of the proposed environmental engineering is RMB 33.7262 million -. To estimate the calculation period of the engineering course economic evaluation in 25 years and the investment cost of the environmental engineering is RMB 134.91million - each

year. In addition, for the normal operation of the environmental protection and the erosion and torrent control works, there should be an expanse of about RMB 9.65 million - including the operation administrative fee, the remediation charge and the cost of maintenance and so on.

2. The indirect loss

The indirect loss is the agricultural loss that caused by the construction project occupation. The project occupied 177.6 mu collectively-owned land, which are all cultivated land. The average economic value of each mu is 2000 yuan/mu according to the relevant standard of Huainan and the statistical material of the regional nation economic statistics, and the annual agricultural loss is 355.2 thousand yuan.

To estimate by the above two summations, the environmental economic loss of the proposed project is 10.0052 million yuan/year.

12.2.2 The estimation of the environment economic benefit

The environmental economic benefit after the completion of the proposed project is shown in the following parts:

1. Save the medicine spending

According to the Report of the Financial Statement Draft of Huainan in 2012, the expenditures for medical care and public health of the whole city in 2012 were 34.7 million yuan. The total population of Huainan was 2.456 million in 2012 and the per capita medical expenditure was about 140 yuan/year. There are 1950 residents - in the project area. Because of the implement of this project, the ecological environment has been improved. The old waste yard is closed to improve, so the pollution to the underground water is effectively controlled, the agricultural loss is reduced, and the morbidity is lower. All these directly reduce the medical treatment spending of the resident. Through calculation, it can reduce the medical treatment spending of 273 thousand yuan each year.

2. The surrounding land appreciation benefits

The comprehensive management of environment and ecological restoration in the subsidence area improve the ecological environment around the project area, perfect the city infrastructure, effectively promote the rapid development of the real estate industry, tourism industry and other tertiary industry, produce good economic benefits and drive the surrounding land appreciation. At present, land transfer price is 200,000 Yuan/mu. After the completion of this project, the land appreciation space is expected to average 1,500,000 Yuan/mu with reference to the land auction price of the similar area in Huainan city. Combined with the project planning, the strip area from the south of Dongshan Road to the project area intends to transfer residential land 2580 mu and commercial land 1064 mu with the total income up to 54.66 billion Yuan, that is, about 0.21864 billion Yuan/ year.

3. Project development rent (profits)

It can obtain rental income by developing bonsai garden, nursery base, flower trading market, etc.

Bonsai garden: the total area is 8.1hm2 and the bonsai production area is about 79mu. It can achieve annual average profit of 5500 Yuan/mu with a conservative estimate by various management methods of green plants flower leasing, green plants flower sales, landscaping, greening and maintenance and all kinds of flower show with reference to the gardening market in the surrounding area.

Nursery base: the total area is 47 hm2, that is about 705 mu. It can achieve annual average profit of 3000 Yuan/mu with a conservative estimate by the management methods of the combination of nursery stock sales and city greening construction self-marketing with reference to the nursery market in the surrounding area.

Flower trading market: the total area is 9.7 hm2 and the trading market construction area that can be use for rent is 51439 m2. It can achieve turnover of 89 million Yuan with a conservative estimate with reference to the same type of trading market. According to the calculation of the state administration of taxation of enterprise income tax reporting statistics, the industry average profit rate is 8% and the calculation profit is 7.12 million Yuan/ year.

Tourism service area: the total area is 0.8 ha and the construction area that can be use for rent is 1300 m2. It can achieve turnover of 5 million Yuan with a conservative estimate with reference to the same type of trading market. According to the calculation of the state administration of taxation of enterprise income tax reporting statistics, the industry average profit rate is 12% and the calculation profit is 600,000 Yuan/year.

4. Ecological park and green solid soil benefit

The forest has the function of soil and water conservation in the subsidence area. Forest vegetation can intercept rainfall, reduce the surface erosion and reduce surface runoff. Relevant data shows that the wasteland soil loss of per hectare is 75.6t with the same intensity of precipitation while forest land is only 0.05t. Dig 1t sediment costs 10 Yuan, and then the ecological park and green solid soil benefits are 45.27 million Yuan per year.

According to the above four benefits estimate, the environment economic benefit of the proposed project is about 229.6352 million Yuan/ year.

12.2.3 Environmental and economic profit and loss analysis

Environmental economic cost-benefit ratio of the proposed project is 1:22.95 with the calculation of the above environmental and economic benefits, that is, inputting per Yuan can achieve environmental and economic benefits of 22.95 Yuan.

12.3 Comprehensive Benefit Analysis

12.3.1 The Ecological Environment Benefit Analysis

After the project, the surrounding ecological environment of subsidence area will be renovated thoroughly. Through field investigation, in the project area, the earth's surface subsidence area formed by Datong and Jiulonggang coal mines is about 4.66 km2. After Datong and Jiulonggang coal mines were scrapped, the newly-built Changqing coal mine, Shuguang coal mine, Datong the 3rd coal mine, Datong the 9th coal mine and Jiulonggang Well no.9, aggravate the ecological damage of the original subsidence area. Except the earth's surface subsidence caused by coal mining, about 0.5km2 vegetation is damaged by quarrying. By the environmental remediation and water system improvement, closing all small mines in the project area, closing the quarries in the relocation project area, can change the bad environment fundamentally, reconstruct the ecological system, and become the most beautiful and pleasant urban ecological park in Huainan to provide good livable environment and leisure venues for the citizens. Meanwhile the project will provide the rest place for numerous creatures. Patches of forest lands and pond wetlands will provide rich food and good survival space for the birds and fishes and play an important role in saving the native species and protecting biodiversity. Urban forests and green spaces are important genetic gene pool, and have great significance in maintainng the local wild species survival.

The role of large-scale urban forest and large green space can't be compared by a number of small pieces of green lands and parks. It plays an irreplaceable role in keeping the ecosystem balance. Huainan city as the resources based city, with coal industry as the main body, has developed towards the direction of all kinds of industrial development and the population also increases rapidly with the industrial development. Resource development and continuous industry development bring some environmental impacts and ecological environment destruction to the natural vegetation, ambient air, and surface water environment. The ecological green space recovery of Datong and Jiulonggang coal mine subsidence area, will play a positive role in the improvement of urban ecological

environment.

By building ecological green space in the subsidence area, the urban ecosystem will be optimized, and thus reduce the pressure and negative impacts of urban development. Large-scale green space can absorb the carbon dioxide in the atmosphere. A large area of forest vegetation and plants can slow down the wind speed through the large canopy and hairy branches, and can retent dust through leaves, playing the role of windproof and dustproof, to improve the urban ambient air quality.

Because of the plants' role of endothermic transpiration and reducing the solar radiation, generally the outdoor temperature of the renovated subsidence area is 1~4oC lower than that of downtown, and the relative humidity of the air will increase 5~12%. The plants can reduce the heat radiation intensity and old city's "heat island effect", and become the "green natural conditioner" of Huainan city.

Located in the central city, with the difference of four seasons, it will effectively supplement the air oxygen content down the wind of the city, provide clean air for the surroundings of the subsidence area, regulate air temperature, humidity, carbon fixation and oxygen release of Huainan downtown, and especially play a great role in improving the air quality of the old city of northern Shungeng mountain, with the function of urban "green lung".

After the completion of the project, trees and grass will be all around the project area. When looking upward, you will see the green mountain, and while looking down, you will see the clean water. It is filled with natural charms. Concrete embodiments are in the following points:

1.The closure of the old wasteyard eradicates the phenomenon of garbage exposure, changes the wasteyard into the green space, completely solves the environmental pollution brought by garbage exposure, and effectively controls the impacts of the wasteyard on the ecological environment.

2.The repairment of the ditches and the increasement of the water area after the water system improvement, effectively enhance the flood control and drainage capacity, and improve the regional climate.

3. The percentage of greenery coverage of the project area (as the center of Huainan city) will reach 69% after the ecological rehabilitation. As the urban "green lung" and "oxygen bar", every year it can absorb vast CO2 and produce O2 to purify the air of Huainan city. The ecological environment of Huainan city will be more pleasant, and form the sustainable producer, resort and landscape in which man and nature coexist harmoniously.

4.Through the water system improvement and ecological rehabilitation in the project area, Huainan city will become a modern ecological city with the phonomena "water in the city, mountains reflected on water, eyeful green, mountain - water dependency".

5.Through the project construction, the nursery industry and ecological rehabilitation are combined, and ecological environment will be improved obviously. The visual scene and dwelling land all can reflect the natural landscape of the project area. It not only embodies good visual aesthetic, but also expresses the connotation and denotation of "health".

12.3.2 Carbon Efficiency Analysis

According to IPCC and "China's provincial greenhouse gas list guideline", carbon reserve variation of artificial afforestation plants is calculated by biomass expansion factor (BEF). The calculation formula is as follow:

In the fomula: C reserve amount = Vi, t × Ai, t × WD × BEF ×CF:

C reserve amount is the active biomass carbon reserve amount of the forest from year i to year t in this region(t C);

Vi, t is the living wood growing stock of the forest from year i to year t in this

region(m3/hm2);

Ai, t is the effective area of the forest in the ith year in this region;

WD is the average density of wood of this region (t (D.M.)/m3);

BEFi is the average value of biomass expansion factor of this region;

CF is forest stand average carbon content of this region(kg/kg)

The total area of vegetation restoration in this project is 373.97 hm2, and by the year 2030 it basically becomes forest. According to Huainan City the Seventh Forest Resources Inventory Data, the average per unit yield of the young forest of the whole city is 5.67 m3/hm2. Calculated by this , forest vegetation carbon reserve amount of the project area increases 1052.00 t C. Besides, the project area will build a nursery, of which the cultivated area of the transplants and big seedlings is 42.88 hm2, belonging to productive green space. The biomass carbon reserve amount can refer to the calculation method of economic shrubbery, namely:

C reserve amount = biomass per unit area × area × 0.5

The biomass per unit area of the big seedling area uses the average biomass of economic shrubbery of Anhui Province (12.34t(D.M.)/hm2). By calculation, the biomass carbon reserve amount of the nursery productive green space is 264.57 t C.

Combining the above two items, we know that the vegetation biomass carbon reserve amount of this project area is 1316.57t C, equal to 4827.42 tons of carbon dioxide equivalence.

When forest stand becomes mature(by the year 2040), the total vegetation carbon sink in the project area will reach 47189 tons of carbon dioxide equivalence. During the vegetation restoration, soil carbon reserve amount increases apparently. The monitoring results of Grain to Green Program show that the organic carbon of the surface soil will increase 60% on average after 8-10 years Grain to Green Program. If adding the soil carbon reserve amount, the total carbon reserve amount of the vegetation restoration of this project will reach 100,000 tons of carbon dioxide equivalence. For Huainan, the energy type industrial city, it not only helps emission reduction and remit increasement, but also provides larger development space for the industrial economic development.

12.3.3 Water Environment Benefit Analysis

The drained water in the project area mainly includes mine water from small coal mines, landfill leachate, silting water formed by atmospheric precipitation in the quarries, and the production and domestic sewage of some small companies. It produces certain adverse effect on the surface water, because the waste water is directly discharged without treatment. The project takes the following measures to restore and improve the environment: close all small mines; do the necessary anti-seepage and plugging treatments to the garbage disposal plant, and prevent the landfill leachate going into the deep underground and affecting the quality of the underground water; take measures to treat landfill leachate, and discharge according to the standard; clear up the existing quarries, and take engineering measures and vegetation measures to recover the ecology; reduce the sediment amount and soil and water loss amount of the bare surface of the quarries by planting trees and grass; effectively treat the sewage by constructing drainage pipelines to collect some initial rain and sewage；combine the regional pits to a unified and smooth water system by water system repair, and change the flow pattern of the regional surface water, and then improve the quality of the surface water to make the project area become a true ecological park with green hills and clear waters. The project has an important significance on regional COD emission reduction. The reduction quantities of main pollutants are shown in table 12.3--1, table 12.3--2. The total intercept sewage amount is 209.88m3/d, and total COD emission amount is 50.57 t/a.

The Output and Reduction Amount of Landfill Leachate Main Pollutants of Datong Old Refuse Landfill Closure Project

Table 12.3-1

Pollutant name	Production concentration (mg/L)	Output (t/a)	Reduction amount(t/a)	Emission amount(t/a)
COD	5000	42.6	42.17	0.43
BOD5	2000	17.0	16.91	0.09
NH3-N	3000	25.6	25.56	0.04
SS	1000	8.5	8.41	0.09

The Output and Emission Amount of Domestic Sewage Pollutants of Regional Land Development

Table 12.3-2

Pollutant name	Production concentration (mg/L)	Output （t/a)	Emission concentration(mg/L)	Emission amount (t/a)	Reduction amount （t/a）
COD	200	11.2	50	2.80	8.40
BOD5	120	6.72	10	0.58	6.14
NH3-N	30	1.68	5	0.30	1.38
SS	100	5.60	10	0.58	5.02
Animal and vegetable oil	10	0.56	5	0.28	0.28

12.3.4 Social Benefit Analysis

Make a comprehensive treatment to coal mining subsidence area by using World Bank Loan Project. The major is to repair and improve the remaining environmental problems in the resource depletion area of Datong and Jiulonggang coal mines. Social benefits from the repairment and improvement mainly reflect in two aspects: one is improving the living conditions of surrounding residents to improve regional investment climate; the other is making the land resource to be used rationally to bring opportunities for social development. The specifics are as following points:

1. After the comprehensive treatment to the project area, the ecological environment has been greatly improved; the residents living environment has become more beautiful; the physical conditions will also be improved to some extent. It creates better living environment and conditions for citizens of Huainan City;

2. That the closure treatment of the former waste yard can reduce the pollution to ambient air, surface water and underground water. Thus it can reduce the resident morbidity and thereby lower health care cost;

3. Build roads and other infrastructures inside the project area. It helps to improve the traffic situation in the project area and even the whole urban area. Compelte the water supply system and drainage system while building the roads. And make the sewage in the project area to be collected and treated effectively to improve the water quality of the surface water;

4. With the construction of project, the construction and development of subsequent projects and the development of future tourist industry and other industries, it can drive the development of local construction industry, building material industy, finance and other relevant industries. And therefore increase the demand for labor force and local working

opportunity;

5. The surrounding environment is improved gradually with the ongoing project construction. It not only has the external environment for shopping but also can the invest to food, entertainment and other comprehensive consumption projects, which will significantly enhance investors' confidence and promote the development of surrounding commerce and trade;

Modern people live in the cities and they pay more and more attention to the healthy life style of outdoor recreation in regular. Healthy travel and providing slow life of recreational environment, forest walking, forest deep breath, forest bicycle and so on have become an indispencible part of the public daily life. After the completion of the project, it can satisfy the various demands for travel, tourist, entertainment, health care, body building and so on of the citizens nearby and far away and the tourists. Residential demands of being close to the environment is improving continuously; this project also provides the residents of Huainan City with good sightseeing and recreational place, protects the wildlife and bird resources in the region efficiently and helps to improve the citizens' sense of ownership and the responbility of protecting environment.

12.3.5 Economic Benefit

The comprehensive treatment and ecological remediation can revitalize the abandoned land in the subsidence area of the city, and promote the surrounding land to generate bigger appreciation benefits. At present the land remise price of the surrounding land is 200 thousand yuan/mu in average. The project will improve the ecological environment of the surrounding land of the project area after being completed. The appreciation space is predicted to be 1.5 million yuan/mu in average. Considering the project area planning, the intended remise land parcel amount of the belt region from south of Dongshan Road to the project area is 2,580mu residential land and 1,064mu commercial land respectively; the total revenue can reach to 546.6 thousand yuan.

The environment of the project area is beautiful after the ecological remediation, which helps to create good investment climate and drive the development of tertiary industry such as the tourism so that to make contributions to GDP increase of Huainan City; Because the steel products, building materials, concrete and other materials will be purchased in local place, not only the enterprises in Huainan but also the relevant enterprises of Huainan City and the surrounding area will benefit from it. Enlarge the capital investment and increase the product demand of the project area can drive the production of the relevant enterprises. By the primary statistics, the nursery stock base, bonsai cultivating base and training center and so on in the subsidence area can provide the relevant opportunities of employment.

Forest by-products of the city forest construction can bring direct economic benefits, and bring considerable economic benefits to tourist resource developing zone. City forest construction can promote local economy and the the community development, and can enhance the economic vitality of the city and the surrounding area. Promote Huainan citizens to go to the subsidence area by proximity by intensifying the publicity. Promote the rapid development of the Huainan forest tourism and other additional tourist products through intensifying the surrounding tourism resources of Shungengshan forest park and other surrounding tourist resource. The amount of annual tourist reception will reach to 1.8million.

It is possible to carry out industrial heritage tourism in the renovated subsidence area. At present, the minings in the subsidence area are all closed because of the resource depletion. However, in the downhole, the coal mining system, mine hoisting, coal mining, underground transportation and ventilation pattern which were formed before are of great significance to help people especial the teenagers know the basic features of coal mine deposit formation, the coal resource developing process and the history of Huainan coal mining history. The

industrial heritage tourism can realistically display the mysterious underground coal mining process, and reveal the early history of coal mining and modern coal industry and coal culture.

The tourist development of Huainan City is still in the initial stage. The tourist market will be relatively small at the beginning period. Therefore the ecological tourism in the subsidence area shall pay attention to cooperate with the tourist attractions in the surrounding neighbouring counties and cities (such as Huainan Bagongshan national geological park, old city in Shou County and so on) to form into a bigger plane in order to expand popularity and attract more tourists. If the entire scheduling works well, it will certainly accelerate the development of Huainan tourism, drive the development of the relevant industries and promote the economic take-off of Huainan City.

Forest can absorb and converse the toxic gas effctively since the factories in cities often discharge toxic gas such as sulfur dioxide, hydrogen fluoride, chlorine and so on which seriously endangers people health. And some plants are able to absorb and converse a part of toxic gas, for instance, cryptomeria fortunei and ailanthus altissima can absorb sulfur dioxide; robinia pseudoacacia and ligustrum lucidum ait can absorb hydrogen fluoride; cotoneaster and nericum indicum can absorb chlorine and so on. There are some plants are sensitive to the toxis gas. Once the toxic gas increases, these plants will be poisoned. Therefore, these plants can be used as indicative plants. In addition, some plants such as pine, cypress and so on can release bactericide to kill some germs.

Forest in subsidence area also plays a role in soil and water conservation. Forest cover can hold up the precipitation, lower its washout to the ground surface and decrease the surface runoff. According to relevant data, soil loss amount per hectare of the waste land is 75.6t while the forest land is 0.05t at the same intensity of precipitation. If it is costed 10 yuan to dig 1t sediment, the benefit of ecological park and green land soil conservation is 452.7 thousand yuan per year.

12.3.6 Indirect Influence

The indirect environment influence of the comprehensive treatment to coal mining subsidence area of resource-based city (Huainan City) sustainable development engineering is mainly shown as the following aspect:

1. It is expected to the year 2020, the maximum flow of people shall be controlled within about 4 thousands, and the annual visitor capacity will be controlled with in 300 thousand with the development and construction of the regional land as well as the establishment of the road side service points. With the increasing visitors, a large quantity of motorcycles will appear in the project area. The enlargement of traffic flow will have the indirect environment influence such as vehicle exhaust, household garbage and vehicle noise and so on. The Project design has included necessary mitigation measures, including provision of sanitation facilities, parking lot, and dust bins. After the project area is remediated and becomes a recreation and tourist site, it is anticipated that recreation and tourism may be promoted and developed in the project area and its surrounding area, while the enterprises now operating at the site would likely be closed or moved out of the project area gradually.

2. The establishment of this project will destroy the agricultural production facilities to some degree. The reduction of cultivated land area has an effect on farming and livelihood of the local farming area. It needs introducing new industries and increasing employment opportunities to help these regions restore the level of production and living. Meanwhile, resettlement of inhabitants will create a serial of indirect environment problems. The impacts can be mitigated by the measures proposed in the ESMP.

12.3.7 Cumulative Impact

In the preparation of the EA, the VECs for cumulative impact analysis have been screened as the water quality, because the project is intended to remediate the local

environment by closing dumpsites, construction of drainage system, etc. and the adverse impacts are very localized and limited.

Huainan is facing challenges in the management of the water environment, among which the overriding issues is the water pollution. In order to tackle the water pollution problem, Huainan Government has developed an ambitious plan-The 12th Five Year Plan for Environment Protection (the Plan hereinafter), which establishes the water pollution load reduction target that by year 2015 the COD will be reduced by 2,823 t/a and NH3-N by 357 t/a.

To meet the water pollution load reduction target, the Plan calls for a series of works centered on municipal wastewater collection and treatment, and leachate collection and treatment from landfills. This project is an integral part of the Plan and the projects in the future and current have been identified. It is estimated that the project alone will contribute 0.3% of COD reduction target while 0.4% of NH3-N target.

Chapter XIII Public Participation

13.1 Survey Objective

As an important part of environmental impact assessment and one kind of two-way communication between the project implementation agency or environmental impact assessment agency and the public, public participation will improve environmental rationality and social acceptability of the project, which will further enhances the effectiveness of the environmental impact assessment. As stipulated in Environmental Impact Assessment Law, Regulations on Environmental Protection of Construction Project, Interim Procedures of Public Participation in Environmental Impact Assessment and World Bank BP 17.50 for Public Consultation and Information Disclosure, public consultation should be part of environmental impact assessment.

As subsidence area rehabilitation project, this project covers a large area and large number of affected population either directly or indirectly affected by this project, so the general public in project area should be made aware of nature of the proposed project, location, scale, pollutant discharge, measures for mitigating the adverse impacts and environmental benefits to be contributed by this project. Meanwhile, comments and suggestions should be collected from the public and should be reflected in conclusions of public consultation, in order to ensure feasibility of the mitigation measures to be taken and provide basis for decision-making during project implementation.

13.2 Scope of Public Consultation

Public participation is carried out in project area. Total 120 questionnaires were issued in this public participation and were all collected. Participants include farmers, workers, employees of public institutions, teachers and students, which generally cover affected people in project area.

13.3 Survey Form

Approaches of public participation include project information disclosure and public consultation.

13.3.1 Information Disclosure

(1) First round media notice

Public notice was made on local government website after environmental impact assessment contract was signed. Contents of the public notice include project overview, EIA procedure and major tasks. The public notice also includes topics for which public comments will be collected and contact information of project implementation agency and EIA agency, in order to collect comments and suggestions from general public and concerned sectors.

Notice Website: Huainan Environmental Protection Bureau (http://www.hnhb.gov.cn);

Notice Time: 6-20 May 2013 (see Attachment for the first online notice);

(2) Second round media notice

The second round notice was made right after first draft of the EIA report was available. Contents of the public notice include basic project information, potential environmental impact and associated mitigation measures. The public notice also includes major points of environmental impact assessment and the way for the public to access to the full EIA report, approaches of public participation, start and end date and contact information, in order to collect comments and suggestions from the affected people (directly or indirectly) and various sectors. During period of the second round public notice, the project implementation agency or EIA institute had not received any consultation or feedback from the public.

Notice Website: Huainan Environmental Protection Bureau (http://www.hnhb.gov.cn);

Notice Time: 4-18 June 2014 (print screen of the second online notice, see Attachment.);

(3) Newspaper notice

On June 11, 2014, local newspapers in Huainan City published the environmental impact assessment information of this project. See figure 13-1 for the report publicity.

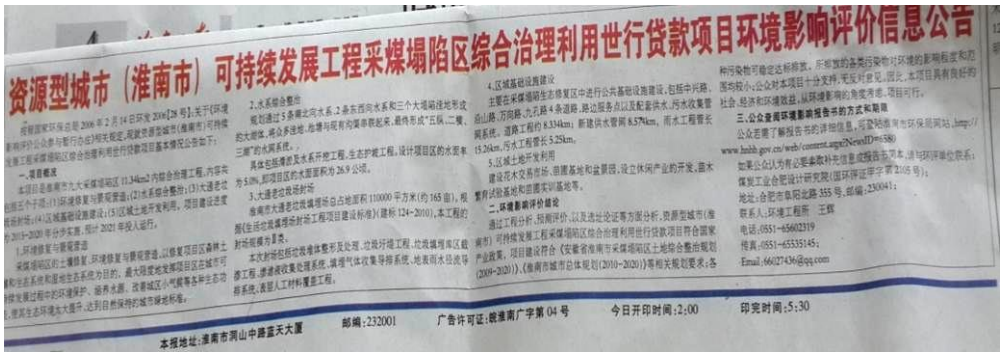

资源型城市（淮南市）可持续发展工程采煤塌陷区综合治理利用世行贷款项目环境影响评价信息公告

Figure 13-1 Photos of the public notice on newspaper

(4) Information Disclosure

The final full size EIA reports and ESMP were disclosed at Huainan EPB on September 5, 2014

http://www.hnhb.gov.cn/web/content.aspx?NewsID=6845

13.3.2 Public Consultation

Following concerned laws and regulation of PRC and the World Bank policies and with reference to successful experience of similar projects in China, questionnaire survey, workshop and consultation of professionals were adopted for public participation of this EIA to collect comments and suggestions from the affected people, answer questions from the public and present mitigation measures for adverse environmental impact.

In order to fully understand views of the public on project impacts and whether they are satisfied with the proposed mitigation measures, two round public consultations and one workshop were conducted.

(1) Public Consultation

On 20 June 2013 pubic interview was made in Chenxiang Village and Jiulonggang Town to collect public comments and suggestions to this project. The first interview introduced project components and implementation arrangements with the purpose to improve EIA outline by understanding major concerns of the public. Majority of the public interviewed expect the project will be implemented soon to improve local environment by addressing existing major environmental problems like pollution from the landfill, inadequate infrastructure and poor environmental management.

The second public interview was conducted in Chenxiang Village and Jiulonggang Town on 13 May 2014 to collect comments and suggestions from the public in project area. Environmental impacts of the proposed project and mitigation measures were introduced and public comments and suggestions were collected to improve design of environmental protection measures. The second interview indicated the proposed mitigation measures are well accepted by the public and they expect strict implementation of these measures.

(2) Questionnaire Survey

Firstly, the questionnaire introduces basic project information to the public, including location, scale, main contents of the project and potential impact on the surrounding environment, as well as main pollution control measures to be taken. 120 questionnaires were provided to the public focusing on residents in affected area, especially people directly affected. The participants include people in different ages, different gender and different profession.

In order to reflect the representativeness and comprehensiveness of the public participation, comments and suggestions were collected from both the concerned agencies and general public. Details of the questionnaire are given in Table 13.4-1.

Table 13.4-1 Public Participation Questionnaire

Project Description	This project includes five sub-components: (1) environmental remediation, including restoration of original ecological system and construction of 16.4km greenway; (2) water system rehabilitaiton: including sediment dredging and ecological embankment; (3) closure of old Datong landfill: including dump pile shaping, solid waste retaining wall, landfill area seepage-proof, landfill leachate collection, landfill gas collection and emission system, surface runoff draining system and landfill capping; (4) regional infrastructure development: including construction of 4 roads (Zhongxing Road, Wanxiang Road, Jiukong Road and Yanshan Road), roadside service areas and associated water supply and wastewater pipelines. Total length of the roads is about 8.337km, and length of water supply, stormwater and wastewater pipeline is 8.574km, 15.26km and 5.25km respectively; (5) site utilization: constructing flowers and trees trading market, nursery base and bonsai garden. The total cost is 1.163678 billion Yuan ($187.690 million equivalent). The planned project implementation period is from 2015 to 2020, and the facilities built will be put into operation since 2021.
Potential environment impacts and mitigation measures	Environmental impacts associated with construction period: 1. The bare ground surface in the industrial site is easily to form wind erosion and dust; raise dust in transporting and unloading building materials; raise road dust by earthwork and powdery material transport vehicle; wind erosion and dust produced by temporary material stack yard. Gases produced when turning the rubbish to close the Datong old refue landfill. 2. Influence from domestic sewage and construction wastewater of constructors to surface water environment. 3. Construction machinery noise. 4. The solid wastes in construction period are mainly construction waste, household garbage, sludge and spoil produced in channel cleanout. 5. The influence to the ecological environment of the project in the construction period is mainly caused by excavation of the ground surface and temporary land occupation of temporary shortcut and spoil area, which destroys some land surface, vegetation and farmland and causes vegetation deterioration and water and soil loss. These influences will disappear along with the construction completion for it's an ecological project. Pollution prevention measures include: dust suppression by spraying water and covering transport vehicles under construction; discharging the sanitary sewage into temporary septic tank and recycling construction wastewater after sedimentation treatment; construction noise protection; recycling or disposing construction waste and household refuse by specially-assigned person. Influence during the operation period: this project is a non-ecological impact project without the "three wastes" (waste gas; waste water; industrial residue) during the project operating period and has almost no environment pollution. The influencing factors during the operation period mainly include sanitary sewage and household refuse discharged by administrative staff of the nearby roadside service area, wasteyard and nursery garden, automobile exhaust and noise and leachate after closing the old wasteyard, etc. Controlling measures during the operation period: 1. Road dust is the major pollution

	for the infrastructure construction in operation period. For the 4 roads in the project area belongs to urban road of Huainan city in operation period, road cleaning work is under the unified management of health department of Huainan city. 2. After being burned, the atmospheric pollutants influential to the environment in the landfill gas extracted from Datong old refuse landfill are disintegrated or burned without influence to ambient air. In the meantime, after the closure of dumping site, make comprehensive greening to its surface, which will improve the quality of ambient air. 3. After the closure of Datong old refuse landfill, the leachate which has been collected and discharged will enter into the filter liquor regulating reservoir and is transported by suction sewage truck to the leachate treatment station of household refuse sanitary landfill in eastern Huainan city. 4. Household refuse is unified bagged and disposed in the leachate treatment station of household refuse sanitary landfill in eastern Huainan city.

Survey contents of public participation					
Name:	Age:	Gender:		Occupation	Nationality:
Education degree:	Address:			Contact No.:	
1. What's your attitude to this construction project?	Pro	Con		Indifferent	Abstention
2. What's the main environmental impact do you think in the project construction period?	Ecological damage	Water pollution	Air pollution	Noise pollution	Solid wastes
3. Do you accept the environmental problems in the project construction period?	Not affected by the construction	With little influence, acceptable		With influence, not acceptable	Abstention
4. What's the main environmental impact do you think in the project operation period?	Ecological damage	Water pollution	Air pollution	Noise pollution	Solid wastes
5. What's the environmental problems do you think that most necessary to be solved at present?	Ecological restoration	Surface water environment	Ambient air	Noise interference	Solid wastes
6. What are the social and environmental benefits do you think that the project construction has?	Promote The Economic Development	Energy Conservation And Emission Reduction	Complete the infrastructure	Provide labor and employment	Improve the quality of life
7. What are your requirements and suggestions on the project construction and environmental protection measures?					
Signature:	Date:				

Note: ①please show your attitude or opinion with "√"; ②please explain the cause or reason for counterview; ③Please specify concrete suggestions.

This public opinion survey requires taking overall consideration on the masses in different ages, genders, education degree and professions, and the total 120 questionnaires issued are all collected validly with a retrieving rate of 100%. For the 120 respondents, from the point of gender, the proportion of male is 55% with 66 persons and the proportion of female is 45% with 54 persons; from the point of education, 112 persons are in elementary school education level and above and 8 persons are not indicated; from the point of age level, 26 persons are in the age group 15-30 (including 30), occupying 21.7%; 30 persons are in the age group 30-45 (including 45), occupying 25%; 59 persons are over the age of 45, occupying 42.9%. From the point of profession, 30.8% are farmers and 42.5% are staffs. See table 13.5-2 for the basic information of the respondents, and see table 13.4-2 for the statistical result of the questionnaire survey.

Table 13.4-2 Statistics of Public Participation Survey Results

No.	Survey Contents	Public Opinions	Number of Participants	Percentage of Valid Questionnaires (%)
1	What's your attitude to construction of this project?	Pro	120	100
		Con	0	0
		Indifferent	0	0
		Abstention	0	0
2	What's the main environmental impact do you think in the project construction period?	Ecological damage	25	20.8
		Water pollution	28	23.3
		Air pollution	64	53.3
		Noise pollution	82	68.3
		Solid wastes	15	12.5
3	Do you accept the environmental problems in the project construction period?	Not affected by the construction	14	11.7
		With little influence, acceptable	99	82.5
		With influence, not acceptable	6	5
		Abstention	1	0.83
4	What's the main environmental impact do you think in the project operation period?	Ecological damage	14	11.7
		Water pollution	39	32.5
		Air pollution	62	51.7
		Noise pollution	78	65
		Solid wastes	18	15
5	What's the environmental problems do you think that most necessary to be solved at present?	Ecological	47	39.2
		Surface water environment	69	57.5
		Ambient air	82	68.3
		Noise interference	15	12.5
		Solid wastes	32	26.7
6	What's the social and environmental benefits do you think that the project construction has?	Promote the economic	82	68.3
		Energy conservation and emission	38	31.7
		Complete the	79	65.8
		Provide labor and employment	62	51.7

		Improve the quality	93	77.5
7	What are your requirements and suggestions on the project construction and environmental protection measures?	1. Complete the project as soon as possible; 2. The project shall be closely around the theme of ecological construction and livable and suitable for traveling; 3. Set up communal facilities; 4. The more green area the better; 5. Pay attention to disposal of water pollution, noise pollution and solid wastes;		

2. Analysis of Survey Results

(1) All the respondents hold supportive attitude to this project, and no dissenting opinion. The public show that there is little environmental influence during the project construction period with 82.5% respondents accepting the influence, 11.7% respondents not being affected by the construction, 5% respondents not accepting the influence and 0.83% respondents abstaining from voting.

(2) For the main environmental influences during the construction period of the project, 68.3% of the respondents choose noise pollution, 53.3% choose air pollution, 23.3% choose water pollution, 20.8% choose ecological damage and 12.5% choose solid waste.

(3) For the main environmental influences during the operation period of the project, 65% of the respondents choose noise pollution, 51.7% choose air pollution, 32.5% choose water pollution, and 15% and 11.7% of them choose solid waste and ecological damage.

(4) For the main environmental influences which shall be urgently solved at present, 68.3% of the respondents choose ambient air pollution, 57.5% choose surface water environment pollution, 39.2% choose ecological restoration, 26.7% choose solid waste, and 12.5% choose noise influence.

(5) This project can benefit the environmental improvement of this area, 77.5% of the public think that the project construction will contribute to improving the living quality, 68.3% think that it can promote the economic development, 65.8% think that it can perfect the infrastructure, 51.7% think that it can provide labor employment, and 31.7% think that it can save energy and reduce emission.

(6) The surveyed masses all support the construction of this project, and put forward many opinions and suggestions, for example, construct as soon as possible, strengthen management during the construction process, increase the green area, and beautify the environment, etc.

3. Public Consultation Workshop

In the afternoon on May 19, 2014, the public consultation symposium was held by Finance Bureau of Huainan City and the government of Datong District in government conference room of Datong District, which was attended by representatives from Hongqi Community Committee Jiulonggang Town, Chonghua Community Committee Jiulonggang Town, Hongqi Community Committee Jiulonggang Town, Economic and Information Commission of Jiulonggang Town, Zhanhou Community Committee Datong Sub-district Office, Huainan Municipal Commission of Development and Reform, Datong District Government, Huainan City Agricultural and Forestry Bureau, Environmental Protection Agency of Datong District and Datong Sub-district Office, etc., public representatives within the influence range of the project and representatives of environmental impact assessment unit, see table 13.4-3 for the list of public representatives present at the meeting. See figure 13-2 for the symposium scene photos.

Figure 13-2 Workshop

On the symposium, environmental impact assessment unit introduces the project construction content, the possible environmental influence of the project construction, mitigation measures and improvement of the project area environment, etc. to the public, who all think that the project is a livelihood project with positive significance to Datong District, even to Huainan City. The environmental influence in the project construction period is within the affordable range of the residents, and all the representatives hope to complete this project as soon as possible so as to improve the current dirty, disordered and poor situation of environment in the project area. In the meantime, the residents also show concerns on environmental problems, such as: air pollution, noise pollution and solid waste pollution, etc. The project construction unit promises to conduct civilized construction and try their best to reduce influence to residents.

Table 13.4-3 List of Public Consultation Workshop Participants

Serial No.	Name	Gender	Age	Profession	Education degree	Work unit or address	Contact No.	Attitude
1	Mi Fuhui	Male	35	Civil servant	Bachelor degree	Justice office of Jiulonggang Town	13955403451	Pro
2	Chen Yan	Female	39	Community worker	Technical secondary school	Hongqi Community Committee Jiulonggang Town	13855472080	Pro
3	Li Lingchao	Female	48	Community worker	/	Chonghua Community Committee Jiulonggang Town	18955412958	Pro
4	Tao Hong	Female	35	Community worker	/	Hongqi Community Committee Jiulonggang Town	15055427346	Pro
5	Wang Xianling	Female	42	Cadre	Junior college	Economic and Information Commission of Jiulonggang Town	0554-62211718	Pro

6	Wang Xingwu	Male	60	Community worker	Senior high school	Zhanhou Community Committee of Datong District	13013056135	Pro
7	Duan Junmei	Female	42	Resident	/	Juren Village Datong Jiedao Committee	18055497361	Pro
8	Su Yunqian	Female	27	Resident	Bachelor degree	Jindi International City	15856686361	Pro
9	Zhang Xianling	Female	47	Resident	Technical secondary school	cement plant	15956674897	Pro
10	Zhu Ming	Female	34	Resident	Junior college	The second Phase Jinfeng Yiju	13956400284	Pro
11	Wang Tao	Male	40	Cadre	Junior college	Huainan Municipal Commission of Development and Reform	15955409929	Pro
12	Gao Dandan	Female	24	Community worker	Junior college	Xinjian community committee Datong District	13685540291	Pro
13	Li Yanhua	Female	49	Cadre	Senior high school	Datong District Government	/	Pro
14	Zhao Peishu	Female	48	Community worker	Senior high school	Jubei community committee Datong District	0554-62130136	Pro
15	Liao Fang	Female	50	Cadre	Junior college	Environmental Health Management Office Datong District	/	Pro
16	Wang Hong	Male	50	Resident	Bachelor degree	The Third District of Junren Village	13637115465	Pro
17	Yang Jie	Female	47	Community worker	/	Zhanhou community committee Datong Sub-district Office	135164355145	Pro
18	Ma Jixiao	Female	49	Worker	/	Tongjian Village Datong District	18955437910	Pro
19	Shen Liwu	Male	38	Cadre	Bachelor degree	Datong Sub-district Office	15395440306	Pro
20	Lin Dalan	Female	50	Worker	Junior college	Datong Sub-district Office	0554-62517189	Pro
21	Wang Shifei	Male	44	Civil servant	Bachelor degree	Huainan City Agricultural and Forestry Bureau	0554-62519350	Pro
22	Tian Yi	Male	32	Civil servant	Bachelor degree	Datong District Government Office	0554-62519400	Pro

23	Chen Yanxia	Female	42	Civil servant	Bachelor degree	Datong District Environmental Protection Agency	15956696617	Pro

13.4 Conclusion of Public Consultation

Public consultation process is shown in Table 13.4-1.

Table 13.4-1 Public Consultation Process

Time	Place	Materials supplied when consulting	Participants	Questions Raised	Answers
2013.5.6-2013.5.20	The first online publicity Publicity website: Huainan Environmental Protection Agency	Environmental impact assessment information notice of this project (for the first time)	/	/	/
2014.6.4-2014.6.18	The second online publicity Publicity website: Huainan Environmental Protection Agency	Environmental impact assessment information notice of this project (for the second time)	/	/	/
2013.6.20	The first time to post announcement Place: Chenxiang Village	Outline of the environmental impact assessment work	Residents of Chenxiang Village	Due to the gas of Datong old refuse landfill having influenced the daily life of residents, they hope to take measures to treat is as soon as possible and put environmental protection measures into practical implementation during the project implementation	Treatment measures (landfill closure measures) have been incorporated into the design and environmental impact assessment
2014.5.13	The second time to post announcement Place: the government of Jiulonggang town, Chenxiang Village	Full environmental impact assessment report	Residents of Jiulonggang Town		

2014.5.19	Public consultation symposium Place: government conference room of Datong District	Public participation questionnaire	Hongqi Community Committee Jiulonggang Town, Chonghua Community Committee Jiulonggang Town, Hongqi Community Committee Jiulonggang Town, Economic and Information Commission of Jiulonggang Town, Zhanhou Community Committee Datong Sub-district Office, Huainan Municipal Commission of Development and Reform, Datong District Government, Huainan City Agricultural and Forestry Bureau, Environmental Protection Agency of Datong District and Datong Sub-district Office and public representatives within the influence range of the project, 23 persons in total.	Representatives hope to complete this project as soon as possible so as to improve the current dirty, disordered and poor situation of environment in the project area. In the meantime, the residents also show concerns on environmental problems, such as: air pollution, noise pollution and solid waste pollution, etc.	Relevant measures have been incorporated into the design and environmental impact assessment.

2014.6 -2014.7	Project and around area	Public participation questionnaire, a total of 120 copies are issued	Affected residents	1. Implete the project as soon as possible; 2. The project shall be closely around the theme of ecological construction and livable and suitable for traveling; 3. Set up communal facilities; 4. The more green area the better; 5. Pay attention to disposal of water pollution, noise pollution and solid wastes;	Relevant measures have been incorporated into the design and environmental impact assessment.

Therefore, this public participation has legal procedures, valid formats, strong targeted surveyed objects, and consistent return visit situation and survey conclusion, thus meeting the requirements of Notice on Practically Strengthening the Risk Prevention and Tightening the Environmental Impact Assessment Management (HF No. [2012]98) and Interim Procedures of Environmental Impact Assessment Public Participation (HF No. [2006]28) issued by Ministry of Environmental Protection.

In conclusion, the local people in the project area have possessed certain environmental awareness, and generally support the construction of the Sustainable Development Project of Resource-Based City (Huainan City) World Bank Loan Project of Coal Mining Subsidence Area Comprehensive Treatment and Utilization, and no objections have been received during the public consultation period. The project implementation agency has followed environmental impact assessment requirements for environmental pollution control measures, enforcement of “three-simultaneity” system to improve implementationof the proposed project.

Chapter XIV Environmental Risk Assessment

14.1 Influence of Risk Incidents and the identification of causing factors

Landfill engineering is one of the garbage reasonable disposal methods, and the potential environmental risks of the sanitary landfill of household garbage are mainly the following three aspects: first, the landfill leachate leakage phenomena of landfill leachate regulating reservoir that may make the water pollutant move down and cause the underground water pollution; second, the subsidence of the dam in the landfill area that may cause the subsidence and exposure of the garbage heap, in the rainy season, landfill leachate will appear because of the rain, and then it will flow into the surface water and cause the water environment pollution and ecological pollution; third, the spontaneous combustion or explosion of methane gas.

The waste water in the process of landfill is mainly the landfill leachate, which contains organics, COD, BOD5, ammonia and nitrogen in high concentration, and may also contain coliform, heavy metal ion, odor pollution and other injurious ingredients, so if the landfill leachate enters into the natural water, the water quality will deteriorate and the aquatic organism will die; if it enters into the soil layer, the aboveground vegetation will die or the crop failure will be caused; if it intrudes into the underground water, it will cause the pollution of underground water, and the influence period will be long or permanent. There are mainly two leaking ways of landfill leachate: the subsurface leakage caused by improper anti-leakage measure or the damage of the impermeable layer, and the overflow of the sewage storage pool.

Landfill gas is the mixed gas produced through the anaerobic degradation of the organic waste gas in the landfill process. The main ingredients of the landfill gas are CH4, CO2, H2, N2, and O2, and the trace gas such as H2S, NH3, heptane, octane, and vinyl chloride, etc. The disorderly emission of the landfill gas will cause many environmental issues, the CH4 of high concentration (accounting for over 99% of the total amount with CO2) is a kind of combustible gas; according to its characteristics that spontaneous combustion or explosion may be caused by spark when its volume ratio reaches 5-15% of the mixed gas, it may influence the safety of surrounding people and animals, it is the potential explosive source, and it is also the important greenhouse gas; in addition, H2S, NH3 and other malodorous gases will cause the potential hazard to people that cannot be ignored. Because of the bad situation of ventilation, the methane gas cannot timely diffuse or a large volume of methane gas accumulates owing to the exhaust system failure, and these are the important reasons causing the spontaneous combustion or explosion of methane gas.

14.2 Risk analysis

14.2.1 Risk analysis of leachate leakage

The contaminating liquid formed from the water and organic decomposing liquid after landfilling will ooze from the side and bottom of the landfill, and the ingress of underground water around the landfill will increase the landfill leachate quantity of the storage area. In order to effectively prevent the leachate from polluting the underground water or impacting the ambient enviroment, the landfill must take effective anti-seepage measures to avoid the leachate permeating and diffusing into the adjacent areas, and make the refuse landfill become a closed separate unit.

Based on the engineering geological investigation report of the old landfill, the thickness of 3 layers of silty clays near the field is generally 3~10m in the sourth part, and is larger than

10m in the middle and north parts; the disclosed thickness for exploration is 3.6~19.0m, and the osmotic coefficient of the clay layer is 1×10-6cm/s. Therefore, this project will mainly establish vertical anti-seepage systems around the wasteyard, supprted by reducing the water head height of the leachate in the wasteyard, comprehensively create a independent hydrogeological unit near the wasteyard, and avoid the landfill leachate contacting with the outside environment. By means of vertical anti-seepage design and leachate pump drainage system setups, even though the possibility of landfill leachate leaking into the outside environment cannot be fully eliminated, the diffusing capacity of leachate will inevitably greatly decrease, and the influence on the regional underground water environment will obviously weaken.

14.2.2 Risk analysis of block dam break

When the old landfill is operating, the rubbishes are naturally stacked, no standard paving and compaction operations are executed; the waste pile is loose, and the rubbish stacking dip angle is the natural angle of repose of the rubbish, the altitude difference of the pile is large (max: 10m), and the side slope grade of some piles is very steep, which is far larger than 1: 3; therefore, the piles is liable to subsidence when receiving exogenic action. Under the circumstances of rainstorm or other bad weather, the waste piles are also liable to subsidence and landslide.

In order to prevent the covering soil from water and soil loss due to the erosion of rainwater, wind, and ice and snow, which may further influence the stability of the waste pile, finish the slope of the waste pile which has not been operated according to the sanitary landfill standard originally; the side slope control value shall be controlled within 1: 3.5~ 1: 4. The peak of the storage area will slope down in all directions, and the average gradient is larger than or equal to 5%. After finishing, lay down the slope of the waste pile from the center by a gradient of 5%; the gradient is very small, so that the waste pile is unlikely to slide, and will be stable.

14.2.3 Risk analysis of fire and explosion

Huainan Datong old refuse landfill is located in the north of Laobagou subsidence area of Datong District, east of Chengxiang Village, and 50m east from Jiuda Road; this landfill was started using in 1984, and closed in June of 2009. In recent years, no fire or explosion accident occurred.

Based on the field investigation data and landfill survey report, the total dumping capacity of this landfill is 1 million to 2.5 million tons; it adopts simple dumping technology, so that the landfill gas volume is small; therefore, according to the specification, the key point at the current stage is to design and guide an unblocked passage, so as to avoid the gas exhaust blocking or gathering, which may cause fire and explosion; industrialized utilization is not considered at the moment. If the landfill gas is found of high usable value in the later stage, the landfill gas purification and utilization equipments can be added. After taking the corresponding inverting measures, the possibility of fire and explosion becomes very low.

14.2.4 Geological hazard risk analysis

The third coal mine of Datong district is in the north side of the wasteyard, which is a collective small coal mine and closed at the end of 2012. But due to repeated mining, repeated subsidence within the region has a trend of development. In the meantime, it's revealed that the southeast corner of the site existe limestone and part may have karst cave.

According to Sustainable Development Project of Resource-Based City (Huainan City) Coal Mining Subsidence Area Comprehensive Treatment and Utilization Geological Hazard Risk Assessment Report (Anhui hydrology and engineering geology company, August 2013), the geological hazard risk analysis around old Datong old refuse landfill is as follows:

1.Goaf subsidence prediction of the third coal mine of Datong district

It is predicted that the goaf subsidence influence range of the third coal mine of Datong district is about 0.16km2, and the maximum subsidence depth is about 1.5m. It is located in the central mining area with a major influence radius of 135m and in elliptical shape. The subsidence range and isoline are as shown below.

List of subsidence conditions in the third coal mine of Datong district
Table 14.2-1

Subsidence depth (m)	Area (km2)	Damage degree	Risk
＞1.0	0.04	Serious	Great
0.5～1.0	0.05	Moderate	Moderate
＜0.5	0.07	Small	Small

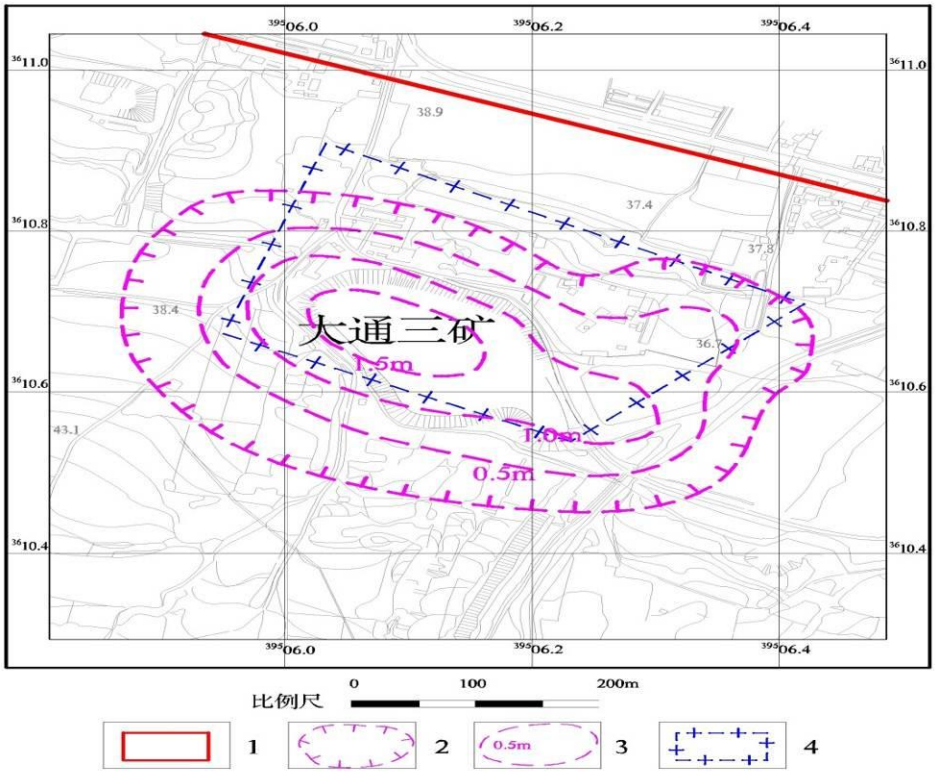


Figure 14.2.1 the predicted subsidence isoline map of the third coal mine of Datong district

Note: 1. Evaluates district boundary line; 2. Goaf subsidence range 3. Subsidence isoline and depth; 4. Mining area boundary line.

Wellbore danger zone prediction

The wellbore structure in the third coal mine of Datong district and shut-in well conditions are as shown in the below table.

The wellbore structure in the third coal mine of Datong district Table 14.2-2

Name of coal mine	Wellbore name	Wellhore size (length × width or diameter)	Stratigraphic texture	Wall structure
The third coal mine of	Main shaft	2.2×2.0	The upper is clay with a thickness of 15m; underpart is sandstone mixed with mudstone	Wooden tray structure
	Ventilating shaft	1.6×1.4	The upper is clay with a thickness of 14m; underpart is sandstone mixed with mudstone	Wooden tray

Datong district				structure
	Safety exit	φ1.0	The upper is clay with a thickness of 18m; underpart is sandstone mixed with mudstone	Wooden tray structure
	No. 1 wellbore (scrapped)	φ5.0	The upper is clay with a thickness of 25m; underpart is sandstone mixed with mudstone	Wooden tray structure

Shut-in well conditions in the third coal mine of Datong district
Table 14.2-3

Name of coal mine	Wellbore name	Shut-in time	Shut-in well depth (m)	Shut-in well conditions
The third coal mine of Datong district	Main shaft	2012.12	199	Fill in the wellbore with gangue and loess to the 2m place under the ground surface, place the joist steel to be vertical to the well wall with equidistance to the south and north and the length of the two sides that exceeding the well wall shall be not less than 0.3m. Lay wooden tray or square timber that not less than 0.12m tightly on the joist steel and placing concrete till to the ground surface. After the completion of shut-in, lay steel mesh reinforcement in each well mouth surface and placing concrete cover plate with concrete, whose thickness shall be not less than 0.2m and shall be not less than the well mouth surrounding with 0.3m, and set permanent monument of shut-in well date and others.
	Ventilating shaft	2012.12	40	
	Safety exit	2012.12	39	
	No. 1 wellbore (scrapped)	1998	-	Seal the well mouth with concrete cover and the size is greater than the well wall perpendicular to the outside with 1.0m.

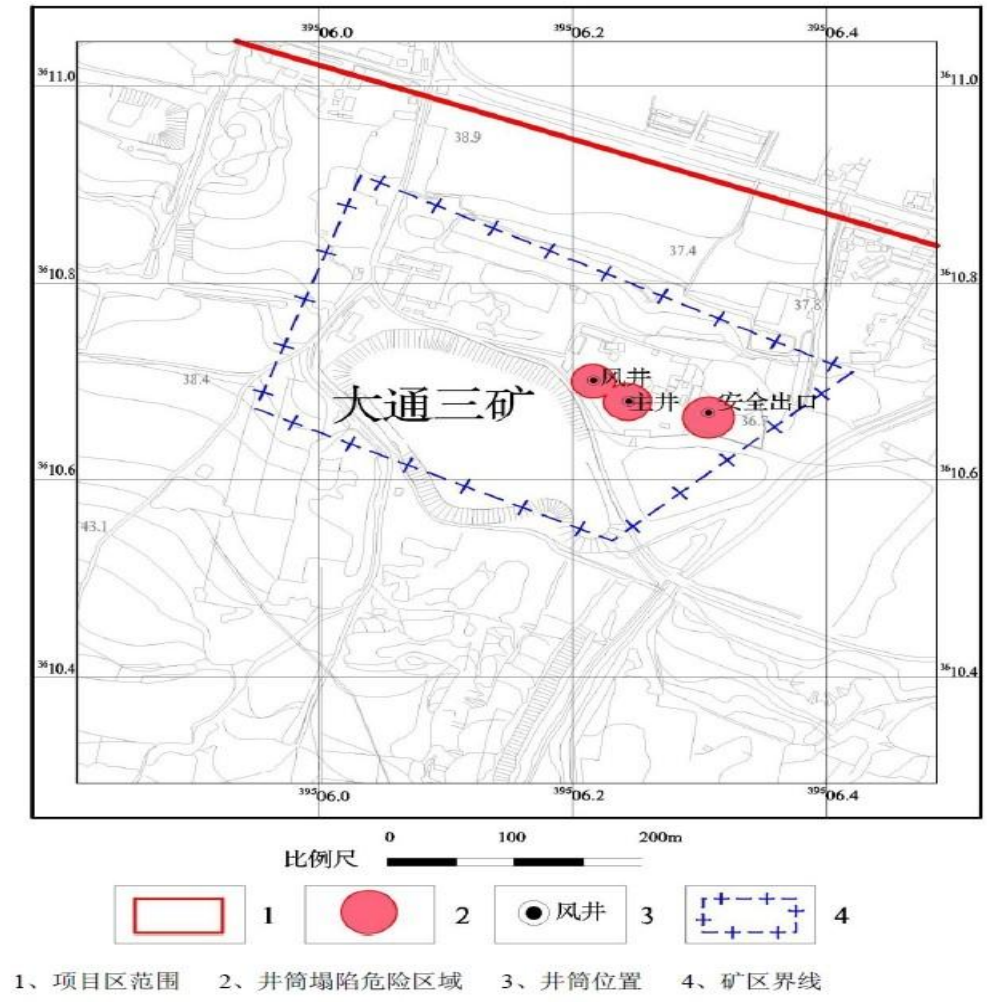
Due to that part of wellbores are not filled till to the bottom or not be filled, underground water level will recover gradually after the closure of the coal mine, and the underground water runoff will scour the loess. The unconsolidated formation in the upside of the wellbore has the subsidence hazard when the fillings are scoured off. Calculate the wellbore hazardous area according to the calculation method of wellbore hazardous area on Geotechnical Model Concept on Hazardous Area Assessment Report of the Yachen Revier Old Mining Area and Axis Conservation Area.

Calculation results list of the hazardous area in the third coal mine of Datong district
Table 14.2-4

Name of coal mine	Wellbore name	Wellbore structure	Thickness of unconsolidated formation (m)	Uphill influence radius (r1)	Downhill influence radius (r2)	Wellbore size (d)	Radius of influence (R)
The third coal	Main shaft	Vertical shaft	15.0	17.2	17.2	2.2	36.6

mine of Datong district	Ventilating shaft	Vertical shaft	14.0	16.1	16.1	1.6	33.8
	Safety exit	Inclined shaft	18.0	15.8	25.6	1.0	42.4
	No. 1 wellbore (scrapped)	Vertical shaft	25.0	28.5	28.5	5.0	61.0

Subsidence influence range geologic plan of the third coal mine of Datong district is as shown below:



大通三矿	The third coal mine of Datong district
主井	Main shaft
风井	Ventilating shaft
安全出口	Safety exit
比例尺	Proportional scale
1、项目区范围	1. Project area range
2、井筒塌陷危险区域	2. Wellbore subsidence hazardous area
3、井筒位置	3. Location of wellbore
4、矿区界限	4. Mining area boundaries

Figure 14.2-2 Subsidence influence range geologic plan of the third coal mine of Datong district

3. Geological disaster risk comprehensive regional assessment

Geological disaster risk comprehensive regional assessment around the old Datong old refuse landfill is as follows:

(1) Goaf subsidence and swelling soil deformation region in great geological disaster risk (Ⅰ4)

The area is located in the south of the third coal mine of Datong district with an area about 0.04km2, and the major construction project is the wasteyard closure project. Geological environmental complexity in this region is in a moderate degree; the current geological disaster is goaf subsidence in great damage degree and great risk; the ground surface lithology is the upper pleistocene series Qi Zui Fm (Q3q) silty clay and clay, ① the free expansion rate (δef) of the silty clay body is 46.5% ～ 55.0% (40.0% ≤ δef ＜ 65.0%) with weak expansion potential and in little damage degree and risk; It is predicted that the biggest subsidence depth in the third coal mine of Datong district is 1.5m in great damage degree and great risk.

(2) Goaf subsidence and swelling soil deformation region in moderate geological disaster risk (Ⅱ1)

The area is located in the south of the third coal mine of Datong district with an area about 0.05km2, and the major construction project is the wasteyard closure project.

Geological environmental complexity in this region is in a moderate degree; the current geological disaster is goaf subsidence in moderate damage degree and great risk; the ground surface lithology is the upper pleistocene series Qi Zui Fm (Q3q) silty clay and clay, ① the free expansion rate (δef) of the silty clay body is 46.5% ～ 55.0% (40.0% ≤ δef ＜ 65.0%) with weak expansion potential and in little damage degree and risk; It is predicted that the biggest subsidence depth in the third coal mine of Datong district is 0.5~1.0m in moderate damage degree and risk.

(3) Goaf subsidence and swelling soil deformation region in little geological disaster risk (Ⅱ1)

The area is located in the south of the third coal mine of Datong district with an area about 0.72km2, and the major construction project is the wasteyard closure project.

Geological environmental complexity in this region is in a moderate degree; the current geological disaster is goaf subsidence in little damage degree and risk; the ground surface lithology is the upper pleistocene series Qi Zui Fm (Q3q) silty clay and clay, ① the free expansion rate (δef) of the silty clay body is 46.5% ～ 55.0% (40.0% ≤ δef ＜ 65.0%) with weak expansion potential and in little damage degree and risk; It is predicted that the biggest subsidence depth in the third coal mine of Datong district is 0~0.5m in little damage degree and risk.

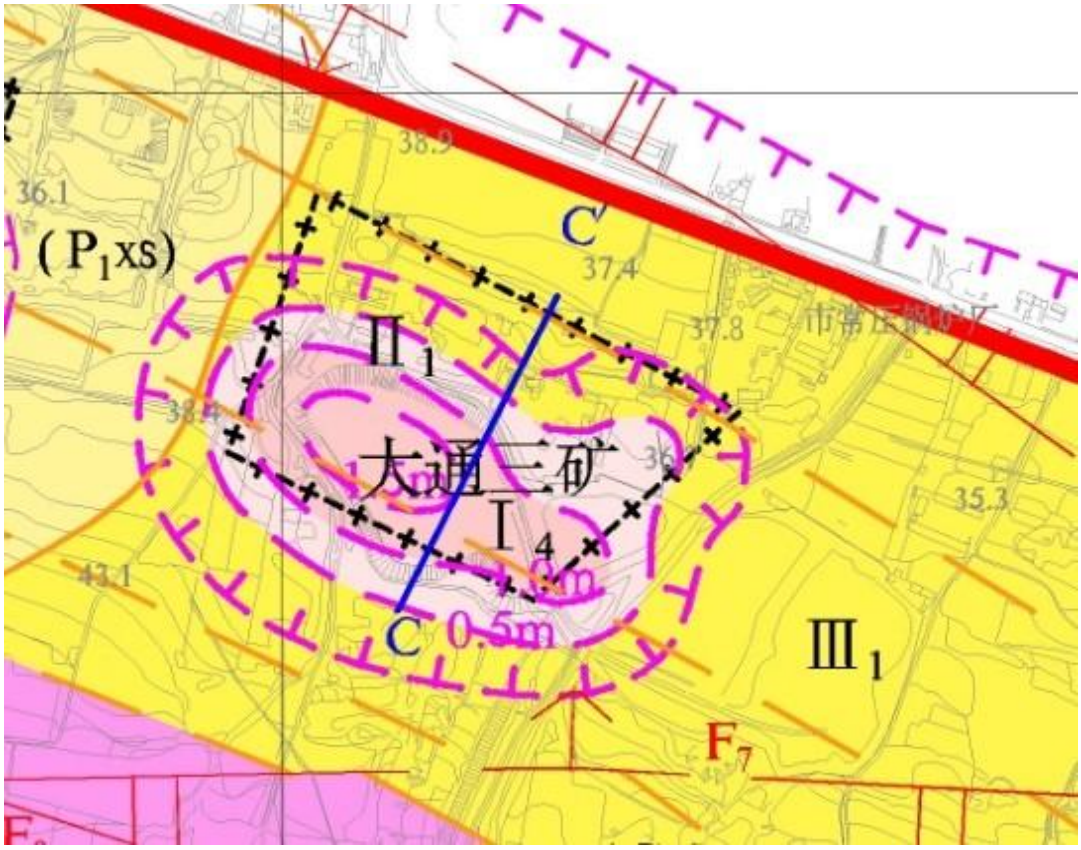


Figure 14.2-3 Risk comprehensive district map of the geological disaster around Datong old refuse landfill

4. Karst subsidence boundary

In earlier reconnaissance, it's revealed that the southeast corner of the site existe limestone and part may have karst cave. In order to further find out the limestone distribution conditions in the southeast corner of the wasteyard, densely covered holes are added in this part during reconnaissance period. Combined the regional geological data, the limestone range is defined as shown below.

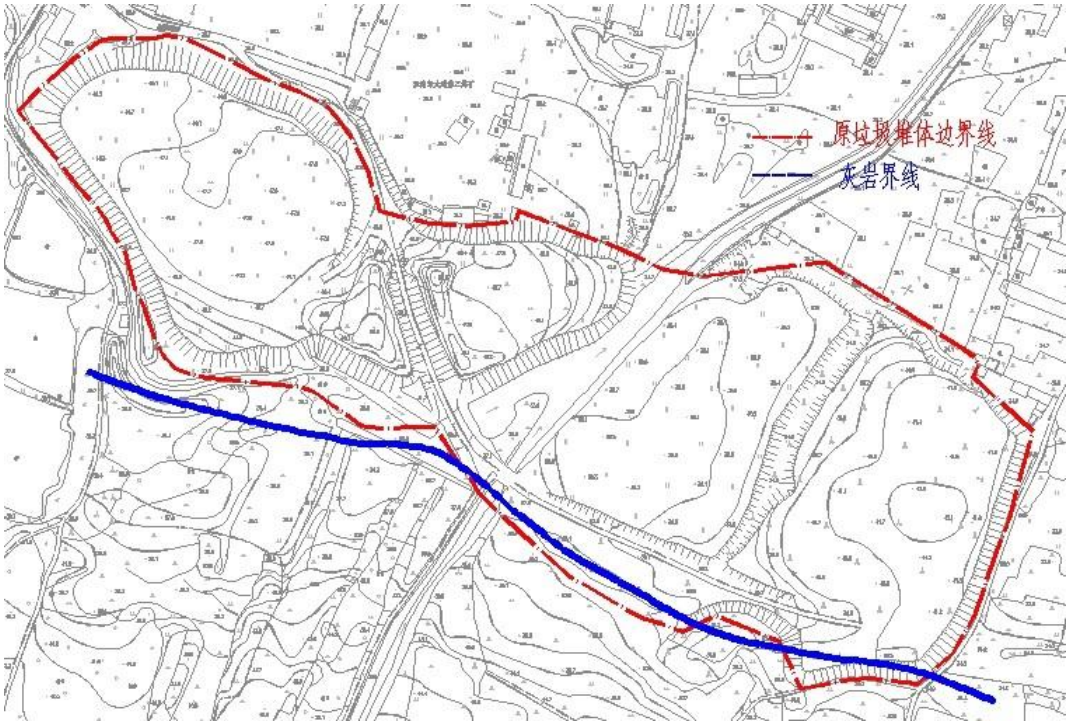


Figure 14.2-4 limestone boundary figure

In rubbish reshaping construction of this project, the dangerous boundary in the project area is fully taken into account and the limestone boundary in the south side of the rubbish heap is all located outside of the rubbish heap body. Turn over and reshape the rubbish in the karst subsidence area to make sure no karst subsidence wind direction existing in the rubbish heap body.

14.3 Risk prevention measures

14.3.1 Measures to prevent infiltration

Water pollution is mainly caused by percolate from the landfill. In order to prevent water pollution, landfill area has taken manual seepage-proofing, rain sewage diversion, percolate collecting, guiding and draining, etc.

1. Manual seepage-proofing: use HDPE membrane on the landfill area top to intercept the seepage, the entire original landfill area surafce is covered with manual impervious bed.

2. Rain sewage diversion: drain the earth surface rain into the flood intercepting trench to the greatest extent, reduce the rainfall capacity received by the rubbish storage area, thus dramatically reducing the percolate quantity.

3. Percolate collecting, guiding and draining: collect the percolate and then convey in to the percolate regulating reservoir through percolate transmission pipes; transport to the percolate treatment station in the sanitary landfill through suction-type sewer scavenger, drain after reaching the standards. After collecting, guiding and draining, the percolate will enter into the percolate regulating reservoir, and then be transported to the percolate treatment station in the eastern household garbage sanitary landfill through suction-type sewer scavenger for disposing. This percolate treatment station is designed with a daily treatment scale of 200m³/d, the treatment process adopts “coagulating sedimentation+ MBR membrane bioreactor + nanofiltration (NF) + reverse osmosis (RO)”, the effluent will implement Pollution Control Standards for Household Garbage Landfill (GB 16889-2008), Table 2: Water Pollutants Discharge Mass Concentration Limits For Existing And Newly Built Household Garbage Landfill.

4. Strengthen rainwater discharge capacity; complete the renovation of flood

intercepting trench before the flood season each year, and guarantee it is unobstructed;

14.3.2 Fire and explosion prevention measures

1. Set up isolation belt, provide emergency fire extinguishing system: in consideration that the main source of fire occurring in the landfill operating area is landfill gas, water is not suitable for extingiushment; therefore, set up a fire barrier with a width of 8 meters, surrounding the landfill reservoir area, and provide a certain number of fire prevention sandy soil and 2 watering carts, so as to meet emergencies.

2. No Open Flames, provide monitoring facilities: no smoking or open fire in the landfill reservoir area. Provide combustible gas detection and alarming apparatus; pay attention to the calibration and maintenance of the apparatus at ordinary times, and periodically monitor the gas concentrations (such as methane) in and around the wasteyard. Provide dry powder extinguisher for the vehicles and other operation machines operating in the landfill reservoir area.

3. Gas guiding and exhausting, long-term monitoring: in order to prevent the explosion and fire accidents of methane gas, in this project, the landfill is designed with complete gas educing and processing system. Totally 65 landfill gas collecting shafts and 6 gas gathering stations are planned to be set up in this project; DN 90 HDPE gas transmission branch pipe 1742m, DN 110 HDPE gas transmission branch pipe 1014m， DN 200 HDPE gas transmission main pipe 630m; in the meantime, there is also a set of air exhaust and torch combustion system with a processing capacity of 500Nm³/h. It is also equipped with methane gas concentration automatic monitoring and alarming system, which can effectively prevent the occurrence of explosion and fire accidents.

4. Personnel training: it is suggested that the workers in the landfill should be trained with the fire protection knowledge and operation, and manoeuvre should be periodically launched.

5. Strictly follow the rules and regulations: the landfill shall formulate fire protection rules and regulations, which shall be inspected by specially-assigned person. Fire prohibition area, fire zone, and emergency exit marks, as well as schematic diagram plate , etc, are set up in the landfill.

14.4 Emergency Response

Formulate underground water risk accident emergency response plan, define the closing and interception measures which shall be taken under risk accident state, and put forward specific schemes for polluted underground water diffusion prevention and polluted underground water control.

I. Emergency plan

On the basis of formulating factory-wide safety management system, formulate emergency measures for specialized underground water pollution accident, and coordinate with the other emergency plans. See Table 4-15 for the contents of underground water emergency plan.

(1) Daily coordination and command organization of emergency plan;

(2) Responsibilities and division of labor of relevant departments in the emergency plan;

(3) Determination of underground water environment protection objectives, emergency treatment measures taken, and assessment of potential source of pollution;

(4) Organization conditions, personnel and equipment conditions of extra serious accident emergency rescue, regular training and manoeuvre;

(5) Social support and assistance of extra serious accident, fund guarantee of emergency rescue.

II. Emergency disposal

Once abnormal conditions of underground water are found, emergency measures must be taken according to the emergency plan immediately:

(1) when abnormal condition of underground water is confirmed, based on the formulated underground water emergency plan, report to the company's competent leaders as soon as possible, inform the neighboring underground water users, and pay close attention to the underground water quality change conditions.

(2) organize specialized personnel to investigate and monitor the accident site, search the accident location, analyze the accident reason, localize the emergency to the greatest extent, eliminate if possible; take all measures, including cutting off production equipments or facilities, to prevent accident diffusion, spread and chain reaction, and minimize the influences of underground water pollution accident to people and properties to the greatest extent.

(3) when the surrounding underground water is found polluted through monitoring, based on the feedback information of the observation well, manually extract the underground water in the polluted area and form underground water depression cone, control the underground water flow field in the polluted area, and prevent the pollutants diffusion.

(4) Evaluate the accident consequence, and formulate the measures which can prevent similar events from occurring.

(5) Request the social emergency forces to assist and dispose if necessary.

Table 11.4-1 Underground water pollution emergency plan contents

No.	Item	Contents and requirements
1	general rules	
2	Overview of pollution sources	Detail the type, quantity and distribution of pollution sources, including production equipments, auxiliary facilities and public works
3	contingency plan area	List the dangerous objectives: production equipments area, auxiliary facilities, public works area, and environmental protection objectives; mark the positions in the general drawing of factory.
4	emergency organization	Factory: the factory emergency headquarters-- be responsible for onsite comprehensive commanding; professional rescue team-- be responsible for accident control, rescue and rehabilitation treatment; Region: headquarters-- be responsible for the comprehensive commanding, rescue, control and evacuation of the neighborhood of the factory; professional rescue team--be responsible for supporting the factory's professional rescue team; professional monitoring team, be responsible for supporting the factory's monitoring station; local hospitals, be responsible for receiving and curing the injured and poisoned personnel;
5	Emergency state classification and emergency response procedures	Specify the levels of underground water pollution accidents, and the corresponding emergency classification response procedures
6	Emergency facilities, equipments and materials	Emergency facilities, equipments and materials which can prevent poisonous and harmful substances from overflowing or diffusing

No.	Item	Contents and requirements
7	emergency communication, communication and traffic	Stipulate the communication mode, notification mode, traffic management support and control under emergency state
8	Emergency environmental monitoring and post-accident evaluation	The environmental monitoring station will monitor underground water environment. Evaluate the accident nature and consequence, and provide decision basis for the commanding department.
9	Emergency protective measures, leakage eliminating measures, methods, and equipments	Accident site: control accident, prevent enlargement, spreading and chain reaction. Eliminate the onsite leakage substance; reduce harm; the corresponding facilities and equipments provided. Adjacent area: control the polluted area, control and eliminate pollution measures and the corresponding equipments.
10	Emergency concentration discharge control, evacuation organizing plan, medical aid and public health	Accident site: accident disposing personnel shall formulate the emergency control concentration and discharge of pollutants, as well as the evacuation organization planning and rescue for the personnel onsite and near the equipment. Environmentally sensitive objectives: personnel and general public in the adjacent area of the accident affected area stipulate the pollutant emergency control concentration and discharge, and evacuation organization planning and rescue.
11	Emergency state termination and restoration measures	Stipulate the termination procedures of emergency state. Accident site rehabilitation, dispose, and restoration measures. Accident alert termination, and rehabilitation and restoration measures for the adjacent area.
12	personnel training and manoeuvre	After formulating the emergency plan, arrange relevant personnel to train and manoeuvre at ordinary times
13	public education and information	Launch public education, training, and release relevant information to the neighborhood.
14	Record and report	Set up specialized records of emergency accident, establish file and special report system, and arrange special department to manage.
15	Attachment	Preparation and formation of various kinds of appurtenant materials related to the emergency accident.

Chapter XV. Analysis of Planning Coordination

15.1 Conformity Analysis of Industrial Policies

According to Order No. 21 Industrial Structure Adjustment Guidance Catalogue (2001) (2013 Revision) of the National Development and Reform Commission, this project belongs to “III. Coal: Management of Ground Subsidence Area and Protection and Utilization of Mine Water Resources” as listed in the encouraged industry directory.

By ecological restoration and comprehensive treatment of the subsidence area, this project improves regional atmospheric and water environment, enhances the land protection function of the subsidence area, strengthens the natural ecosystem stability, and facilitates regional sustainable development. Therefore, the construction of the project conforms to national industrial policies.

15.2 Analysis of Conformity to Comprehensive Land Improvement Planning of Coal Mining Subsidence Area in Huainan City, Anhui Province (2009-2020)

According to Comprehensive Land Improvement Planning of Coal Mining Subsidence Area in Huainan City, Anhui Province (2009-2020), the planning goal is to timely treat the subsidence area caused by coal mining when it meets the requirements for treatment to guarantee relative balance of the geological and ecological environment in the mining area; further improve and restore geological, living, and ecological environment in the mining area after coal mining is finished; and strive to build Huainan coal mining subsidence area into a beautiful water city of “half city lake and half city towers” in Huai River basin, integrating production, ecology, tourism and leisure.

This project mainly focuses on treatment of the subsidence area and improvement of the ecological environment to restore, protect and conserve the ecological environment in the area by making full use of the self-repairing capability of natural environment to embody natural beauty and build it to an ecological area integrating leisure, entertainment and fitness. Thus, the construction of the project conforms to the planning requirements of the Comprehensive Land Improvement Planning of Coal Mining Subsidence Area in Huainan City, Anhui Province (2009-2020).

15.3 Analysis of Conformity to Urban Master Planning of Huainan City (2010-2020)

Urban Master Planning of Huainan City (2010-2020) defines the overall objective of the city: Under the guidance of scientific concept of development, Huainan City needs to lay emphasis on dealing with the relationship between coal production and ecological environment sustainable development according to the requirements of building a harmonious society and a resource-conserving and environmentally friendly society. On this basis, Huainan City is built into a resources-based science and technology city by further developing the coal resources and technical talent advantages.

Urban Master Planning of Huainan City (2010-2020) also defines the main treatment goal for the subsidence area: improve land conditions and partially recover the land use function; restore the vegetation and biodiversity, improve the initial productivity, and enhance the self-sustaining ability of the land system; realize landscape integration, restore the environment aesthetic characteristics, and comprehensively recover the service function of the ecosystem.

Through comprehensive environment treatment of “nine coal mining subsidence areas”, the project improves the regional environment quality of Huainan City and enhances the city grade to turn wasteland and abandoned land in this area to be available land with road network extending in all directions and perfect supporting facilities and to change the area

from urban fringe to city center area, a green belt connecting north and south main urban area, and also “green lung” and “kidney” of Huainan City. Eco-environmental modification is relied on to prevent ecological environment in this area from further deteriorating, to recover the ecology in the coal mining subsidence area, effectively enhance urban ecological functions and increase green land area, and gradually improve the current situation of ecological and living environment, so as to form beautiful environment with harmonious blending between human and nature of high quality with “mountain, water, forest and habitation” as characteristics. Therefore, the construction of the project conforms to the planning requirements of Urban Master Planning of Huainan City (2010-2020).

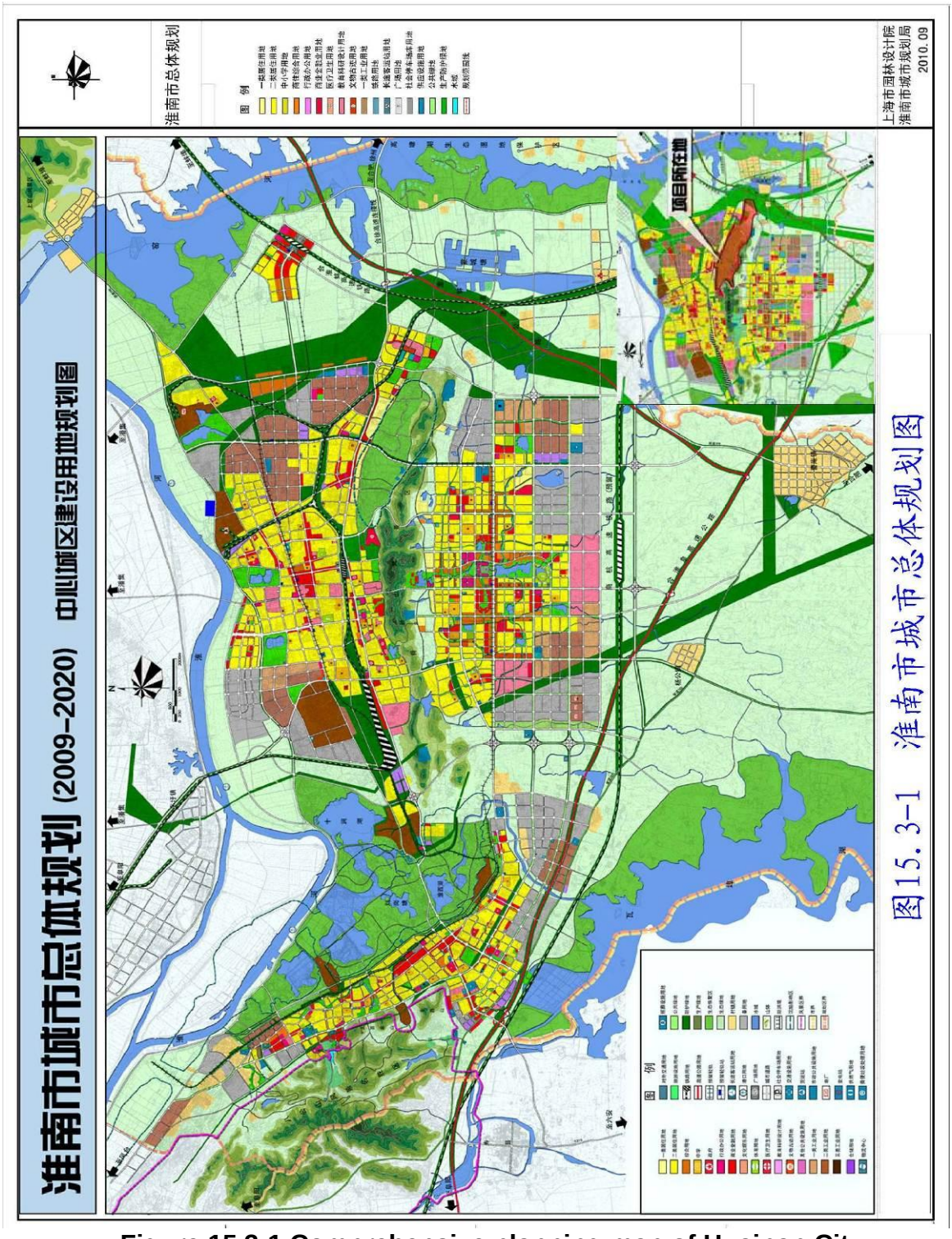


Figure 15.3-1 Comprehensive planning map of Huainan City

15.4 Analysis of Conformity to the Twelfth Five-Year Plan Outline of National Economic and Social Development in Huainan City

The Twelfth Five-Year Plan Outline of National Economic and Social Development in Huainan City points out that comprehensive treatment of the coal mining subsidence area shall be strengthened and the comprehensive treatment thinking of “Centralized relocation, developmental resettlement and developed treatment” shall be insisted, with clear goals as follows: obtain significant progress in comprehensive treatment of the coal mining subsidence area at the end of the Twelfth Five-Year Plan Period, gradually form the comprehensive coal mining subsidence area treatment model with Huainan characteristics, and make great efforts to achieve the comprehensive coal mining subsidence area treatment goal of “urban life, diversified production and resource-based ecology”. Strengthen comprehensive treatment of the coal mining subsidence area, drive coordinated development of the urban mine, establish a mechanism for ecological compensation due to damages to agriculture, ecology and environment and a mechanism for resources compensation in respect to residents relocation and resettlement, training, employment and social security and other problems brought by coal mining subsidence, repair the ecological environment, and improve the living environment and living conditions of local residents.

Acceleration of comprehensive treatment project construction of the coal mining subsidence area is the development strategy for strengthening environmental protection and treatment and advancing ecological sustainable development in Huainan City. By strengthening environmental protection and comprehensive treatment in nine coal mining subsidence areas, accelerate harmless treatment of household refuse, make overall plans and coordinate domestic, production and ecological water, promote vegetation and ecological remediation, and put forth efforts to build a green corridor system in Huainan City to build a national environmental protection model city. This project maintains the sustainable development of the economy in Huainan City, guarantees physical health of the masses and promotes benign development of recycling economy. Therefore, the construction of this project conforms to the Twelfth Five-Year Plan Outline of National Economic and Social Development in Huainan City.

15.5 Analysis of Conformity to Short-Term Urban Construction Plan of Huainan City (2011—2015)

Short-term planning is an important step for implementing Short-Term Urban Construction Plan of Huainan City (2011—2015) and also a legal basis for controlling and instructing short-term urban construction. In the short-term planning, “nine coal mining subsidence areas” are seen as key ecological restoration areas and the emphasis for short-term construction is laid on accelerating construction and ecological restoration to guarantee the urban ecological safety, recover ecological functions, and build patriotism education theme area, coal mine culture them demonstration area, creative culture area of industrial sites, and public physical health leisure experience area.

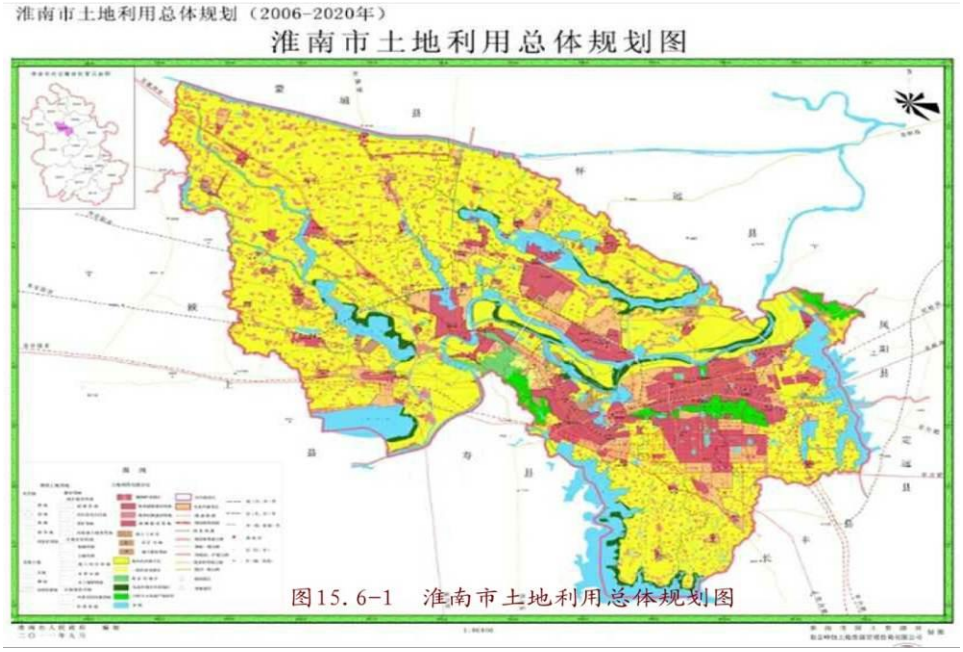
The construction objective of this project is consistent with key content of the Short-Term Urban Construction Plan of Huainan City (2011—2015). Therefore, the construction of this project conforms to planning requirements of the Short-Term Urban Construction Plan of Huainan City (2011—2015).

15.6 Analysis of Conformity to Overall Plan for Land Utilization in Huainan City (2006-2020)

According to the Overall Plan for Land Utilization in Huainan City (2006-2020), long-term goal of planning is: land utilization is more intensive, urban construction is enhanced from scale expansion to connotation, and eastern urban area develops compactly,

with more concentrated population and industries. In the municipal administrative region, “one horizontal and three vertical” ecological corridors form, coal mining subsidence is effectively treated, environment-friendly land use pattern is popularized, environmental quality is effectively improved, and sustainable utilization ability of land resource is also significantly enhanced.

The project fully relies on superior conditions of natural resources, improves ecological environment in the subsidence area through project construction, and at the same time, it improves urban function and has high economic, social and ecological benefits. Therefore, the construction of this project conforms to planning requirements of the Overall Plan for Land Utilization in Huainan City (2006-2020).



Fiagure 15.6-1 Land use comprehensive planning of Huainan City

15.7 Analysis of Conformity to Shungeng Mountain Scenic Area Planning of Huainan City (2009-2020)

Shungeng Mountain Scenic Area, located in the middle of main urban area in Huainan City, is the backbone of Huainan City and core block of urban green space ecology system and landscape system, so it is called “urban green ridge”. According to conditions of Shungeng Mountain and considering higher development standard in the future, Shungeng Mountain Scenic Area is positioned as: a compound urban scenic area integrating mountain forest conservation, patriotic education, sightseeing, ecological agriculture, relaxing on holidays, entertainment and fitness and tourism service and other functions with unique mountain and water resources and abundant forest resources in the scenic area as the ecological basis and unique Shungeng Mountain culture and quarry site landscape as characteristics.

This project will not influence the original landscape of the Shungeng Mountain Scenic Area, and after it is completed, it can effectively linked up with the Shungeng Mountain Scenic Area with mutual support, so as to effectively increase urban ecological function and green area. Therefore, the construction of this project conforms to planning requirements of the Shungeng Mountain Scenic Area Planning of Huainan City (2009-2020).

15.8 Analysis of Conformity to Overall Planning of Tourism Development of Huainan City (2010-2030)

According to the planning, the tourism development goals of Datong District are: energetically develop coal culture tourism and ecological tourism, establish the image transformation of tourism and industrial restructuring in Datong District and even important position in the economic development, and strive to develop and expand the tourism to a pillar industry in economic development of Datong District within the planning period to build Datong District into a representative tourism destination area for “city memory” in Huainan.

The construction of the project can improve the ecological environment of the subsidence area and current situation of urban infrastructure, and at the same time, improve urban function to lay a foundation for the tourism development and regional investment promotion in Datong District. Therefore, the construction of this project conforms to planning requirements of the Overall Planning of Tourism Development of Huainan City (2010-2030).

15.9 Analysis of Conformity to Huainan Ecological City Construction Planning (2003-2020)

According to the planning, 2016-2020 planning goal is: Huainan City will build urban ecological environment quality control system and ecological economic system including production, circulation, consumption and other links, the whole city will reach national ecological city acceptance criteria, and fully complete the ecological city construction task, enabling Huainan City to realize the environmentally friendly situation that economy develops healthily and sustainably, human and natural environment are interdependent and environmentally friendly and society is harmonious with mutual promotion, coexistence and communication in 2020.

After the project is implemented, the environmental quality of those “nine areas” will be improved and city grade will be enhanced. And this area will form beautiful environment with harmonious blending between human and nature of high quality with “mountain, water, forest and habitation” as characteristics. Therefore, the construction of this project conforms to planning requirements of the Huainan Ecological City Construction Planning (2003-2020).

Figure 15.7-1 Shungengshan scenic spot planning of Huainan City

Chapter XVI. Resettlement and Social Influence

16.1 Land Acquisition and Demolition

16.1.1 Overview of Land Acquisition and Demolition Influence

According to the Action Plan of Resource-Based City (Huainan City) for Resettlement and Coal Comprehensive Treatment of Mining Subsidence Area in the Sustainable Development Engineering by Using the World Bank Loan Project (June 2014), basic information for land acquisition and demolition in this project is as follows:

1. Demolition influence

Total area of demolition in this project is 9,652.2 ㎡, including construction area of 2,552.7m2 for demolished private houses of 26 people from 6 households and demolition area of 7,099.5 m2 for 6 enterprises with 38 employees.

2. Land acquisition influence

In this project, total area of land acquisition is 1,233.3 mu, including 177.6 mu of collectively owned cultivated land with 122 people from 33 households being affected and 1,055.7 mu of state land.

3. Land transfer influence

In this project, the use right of 1,533 mu of collective cultivated land needs to be transferred and the land is used for nursery garden construction and environmental modification. And 1,024 people from 306 households are influenced. See table 16.1-1 for land requisition and demolition and land transfer influence in this project.

Table for Land Requisition and Demolition and Land Transfer Influence in Huainan World Bank Project

Table 16.1-1

Project Name	Requisition of state land (mu)	Requisition of collective land (mu)	Collective land transfer (mu)	Demolition area (m2)	Affected enterprises and public institutions	Affected enterprise employees	Relocation households/ people
Service node	12.6	0	0	0	0	0	0
Garden displaying potted landscape	107.7	3.3	0	3,882.7	1	0	6/26
Nursery garden	553.7	0	266	0	0	0	0
Flowers and plants trading market	21.68	103.6	0	5,531.4	4	38	0
Jiukong Road	5.2	15.6	0	238.1	1	0	0
Wanxiang Road	37.3	16.1	0	0	0	0	0
Yanshan Road	36.7	5.7	0	0	0	0	0
Zhongxing Road	63	0	0	0	0	0	0
Water	66.92	16	0	0	0	0	0

system improvement							
Greenway	150.9	17.3	0	0	0	0	0
Environmental modification	0	0	1267	0	0	0	0
Total	1,055.7	177.6	1,533	9,652.2	5	38	6/26

Note: Construction and demolition in Jiukong Road and flowers and plants trading market all involve three mineral resources in Datong District.

16.1.2 Project Land Requisition and Land Transfer Influence

According to investigation and statistics, total area for land acquisition and land transfer in this area is 2,766.3 mu, including 1,533 mu of transferred land, which is the collective land of Chenxiang Village; 1,233.3 mu of acquired land (177.6 mu of collective land of Chenxiang Village and 1055.7 mu of state land). Among the acquired state land, the use right belongs to the Datong District Government, Huainan Mining Group, Huainan Municipal Government and construction land of Huainan Mining Group can be further divided into transferred land and assigned land. See specific details in Table 16.1-2.

Table of Project Land Acquisition and Land Transfer Area (mu) and Land Ownership

Table 16.1-2 **Unit: mu**

Project content	Collective land		Huainan City (orchard)	Mining Group			Datong District Government		Summary
				State-owned forest land	Construction land		Construction land	State-owned forest land	
	Land Acquisition	Land Transfer			Land Transfer	Land assignment			
Roadside service point				7.1				5.6	12.7
Garden displaying potted landscape	3.4			107.7					111.1
Nursery garden		266	274.3	279.4					819.7
Flowers and plants trading market	103.6			21.7					125.3
Jiukong Road	15.6			3.5				1.8	20.9
Wanxiang Road	16.1			9.1	7.3	21			53.5
Yanshan Road	5.7			16.1	1.6			20.6	44.0
Zhongxing Road			33.6	29.2					62.8
Water system improvement	16			40.2	4.8		5.2	20.5	86.7
Greenway	17.2			80.9	12.9	12.8	2.3	36.5	162.6
Environmenta		1267							1267

l modification									
Total	177.6	1,533	307.9	594.9	26.6	33.8	7.5	85.0	2,766.3

This project occupies 1,055.7 mu of state land in all, including: 655.3 mu of land occupied by Mining Group, 92.5 mu of land occupied by Datong District Government, and 307.9 mu of land occupied by Huainan Municipal Government. The nature of land utilization in Mining Group is complicated, as there is construction land, state-owned forest land, subsidence land (unused); the construction land is further divided into transferred land and assigned land. Different land natures lead to different compensation standards. See table 16.1-3 for the area of land of Mining Group occupied by each subproject.

Classification Table for Land of Mining Group Occupied by Each Subproject

Table 16.1-3

Type	Subproject	Area (mu)
Transferred land	Road	8.9
	Water system	4.8
	Greenway	12.91
Assigned land	Road	21
	Greenway	12.8
Forest land	Road	57.9
	Water system	40.2
	Garden displaying potted landscape	107.7
	Flowers and plants trading market	21.7
	Nursery garden	279.4
	Roadside service point	7.1
	Greenway	80.9
Subsidence land	Greenway	1.1
Each subproject directly occupies 26.6 mu of transferred land, 33.8 mu of assigned land, 594.9 mu of forest land, and 1.1 mu of subsidence land and thus 655.3 mu of Mining Group land in total.		

Most land of Datong District Government and Huainan Municipal Government are forest land and orchard and mainly used for nursery garden, road, ecological remediation and water system treatment.

16.2 Resettlement

16.2.1 Resettlement survey

1. Demolished housing area

In this project, demolition involves 6 households, of which 5 households have no certificates and one household (Zhang Liangyou couple) lives in a public house. Houses of these 6 households to be demolished are all located in a nameless residence area in the west of original Huainan Oil Mixture Factory within the administration scope of Zhanhou Community of Datong sub-district. According to field investigation, these households built houses here in the past due to difficulties in life or work inconvenience, thus their houses are not decorated basically without any ancillary facilities. They support the project construction and agree to remove.

Demolition Resident Name and Living Space

Table 16.2-1 **Unit: m2**

Name	Total population of a family (person)	Total area (m2)	Structure	
			masonry-concrete structure (m2)	Simple room (m2)
Shen Songkang	6	321.4	321.4	
Cheng Demei	7	1,447.3	404.3	1,043
Chen Zhi	4	302	302	
Zhang Liangyou	2	0		
Xu Guozhong	4	303	303	
Wang Yunling	3	179	179	
Total	26	2,552.7	1,509.7	1,043

Note: The house with an area of 279.39 ㎡ which Zhang Liangyou's family lives in is the public house of Huainan Oil Mixture Factory, so it is counted into the plant area.

2. Area of demolished unit buildings

Among enterprises to be demolished in this project, all enterprises are closed or shut down, except Huainan Tianhe Industrial Boiler Accessories Factory.

Area of Enterprise Buildings to Be Demolished

Table16.2-2

Enterprise name	Area (m2)	Remarks
Plant of Huainan Tianhe Industrial Boiler Accessories Factory	2,917.11	Production
Datong First Mining plant	1,307.74	It was closed in 2000, with some plants left only
Datong Third Mining plant	618.63	It was closed in 2012, with some plants left only
Huangjian Coating Factory	925.76	It was shut down, with some plants left only
Huainan Oil Mixture Factory plant	1,330.23	It was shut down, with some plants left only
Total	7,099.5	

3. Land acquisition influence

Collective land acquired by this project is located in Chenxiang Village and involves 122 people from 33 households.

4. Land transfer influence

All collective land of 1,533 mu with use right to be transferred in this project is cultivated land and will be used for nursery garden construction and environmental modification. 1,042 people from 306 households are affected.

16.2.2 Resettlement Policy

Resettlement work in this project will strictly abide by relevant laws, regulations and policies of the People's Republic of China, Anhui Province, Huainan City, and the place where the project is located, and will fully comply with the World Bank policies related to involuntary resettlement in resettlement work planning and implementation process.

1. Collective land acquisition and resettlement policy

The land acquired by this project belongs to Jiulonggang Town. According to Notice of People's Government of Anhui Province on Adjustment of Land Compensation Standards in Anhui Province (2012), the whole Jiulonggang Town belongs to Class III area and

comprehensive land price for this area is 52,000 yuan/ mu, including 21,000 yuan for land compensation fees and 31,000 yuan for resettlement allowance. According to the standard specified in the Notice of Huainan Municipal People's Government on Printing Compensation Standards for Attachments and Crops on Acquired Collective Land in Huainan City (No. HF [2013] 38), crop compensation fee in vegetables cultivated land is 3,400 yuan/mu, economic crops cultivated land is 2,200 yuan/mu, food crops cultivated land is 2,000 yuan/mu, and orchard in full productive age is 5,000 yuan/mu.

2. Compensation and settlement policy for permanently occupied state land

The state land occupied by the project belongs to Huainan Municipal Government, Datong District Government, and Anhui Huainan Mining Industry (Group) Co., Ltd. This project belongs to Huainan City and the land of Huainan City is mainly agricultural land in Qishan Garden Spot, so the land use right can be used by the project free of charge.

And the land of Datong District Government will be assigned to the project. According to the Land Administration Law of the People's Republic of China implemented by Anhui Province, the project obtains the state land use right by the way of land assignment and change the land construction purpose after acquiring approval. Paid land use procedures shall be handled and the land use fee shall be paid.

Land of Datong District occupied by the project falls into agricultural land and non-agricultural land and the former mainly involves forest land and water. There is no express provision related to forest land and water compensation in Notice of People's Government of Anhui Province on Adjustment of Land Compensation Standards in Anhui Province (2012). Therefore, according to the forest and road compensation standard in relevant projects, the compensation in this project is 35,000 yuan/ mu for forest land and 35,000 yuan/ mu for water. The compensation for non-agricultural land in Datong District is determined as 50% of the benchmark land price, which is set at 200,000 yuan/ mu, through negotiation, so the compensation standard is 100,000 yuan/ mu.

For the purpose of the project, Huainan Municipal Government has negotiated with Anhui Huainan Mining Industry (Group) Co. Ltd. for many times and reached the land use agreement. The principles of the agreement are: 1) all agricultural land, subsidence land and assigned non-agricultural land of the Mining Group within the project area shall be taken back by Huainan Municipal Government free of charge and used for environmental modification with compensation for ground attachments given only as per the standard; 2) assigned non-agricultural land which is not used by sub-project temporarily shall be changed to the land of Huainan Municipal Government free of charge; 3) as for the land directly occupied by a subproject for earth and stone engineering construction, such as road, water system, garden displaying potted landscape, flowers and plants trading market, and roadside service points, etc., regardless of transferred land or assigned land, the compensation shall be given according to relevant current policy of the Huainan Municipal Government.

3. Demolition and resettlement policies for residence

According to the relevant regulations and policies of the World Bank, our country and Huainan City, the demolition compensation standard and resettlement scheme are prepared in consideration of the reality of Huainan coal mining subsidence area environment comprehensive improvement, and on the basis of adequate communication and negotiation with the affected households.

In recent years, Huainan City always gives monetary compensation (at cost price) to the land-requisitioned person whose house is a building without license, and does not resettle such households. Through repeated negotiation, the Project Office still agrees to provide economically affordable housings in the resettlement site locating in No.3 of East Dongshan Road, to allow such persons to buy. If the house area does not exceed the compensation amount for demolition, they can buy at a preferential price; if not, the excess portion shall be bought at market price. Households who use public houses will be provided with free

economically affordable housing for resettlement (30 m2 per capita), and the portion exceeding 30 m2 shall be bought at market price.

4. Demolition and resettlement policies for non-residential houses

The demolition of this project involves five enterprises; for the production houses and office rooms, the house and appurtenance demolition expenses, compensation fees for stopping production and business, equipment transportation and installation, compensations for equipments and facilities which cannot be recovered and used, and the other related expenses will be compensated on the basis of Expropriation Compensation Standards of Houses on the State-Owned Land in Huainan City (HFB No.[2011]99) and Notice on Printing and Distributing 2009 Huainan Urban House Demolition Monetary Compensation Benchmark Price and Adjustment Factor, and Other Compensations and Allowances Standards (HF No.[2008]91).

5. Land circulation policies

The land circulation will adopt leasing pattern, and the land circulation rent of Jiulonggang Town is 800-1,200 yuan/mu/year in recent years through investigation. Through repeated consultation, the upper limit is RMB 1,200 yuan/mu/year in this project, issue one season's young crops compensation in the first year, and the tenancy term will expire on the second round of land contract period. The Project Office will entrust Datong District Land Requisition and Demolition Office to sign agreements with the peasant households.

16.2.3 Principles of Resettlement

1. The overall process of the affected population participating in the resettlement.

For the houses and facilities compensation standards, resettlement site selection, demolishing time arrangement, recovery time arrangement, capital allocation, use and management of resettlement funds, restoration measures for production and management, and other major issues, the affected people or their representatives must participate in such issues and reach an agreement through consultation. The consultation with the affected people will be carried out through holding representative conversazione and consulting meetings with the affected community residents or farmers, etc.

2. All kinds of compensations to individuals will be completely and directly issued to the property owner, any unit and person cannot retain or embezzle the other's compensation funds.

3. Give assistance and care to the vulnerable groups.

16.2.4 Resettlement of Residence-Demolished Households

The demolished houses in this project have different degrees of problems, for example, the indoor supporting facilities and domestic installations are imperfect, and the structures are old-fashioned and aged; in addition, the complementary conditions around the dwelling position are also very bad without water supply and drainage facilities. The demolition and resettlement of this project will provide an opportunity for the relocation households to improve their housing conditions and environment.

From June 21 to June 30 and November 7 to November 14 of 2013, the World Bank Project Office and resettlement consulting agency carried out extensive and deep investigation and consultation among the demolition-affected population; according to the current relocation policies of Huainan City, the houses constructed without permission and license will only be compensated by money according to the cost price; through negotiation, Datong District agreed to provide economically affordable housings in the residence zone (resettlement area) locating in No.3 of East Dongshan Road, to allow the farmers to buy at a preferential price. At present, the resettlement area locating in East Dongshan Road has accomplished the housing design and started construction, and the construction period is 18

months.

In consideration that Cheng Demei and her family are engaging in cultivation production, which will inevitably be affected after resettlement, the Project Office promises to provide vocational skill training for Cheng Demei and her children according to the immigrant will survey results, and incorporate them into the nursery base to engage in implantation work after project completion.

Zhang Liangyou, who lived in the public housing, will be given a resettlement house in the residence zone (resettlement area) locating in No.3 of East Dongshan Road, and issued with removal grants and transition fees according to the current living area. The residence zone locating in No.3 of East Dongshan Road is only 1.5km away from the demolished households, which has complete road, school and other infrastructures.

16.2.5 Expropriation Compensation for Enterprises and Resettlement of Employees

Except for Tianhe Industrial Boiler Fittings Factory, the other enterprises demolished in this project had stopped production for some time, which only have abandoned plants left, and involve no staff resettlement issue. Through negotiation, only monetary compensation for the abandoned plants and buildings will be granted (reinforced concrete structure: 1,850 yuan/m2, brick-concrete structure: 1,570 yuan/m2), no other compensation fees involved.

The operating Tianhe Industrial Boiler Fittings Factory will stop its business due to poor profitability. Therefore, except for plant compensation, economic loss compensation fees for business termination and equipment costs shall also be paid. Through negotiation, the industry, warehousing and office sites will be priced at 20 yuan/ m2, and will be calculated by 6 months.

For the resettlement of 38 employees after stopping production and business, based on the Labor Contract Law of 2013, except for monetary compensation, we will also provide relevant occupational and skill trainings and information for the employees who want to continue working, so as to help them get a job again.

16.2.6 Resettlement of People Affected by Land Acquisition in Chenxiang Village

This project requisitioned 177.6 Mu collectively owned lands in Chenxiang Village, which are all cultivated land; the land acquisition affected 122 persons from 33 households. The requisitioned cultivated lands all locate in the project area, which are affected by land subsidence for a long time, and have low quality of cultivated land. Therefore, the requisitioned lands in this project have little influence on the local facility agriculture which has high output.

In Chenxiang Village, because the lands are continuously requisitioned in recent years, the village committee has established regulations and systems for the resettlement of land-lost farmers:

1) The land compensation fees of the collectively contracted lands and the resettlement grants will be totally issued to the contracting households and the village collectives will not retain any of such fees;

2) The compensation fees for the collectively-owned lands which are not contracted before will be used for transacting the endowment insurance for land-requisitioned farmers.

During the investigation and consulting process, most immigrants think that after the project implementation, the local dwelling environment and traffic conditions will be greatly improved, and more employment opportunities will generate. The World Bank Project Office also promises to:

1) Generally launch skill training for the land-lost farmers who have employment desire;

2) The employment opportunities generated during the implementation phase of the project and the subsequent operation period will be preferentially arranged to the land-lost farmers; in particular, after the project implementation, the garden displaying potted landscape, nursery base and flower market will generate a good deal of job opportunities and entrepreneurial platforms.

16.2.7 Endowment insurance resettlement of land-requisitioned farmers

Based on the Interim Procedures of Endowment Insurance for Land-Requisitioned Farmers in Huainan City, the social security plan for immigrants of this project is formulated combining with the immigrants' resettlement implementation situations of this project.

1) Security objects

All farmers directly affected by land acquisition shall be included into the social security for land-requisitioned farmers.

2) Distribution standards of endowment insurance benefits for land-requisitioned farmers

① If the land-requisitioned farmers do not participate in the supplementary endowment insurance, each person can acquire 100 yuan of basic old-age pension;

② If the land-requisitioned farmers participate in the supplementary endowment insurance for which they pay 3,000 yuan/year, each person can acquire 130 yuan of endowment insurance pension, including 100 yuan of basic old-age pension and 30 yuan of supplementary old-age pension;

③ If the land-requisitioned farmers participate in the supplementary endowment insurance for which they pay 6,000 yuan/year, each person can acquire 160 yuan of endowment insurance pension, including 100 yuan of basic old-age pension and 60 yuan of supplementary old-age pension;

④ If the land-requisitioned farmers participate in the supplementary endowment insurance for which they pay 9,000 yuan/year, each person can acquire 200 yuan of endowment insurance pension, including 100 yuan of basic old-age pension and 100 yuan of supplementary old-age pension;

16.2.8 Resettlement of people affected by land circulation

This project will circulate the use rights of collective land (1,533 Mu) of Chenxiang Village, all of which are cultivated land; and will affect 1,042 persons of 306 households. in order to properly resettle these farmers, the following measures are hereby formulated through negotiation of the Project Office, villagers committee of Chenxiang Village, and some land contractors:

1) The rent is RMB 1,200 yuan/year, issue one season's young crops compensation in the first year, and the tenancy term will expire on the second round of land contract period.

2) The rent will be totally issued to the land-circulated households;

3) For the land-circulated households who have employment desire, generally launch a free skill training as the land-lost farmers; such population also has preferential training right and employment opportunity;

4) The employment opportunities generated during the implementation phase of the project and the subsequent operation period will be preferentially arranged to the land-circulated households; especially the job opportunities and entrepreneurial platform generated from the development subprojects, such as garden displaying potted landscape, nursery base and flower market, which are very suitable for the peasant households and women.

16.2.9 Resettlement and Recovery of the Affected Women

For the resettlement and recovery of the female population affected by this project, the Project Office of the World Bank and Datong District People's Government will proceed from the long-term and overall benefits of the regional development, and take a series of measures to provide all kinds of convenient conditions for the women's participation and development.

1. Provide endowment insurance for the land-lost farmers, including women, and guarantee women's economic status as soon as possible.

2. Establish an open and transparent mechanism for land requisition and demolishing compensation information publicity, and guarantee that women can acquire equal compensation right and the right to know of such information.

3. Specially establish the work post of clothing fabrication for women in the training scheme, establish menu type recruitment training system, and form one package service of enterprise's labor demand, training professions provision and women's personal interests, so as to reduce the blindness of women's employment.

4. Exert the roles of the Women's Federation, Family Planning Association and other women's organizations, combine the women's development and acquisition of opportunity with the activity execution of these organizations dynamically, and attract and guide women to enjoy the opportunities brought by the development.

5. Encourage women to establish businesses in the flowers and plants trading market.

16.2.10 Resettlement of Vulnerable Groups

Shen Songkang's family, a relocated household, is very poor due to Shen Hongguang, his son's psychosis, and belongs to vulnerable groups. They support the project construction, and agree with the relocation, but they want to get some care. Datong District Land Requisition and Demolition Office has contacted the Human Resources and Social Security Bureau and the hospital, transacted basic cost of living allowances for Shen Hongguang, and sent him to the special ward in the psychiatric hospital for hospitalization.

16.2.11 Time Arrangement for Resettlement and Recovery

The building projects of this project is planned to be started in January of 2016, and completed in 2020. In order to link the immigrating progress plan with the project construction schedule, the immigrant resettlement will be accomplished by the project office three months before the commencement of the building projects. According to the immigrant resettlement plan of this project, the resettlement expense is RMB 67,374,180.

16.3 Social Impact Analysis of Project

Huainan World Bank loan project can not only improve the living conditions and living quality of local residents, but also improve the investment climate, drive local economic construction, and promote the transformation and development of the whole Huainan City through the infrastructure construction in the project area. Therefore, the World Bank requires the project owner to not only pay close attention to the economic benefits and financial continuity of the project itself, but also pay attention to the benefits and functions of the project to the social development of the whole Huainan City from long-term and extensive view, as well as continuously track and evaluate the social benefits brought by the project. The social impacts of the project mainly include:

(1) The project construction will set an example for the related work with innovative environment comprehensive improvement mode in Huainan coal mining subsidence area.

(2) The project will create good investment climate, and promote the development of the real estate and tourist industries after being built.

(3) The redevelopment and reuse project can provide many employment and entrepreneurial opportunities, and increase the farmers' income.

(4) The skill training plan of this project will practically help the affected residents, especially the objective of women realizing employment and reemployment.

(5) The closure and treatment of the old waste yard can completely solve the pollution problems caused by rubbish exposure, effectively control the influence of the rubbish on the surrounding environment, and directly improve the living quality and dwelling environment of the neighbouring residents.

(6) After being built, the project will improve the road network and other infrastructures in the project area, reduce the travel time, and increase the living quality of the residents.

(7) After being built, the project will greatly improve the conditions of the original roads, and improve the local living environment.

(8) During the project construction, the engineering construction will affect the normal lives and travelling of the residents. However, with the implementation of the project, the project will provide conditions and clean and beautiful investment environment for the regional economic development, improve the living environment of the residents, and increase the living quality. According to the World Bank's arrangement, provide skill trainings for the land-lost farmers who have employment wishes; and the job opportunities generated during and after the project implementation will be given to the land-lost farmers preferentially.

(9) Keep away from cultural relics during the project construction. The engineering construction has little effect on the cultural relics department. The location of the project has been agreed by the cultural relics department and the opinions of cultural relics department are shown in Attachment 6. The relationships between the project and cultural relics and tangible cultural heritage are shown in Table16.3-1.

Relocated household names and housing areas
Table 16.3-1

Serial No.:	Cultural relics name	Level	Involving items	Distance(m)	Effect
1	Mass grave	National key cultural relics	Water treatment	94	No effect
2	Secret reservior	National key cultural relics	Environmental remedation	101	No effect
3	Bunker dungeon	National key cultural relics	Environmental remedation	131	No effect
4	Remnants of the bunker	National key cultural relics	Environmental remedation	10	No effect
4	Nanshan Christian church	---	Visitor's service center	51	Little effect

Chapter XVII Conclusion

17.1 Project overview

Sustainable development project of resource-based city (Huainan city) World Bank loan project of coal mining subsidence area comprehensive treatment and utilization covers an area of 9.3 km², which is located in the Jiulonggang-Datong (Jiuda) subsidence area, and is

administered by Datong District. Shungeng Mountain lies in the south of this area; Linchang Road lies in the north; Hefei-Fuyang Railway lies in the east, and the South Huaishun Road in the west; it has a width of 0.9~2.0km (north-south), and a length of 8.4km (east-west); 206 national highway runs through the north and south of the subsidence area and connects with Hexu highway.

This project is the comprehensive treatment of Jiuda coal mining subsidence area of 9.3 km^2 , including three - components, i.e. environmental remediation and water - management, infrastructure improvement and site utilization, project management and technical assistance, among which project management and technical assistance is consulting service and belongs to non-engineering contents. Underthe former two sub components, there are five constituent parts: (1) environmental remediation; (2) water stream rehabilitation; (3) - Datong -dumpsite closure; (4) urban infrastructure improvement; (5) site utilization for community development. The total cost of the project is RMB 1018.1837($166.9154 million) million - among which the loan applied from World Bank is RMB 610 million - ($ 100 million) and the remaining RMB 408.1837 million - ($66.9154 million) is financed by the finance of Huainan City.

17.2 Conformity analysis of industrial policies

According to Order No. 21 Industrial structure adjustment guidance catalogue (2001) (2013 Revision) of the National Development and Reform Commission, this project belongs to “III. Coal 11: management of ground subsidence area and protection and utilization of mine water resources” as listed in the encouraged industry directory. Therefore, the construction of the project conforms to national industrial policies.

17.3 Environmental status

17.3.1 Atmospheric environment

The evaluation results show that daily average concentration and mean suspended sediment concentration of all the monitoring points of SO2,NO2 in the project area meet ambient air quality standard(GB3095-1996) and the secondary standard of its amendment.

The concentration of TSP,PM10 monitoring points exceed the standard in different degrees in the project area. The worst part of TSP is the south field of Huainan No.14 middle school and eastern hospital group tumor hospital with the over standard rate of 85.7%、85.7%. The PM10 over standard rate of eastern hospital group tumor hospital is 71.4%.

The TSP over standard rate is the most serious in 3# around the landfill site with the maximum exceeding multiple of 2.29. PM10 over standard rate in 2# is the most serious with the maximum exceeding multiple of 1.68. The particular pollutants around the landfill site meet the secondary standard of Emission Standards for Odor Pollutants (GB14554—93).

17.3.2 Water environment

The total quality of surface water is polluted in different degrees. The surface water doesn’t meet the V standard of Environmental quality standards for surface water (GB3838-2002)_. The main pollution factors are relatively concentrated, mainly COD, BOD5, ammonia nitrogen, total phosphorus, total nitrogen, etc. The reasons are as follow: municipal solid waste is discarded seriously in the project area and a large number of it is floating in the flood discharge ditch; the sewage pipe network is built and a large number of sewage flows into flood discharge ditch; in addition, agricultural non-point source pollution aggravates the regional water quality deterioration to a s certain extent.

The exceeding standard factors are the most and the exceeding standard multiples are the largest in Chenxiang flood discharge ditch in the project area. In addition to the above reasons, landfill leachate infiltrates into Chenxiang flood discharge ditch from the south of landfill, which influences the water quality greatly in the flood discharge ditch.

17.3.3 Acoustic environment

Environmental noise day and night monitoring value of each noise monitoring point all meets the class 2 standard limited value of Acoustic environmental quality standard (GB3096-2008), so the regional acoustic environmental status is good.

17.3.4 Sediment environment

The content of heavy mental pollutants in each point of sediment all meets the secondary standard of Soil environmental quality standard (GB 15618-1995), so the soil environmental quality is good in the project area.

17.3.5 Soil environment

Each index of the soil environment meets the secondary standard of Soil environmental quality standard (GB 15618-1995), so the soil environmental quality is good in the project area.

17.3.6 Ground water environment

Ground water environment exceeds the standard in different degrees in the project area, and it doesn't meet class III standard of Ground water quality standard (GB/T14848-93).

The main exceeding factors of monitoring well around the landfill are as follows: total dissolved solids, total hardness, color, chloride, nitrite, mercury, total bacteria, total coliform group and so on.

Ground water quality of heavy metals basically meet class III standard of Ground water quality standard (GB/T14848-93), except mercury and nickel.

17.4 Environmental influence and pollution prevention during construction period

17.4.1 Water environmental influence and control measures

The influence of the surface water is mainly the influence of disturbance in the process of river and lake desilting and the influence of surface water caused by wastewater discharge during the construction. Wastewater pollution sources produced during construction period are mainly construction wastewater, domestic wastewater and stacking year residual water in the construction area.

The water disturbance in the process of dredging causes the release and diffusion of pollutants in sediment, and the pollution diffusion areas are roughly as follows: non-point source pollution diffusion zone (0-2m), turbulent diffusion zone (2-30m) and relative pollution diffusion zone (30-50m); its main pollutant is SS. Avoid rainy day excavating in the process of dredging; if it must be excavated in rainy days due to the need of the project, the working face shouldn't be too large and it should be completed in section. The earth excavation should be excavated from top to bottom by layer and make certain slope for discharging and there should be no ponding in the range of affecting slope stability.

90% of the residual water in the sediment yard can remove most of the suspended solids after multistage precipitation and also remove N and P. If the SS index exceeds standard in the rest 10% residual water, we should dose appropriately flocculants for sedimentating to control residual water quality when the mud gets into the sediment yard cofferdam (mud outlet). After taking the above measures, the SS concentration of discharging residual water in the sediment yard reaches the level 1 emission standard requirements of Integrated pollutant discharge standard.

17.4.2 Atmospheric effect and control measures

Main air pollution sources during construction period are as follows: gas fuel emissions of vehicles and mechanical work; yard odor gas; dust produced by sand and cement under the action of wind in the construction site and oil fume produced by workers living stoves.

The main manifestation of atmospheric environmental impact is the temporary local

influence of the construction area. The construction period of each construction area is relatively short, so the influence is relatively short. With the end of the construction activities, the pollution impact during the construction will eliminate.

Environmental protection measures: (1) easily falling bulk materials should be taken windproof cover measures in the process of handling , use, transport, transshipment and temporary storage, etc to reduce dust; (2)arrange the stacking location reasonably in the construction site, set closed fence no less than the stacking height around the location and take surface dust suppression measures of covering tarpaulin, etc; (3) equip with sprinkler, often sprinkle the roads in and out of the yard, clear the scattered materials timely and keep the roads clean; (4) use fully enclosed asphalt paving car to carry out asphalt operations.

17.4.3 Noise effect and control measures

Select the equipments according to the construction characteristics, scale, and site layout and construction machinery. The noise produced in the construction activities mainly includes the noises of construction materials processing and construction machinery. The largest noise of construction machinery is 20m from the sound source in daytime and at night is 100m-200m, which can basically meet the noise limit for construction site(Day 70 dB(A), Night 55dB(A)) in Emission standard of environment noise for boundary of construction site(GB12523-2011). Therefore, choose the construction machinery during construction period that has stable running, low noise, high content of technical indicators and meets the relevant national standards; timely or regularly maintain and repair the mechanical equipment in strict accordance with the product operating requirements and regulations during construction to keep it in good running state; strengthen the acoustic environmental management in the construction site, keep the roads clear and control horns of the transport vehicles in and out; arrange reasonably the construction time and forbid running noise source equipment after 22:00 at night.

This evaluation holds that the environmental influence in the construction period is short-term influence and it is eliminated after the construction. However, considering the influence on the surrounding environment, require the construction unit to comply with the regulations, implement the control measures and suggestions in this report, be civilized construction, strict management and shorten the construction period, and strive for the minimum environmental influence produced during construction.

17.4.4. Solid waste disposal

The solid waste disposal in the construction period is mainly bottom sediment, residual soil, residual waste materials produced during construction and municipal solid waste produced by the workers. The excavation of this project is 1.4326 million m^3, fill is 0.8919 million m^3, internal call is 0.2231 m^3, and discard is 0.5807 m^3. Discard should be received by construction waste treatment plant and environmental protection building materials factory according to the principle of making full use.

17.5 Environmental influence and pollution prevention during operation period

17.5.1 Atmospheric effect and control measures

The atmospheric effect and control measures during operation period are mainly landfill odor gases and automobile exhaust road engineering.

Datong old refuse landfill has been shut down for 5 years. It is still in the stage of gas production, but the gas production declines year by year. Landfill closure will greatly reduce the disorder emissions of odor. The project intends to set up 65 landfill gas collection wells, 6 gas collecting station and 1 set of pumping gas and flame combustion system with the processing capacity of 300 Nm^3/h. The extracted atmospheric pollutants have an impact on the environment. However, after burning, they are decomposed or burned under the action of the flame, so they have no impact on the surrounding ambient air. Meanwhile, after the

landfill closure, comprehensively afforest its surface and have a good effect on the surrounding ambient air.

Strengthen the road management and pavement maintenance and keep roads in good operating condition to reduce the emissions of vehicle exhaust. Implement the automobile exhaust emission standards formulated by the state, strengthen law enforcement of vehicle management, and forbid passing automobile discharged excessively exhaust pollutants to reduce the exhaust pollutants emission. Strengthen the greening and use plants to absorb pollutants to reduce pollution.

17.5.2 Noise effect and control measures

The noise source in the operation period is mainly the fan noise extracted the landfill gas and road noise. Because the landfill gas exhauster will be in long-term operation and exhaust fan is the low-frequency noise, so exhaust fan should be located in a room with brick wall and insulate the noise with enclosure structure. Ensure the factory standard in exhaust fan operation stage.

Due to the lack of environmental sensitive points within the range of 300m of Jiukong road and Wanxiang road, the residential area in the intersection of Zhongxing road and Yanshan road takes protective measures of building structure and sound insulation door and window. Based on the field survey, this area is the brick-mixing structure. The window is sound insulation window with double- deck glass and the sound reduction index is between 15-20 dB (A). The noise in this area can meet the class 2 standard requirement of Acoustic environmental quality standard. After taking the above measures, the influence of project construction is less on the surrounding environment.

17.5.3 Water pollution and control measures

Water pollution control in project operation period is mainly the disposal of landfill leachate and the sewage disposal of service stations and regional land exploitation and utilization.

The water pollution is mainly the landfill leachate in the operation period of Datong old refuse landfill closure regulation engineering. In order to prevent water pollution, take measures of seepage prevention, rain sewage diversion, leachate collection drainage, etc.

1. Seepage prevention: use HDPE membrane on the top of the landfill site and cover artificial impermeable layer on the surface of the original landfill site.

2. Rain sewage diversion: discharge the surface rainfall into the flooding intercepting trench as far as possible to reduce the receiving rainfall in the landfill site, thus greatly reduce the amount of leachate.

3. Leachate collection drainage: after collecting, leachate gets into leachate equalization basin through leachate pipeline. Then it is transported by sewage suction truck into leachate treatment station to dispose together in the site of municipal solid waste sanitary landfill in eastern part of Huainan city. After disposing, the leachate meet chart 2 “Water pollutant emission concentration limits of the existing and new solid waste landfills” in Standard for pollution control on the landfill site of municipal solid waste (GB16889-2008). After reaching the standard, leachate is discharged into the first sewage treatment plant of Huainan city to dispose through municipal sewage pipe network. The sewage is discharged into Huaihe River after the water quality in the first sewage treatment plant meets level-A standard of Urban sewage treatment plant pollutant discharge standard (GB18918-2002).

17.5.4 Solid waste disposal measures

Solid waste in the operation period is mainly municipal solid waste. Municipal solid waste isbagged unified and handed to the sanitation departments to dispose together.

17.5.5. Ground water control measures

(1) According to the nature of the pollutants, the area can be divided into key pollution control area and general pollution control area. As for key pollution control area, execute ground anti-seepage design with reference to Safe landfill of hazardous waste disposal engineering technical requirements (issued by state environmental protection administration in April.30, 2004) and Standard for pollution control on the security landfill site for hazardous wastes (GB 18598-2001). As to general pollution control area, design according to class II site of Standard for pollution control on the storage and disposal site for general industrial solid wastes (GB 18599-2001).

(2) Establish regional groundwater monitoring system to timely and accurately grasp changes in groundwater quality evaluation. Set 24 groundwater monitoring wells, including the initial observation wells and the new observation wells. Discover the groundwater pollution in time and control in time. Once the groundwater pollution accidents occurred, immediately launch emergency plans and emergency response solutions to control the groundwater pollution.

(3) Construction unit proposes the measures of seepage control, monitoring management, contingency plan and so on in strengthening management, improving environmental protection awareness and strictly enforcing environmental impact assessment. On the premise of the above measures, the project is not going to have a significant adverse effect on the surrounding and downstream groundwater environment.

17.6 Public participation

17.7 Environmental management and environmental monitoring program

Agricultural water conservancy of Huainan city investment development Co. Ltd and construction unit are responsible for environmental management together during construction period, and Environmental protection agency of Huainan city is responsible for the supervision and inspection. In the operation period, environmental management is in the charge of Agricultural water conservancy of Huainan city investment development Co. Ltd, Environmental protection agency of Huainan city, and Huainan city municipal administration and Huainan city gardens bureau. Huainan city environmental monitoring station is in charge of environmental monitoring in the construction period and operation period.

17.8 “Three simultaneity” environmental protection acceptance

Based on the approaches of construction project management, environmental protection facilities should be designed, constructed and put into use simultaneously with the mainstay engineering. Check and accept the environmental protection facilities after the completion of the project. Acceptance of sewage treatment project is shown in below table 17.8-1.

Construction project completion environmental protection acceptance list
Table 17.8-1

Influencing factors	Potential Influence and problems	Mitigation measures	Acceptance standard
Construction period			
Water	Landfill residual water	Add chemical agent precipitation method	Meet the Class A of Integrated wastewater discharge standard (GB8978-1996);
	Oil wastewater of construction	Set the gullies in repair and maintenance site of construction machinery and vehicles to collect maintenance washing wastewater, and set oil separating tank for oil wastewater treatment.	

	machinery		
Atmosphere	Fugitive dust	1.Cover the vehicles transported granular or particle materials; 2.Material storage places should be away from the residential area of more than 200m and should be covered with canvas or watered; 3. Construction site and vital communication line should be watered twice a day; 4.The road surface should be kept clean passed by the vehicles of the contractor, subcontractor or supplier; the cleaning work should be conducted on a regular basis to remove the scattered dust and sludge or the fallen materials of the construction vehicles	Meet the secondary standard of Comprehensive emission standard of air pollutants (GB16297-1996) and unorganized emissions monitoring concentration limit;
	Nuisance odor	1.During excavation construction, the odor intensity is about 2-3 grade within the influence scope of 50;2. Excavation work should be chose in dry season，and avoid sediment smell diffusing hot summer to mitigate the impact of odor on the surrounding residents.	
Noise	Vehicle and equipment noise	1. Equipment and machinery noise level should be carried out in strict accordance with GB12523-2011 standard of People's Republic of China; 2. Choose low noise technology and equipment and great vibration equipment should be equipped with damping device; 3. Strengthen the maintenance of vehicles and roads; transport vehicles should be at low speed when passing residential areas and noise sensitive points with no horning; forbid driving at night.	Meet the standard of Emission standard of environment noise for boundary of construction site (GB12523-2011);
Solid waste	Construction waste	Construction waste during construction period should be piled up together and collected timely as the filling materials of foundation; all kinds of construction boxes and bags should be classified and stored by people and transported together into recycling station for recycling. The construction waste disposal scheme should be reported to the relevant department of Huainan city and then implemented, and be transported timely out of the construction site.	Don's discharge construction waste
	Engineering disused soil	Earthwork basic balance	Make full use of the engineer disused soil
Ecosystem	Vegetation	Each contractor should be in accordance with design document to strip, store temporarily and protect the surface fertilizing soil of 0-20 cm; at the same time, transplant the original trees so as to be used for land reclamation or highway greening. Engineering supervisor should strengthen this supervision work.	Reduce the disturbance of the ecological environment by engineering
Operation period			
Sewage	Domestic sewage	Domestic sewage is discharged into Huainan first sewage treatment plant after the treatment of septic tank through municipal sewage pipe	Discharge into municipal sewage pipe network

		network；	
	Leachate	After collecting, leachate gets into leachate equalization basin through leachate pipeline. Then it is transported by sewage suction truck into leachate treatment station to dispose together in the site of municipal solid waste sanitary landfill in eastern part of Huainan city. After disposal reaches the standard, leachate is discharged into the first sewage treatment plant of Huainan city to dispose through municipal sewage pipe network.	Leachate equalization basin and sewage suction truck are sent regularly to the leachate treatment station in the site of municipal solid waste sanitary landfill in eastern part of Huainan city.
Solid waste	Municipal solid water	Regularly collected by sanitation departments;	Regularly sent to landfill
Noise	Equipment noise	Pumping station insulation, equipment anti-vibration;	Meet the secondary standard of Emission standard for industrial enterprises noise at boundary (GB12348-2008);
Exhaust gas	Nuisance odor	Close regulating tank with a lid, and torch combustion of the landfill odor	Meet the secondary standard of Emission standard for odor pollutants.

17.9 Overall conclusion

Sustainable development project of resource-based city (Huainan city) World Bank loan project of coal mining subsidence area comprehensive treatment and utilization belongs to one of the projects of Huainan city environmental improvement. In the construction process, it will inevitably have adverse effects on the surrounding acoustic environment and air environmental quality. But the impact area and degree are small and the effects are all temporary, periodical and regional. With the end of the project construction, the adverse effects will be terminated. The construction of the project will improve the environment, raise the environmental quality and improve water quality. It plays a positive role in promoting regional aquatic ecosystem restoration and regional landscape restoration and has good environmental benefits. The implementation of the project can improve the environmental sanitation of Huainan city, enhance people's living standard and life quality, safeguard people's health and promote social and economic development. It has a positive far-reaching significance in implementing the sustainable development strategy of Huainan city and has a very significant social benefits and good environmental benefits.

In a word, sustainable development project of resource-based city (Huainan city) World Bank loan project of coal mining subsidence area comprehensive treatment and utilization conforms to the needs of social development of Huainan city and has great significance to the sustainable development of society and environment. Therefore, from the perspective of environmental impact, sustainable development project of resource-based city (Huainan city) World Bank loan project of coal mining subsidence area comprehensive treatment and utilization is feasible.

Attachment 1 Environmental Quality Monitoring Data

1. Surface Water Monitoring

Table 1.1-1 Surface Water Monitoring Results

Water body	Sampling Locatioin	Code	Monitoring Date	Water temperature	pH	DO	COD	BOD5	Ammonia Nitrogen	Total P	Total N	Arsenic	Total Lead	Hexavalent chromium	Total Cadmium	Sulfide
				℃		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	mg/L	mg/L	mg/L	mg/L
Datong - drainage channel	100m of the upstream of Datong - drainage channel	DT-01#	2013-5-15	20.0	8.41	4.94	51	22.4	0.515	0.086	0.976	2.31	<0.010	0.004	<0.001	0.018
			2013-5-17	20.2	8.18	5.13	49	21.2	0.491	0.088	0.988	2.49	<0.010	0.004	<0.001	0.020
	500m of the midstream of Datong - drainage channel	DT-02#	2013-5-15	21.7	8.23	6.18	17	3.63	0.339	0.076	0.871	0.803	<0.010	<0.004	<0.001	0.029
			2013-5-17	21.3	8.31	6.06	20	3.43	0.360	0.069	1.06	0.791	<0.010	<0.004	<0.001	0.028
	500m of the midstream of Datong - drainage channel	DT-03#	2013-5-15	20.3	8.16	5.98	28	3.78	0.345	0.073	1.04	0.912	<0.010	<0.004	<0.001	0.033
			2013-5-17	20.6	8.03	5.91	30	3.63	0.327	0.074	0.918	0.986	<0.010	<0.004	<0.001	0.035
	1000m of the downstream of Datong -drainage channel	DT-04#	2013-5-15	21.4	8.31	7.34	16	4.91	0.372	0.072	0.718	<0.300	<0.010	<0.004	<0.001	0.027
			2013-5-17	21.4	8.27	7.18	17	4.28	0.380	0.079	0.682	<0.300	<0.010	<0.004	<0.001	0.030
	1500m of the midstream of Datong -d drainage channel	DT-05#	2013-5-15	21.2	8.21	7.62	14	3.91	0.372	0.072	0.847	<0.300	<0.010	<0.004	<0.001	0.027
			2013-5-17	21.0	8.22	7.49	15	3.82	0.357	0.077	0.729	<0.300	<0.010	<0.004	<0.001	0.030

	Central pond section of Datong -drainage channel	DT-06#	2013-5-15	23.1	8.27	4.25	70	30.5	0.554	0.108	1.09	0.716	<0.010	0.009	<0.001	0.029
			2013-5-17	23.0	8.18	3.96	72	31.4	0.566	0.111	0.941	2.17	<0.010	0.008	<0.001	0.030
	Central pond section of Datong - drainage channel	DT-07#	2013-5-15	23.9	8.21	4.54	64	28.8	0.503	0.086	0.965	1.01	<0.010	<0.004	<0.001	0.010
			2013-5-17	23.4	8.31	4.71	61	26.5	0.491	0.103	0.753	0.969	<0.010	0.004	<0.001	0.013
	Central pond section of Datong - drainage channel	DT-08#	2013-5-15	23.7	8.20	4.48	44	21.3	0.580	0.081	0.882	1.02	<0.010	0.005	<0.001	0.028
			2013-5-17	23.2	8.06	4.63	42	19.8	0.564	0.097	0.800	1.06	<0.010	0.006	<0.001	0.031
Jiulonggang flood drainage channel	Upstream of Jiulonggang -drainage channel	JL-01#	2013-5-16	20.0	7.70	3.57	12	1.87	5.15	0.434	6.68	1.35	<0.010	0.005	<0.001	0.023
			2013-5-18	19.8	7.68	3.82	13	2.16	5.00	0.416	6.06	1.25	<0.010	0.004	<0.001	0.026
	Midstream of Jiulonggang -drainage channel	JL-02#	2013-5-16	20.1	7.82	3.36	22	1.78	5.00	0.432	6.28	1.34	<0.010	0.004	<0.001	0.037
			2013-5-18	20.2	7.84	3.44	23	1.93	4.83	0.440	6.21	1.44	<0.010	0.004	<0.001	0.032
Environmental Quality Standards for Surface Water (GB3838-2002) V Standard				---	6-9	2	40	10	2	0.4	2	100	0.1	0.1	0.01	1.0

Table 1.1-2 Surface Water Monitoring Results

Water Body	Sampling Location	Code	Monitoring Date	Water Temperature	pH	DO	COD	BOD5	Ammonia Nitrogen	Total P	total N	Arsenic	Total Lead	Hexavalent Chromium	Total Cadmium	Sulfide
				℃		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	mg/L	mg/L	mg/L	mg/L
Sundian	Upstream of	SD-01#	2013-5-16	19.3	7.95	3.09	28	15.4	0.506	0.114	1.58	3.99	<0.010	<0.004	<0.001	0.042

drainage channel	Sundian-drainage channel		2013-5-18	19.4	7.83	3.63	30	15.8	0.500	0.117	1.18	3.90	<0.010	0.004	<0.001	0.040
	Upstream of Sundian-drainage channel	SD-02#	2013-5-16	19.6	8.12	3.47	27	12.5	0.518	0.109	1.30	1.37	<0.010	0.004	<0.001	0.045
			2013-5-18	19.4	8.02	3.74	28	13.6	0.530	0.106	1.09	1.18	<0.010	0.005	<0.001	0.046
	Midstream of Sundian drainage channel	SD-03#	2013-5-16	20.1	7.98	4.25	24	13.2	0.518	0.091	1.10	1.34	<0.010	<0.004	<0.001	0.036
			2013-5-18	21.0	8.12	4.11	25	13.8	0.509	0.099	0.918	1.39	<0.010	<0.004	<0.001	0.038
	Midstream of Sundian drainage channel	SD-04#	2013-5-16	20.0	8.03	4.15	24	12.5	0.476	0.083	0.941	2.72	<0.010	0.004	<0.001	0.036
			2013-5-18	20.3	7.98	4.25	25	11.9	0.464	0.088	0.788	2.60	<0.010	<0.004	<0.001	0.040
	Central pond section of Sundian drainage channel	SD-05#	2013-5-16	20.3	8.48	3.57	38	18.8	0.264	0.216	0.929	1.59	<0.010	0.004	<0.001	0.092
			2013-5-18	20.2	8.11	5.08	40	20.3	0.252	0.226	0.788	1.63	<0.010	<0.004	<0.001	0.089
	Central pond section of Sundian drainage channel	SD-06#	2013-5-16	20.1	8.12	6.10	25	2.36	0.222	0.226	1.00	0.635	<0.010	0.005	<0.001	0.098
			2013-5-18	21.3	7.96	5.95	26	1.97	0.207	0.219	0.953	0.664	<0.010	0.006	<0.001	0.098
206 National	A pond in the east side of the 206 national road		2013-5-16	20.6	8.02	3.78	35	19.1	0.455	0.077	0.918	1.01	<0.010	0.004	<0.001	0.017
			2013-5-1	20.4	8.12	3.94	31	17.0	0.43	0.09	0.90	1.05	<0.0	0.005	<0.00	0.022

Road		8						7	0	6		10		1	
	A pond in the west side of the 206 national road	2013-5-16	20.4	8.18	4.09	65	29.8	6.11	0.459	6.85	0.578	<0.010	0.008	<0.001	0.032
		2013-5-18	20.3	8.04	4.30	61	28.2	5.93	0.461	6.79	0.525	<0.010	0.007	<0.001	0.034
Environmental Quality Standards for Surface Water (GB3838-2002) V Standard			---	6-9	2	40	10	2	0.4	2	100	0.1	0.1	0.01	1.0

Table 1.1-3 Surface Water Monitoring Results

Water Body	Sampling Location	Code	Monitoring Date	Water Temperature	pH	DO	COD	BOD5	Ammonia Nitrogen	Total P	Total N	Arsenic	Total Lead	Hexavalent chromium	Total Cadmium	Sulfide
				(℃)		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	mg/L	mg/L	mg/L	mg/L
Chenxiang-drainage channel	100m of the upstream of Chenxiang-drainage channel	CX-01#	2013-5-15	20.1	8.36	3.19	60	30.1	0.473	0.086	0.788	4.24	<0.010	0.004	<0.001	0.015
			2013-5-17	20.4	8.27	3.44	60	29.5	0.461	0.090	0.812	4.33	<0.010	0.004	<0.001	0.022
	500m of the midstream of Chenxiang-drainage channel	CX-02#	2013-5-15	19.7	7.94	4.34	110	55.5	19.3	8.13	21.6	1.80	<0.010	0.008	<0.001	0.153
			2013-5-17	19.8	7.83	4.21	120	60.4	18.3	7.03	18.8	1.86	<0.010	0.009	<0.001	0.122
	1500m of the downstream of Chenxiang-drainage channel	CX-03#	2013-5-15	20.0	8.12	4.05	152	71.4	19.3	8.28	21.2	1.96	<0.010	0.012	<0.001	0.139
			2013-5-17	20.2	8.16	4.32	170	75.2	18.7	7.56	20.6	2.14	<0.010	0.010	<0.001	0.137
	100m of the	CX-04	2013-5-15	20.7	7.99	3.96	27	13.2	0.473	0.093	0.800	1.14	<0.01	0.014	<0.00	0.023

	upstream of Chenxiang -drainage channel	#										0		1	
			2013-5-17	20.5	8.02	4.15	28	15.4	0.482	0.098	0.824	1.08	<0.010	0.013	<0.001	0.025
	500m of the midstream of Chenxiang - drainage channel	CX-05 #	2013-5-15	20.3	8.34	2.99	60	30.8	0.545	0.086	0.694	4.60	<0.010	<0.004	<0.001	0.021
			2013-5-17	20.4	8.18	3.24	58	28.7	0.536	0.092	0.706	4.43	<0.010	0.004	<0.001	0.025
	2000m of the downstream of Chenxiang -drainage channel	CX-06 #	2013-5-15	18.9	7.88	5.66	165	88.4	19.6	0.879	22.2	1.96	<0.010	0.014	<0.001	0.123
			2013-5-17	19.0	7.83	5.52	150	79.1	19.0	0.896	21.5	1.68	<0.010	0.015	<0.001	0.123
	Central pond section of Chenxiang -drainage channel	CX-07 #	2013-5-15	20.6	8.62	9.07	27	14.8	0.103	0.020	0.588	0.950	<0.010	<0.004	<0.001	0.012
			2013-5-17	20.4	8.47	9.42	28	15.4	0.109	0.026	0.612	0.662	<0.010	0.004	<0.001	0.013
	Central pond section of Chenxiang -drainage channel	CX-08 #	2013-5-15	21.2	8.71	8.34	58	29.0	0.121	0.032	0.518	0.637	<0.010	0.004	<0.001	0.012
			2013-5-17	21.3	8.69	8.82	60	29.9	0.127	0.041	0.541	0.608	<0.010	<0.004	<0.001	0.012
	Central pond section of Chenxiang -drainage channel	CX-09 #	2013-5-15	20.8	8.60	8.84	20	4.07	0.115	0.009	0.518	0.311	<0.010	<0.004	<0.001	0.010
			2013-5-17	21.0	8.71	8.30	20	4.37	0.118	0.018	0.471	0.469	<0.010	0.004	<0.001	0.012
Environmental Quality Standards for				---	6-9	2	40	10	2	0.4	2	100	0.1	0.1	0.01	1.0

Surface Water (GB3838-2002) V Standard															

Table 1.2-1 Evaluation of Surface Water Monitoring Results

Water body	Sampling Location	Code	Monitoring Date	Water temperature	pH	DO	COD	BOD5	Ammonia Nitrogen	Total P	Total N	Arsenic	Total Lead	Hexavalent Chromium	Total Cadmium	Sulfide
				℃												
Datong -drainage channel	100m of the upstream of Datong -drainage channel	DT-01#	2013-5-15	20.0	0.705	0.584	1.275	2.240	0.258	0.215	0.488	0.023	Lower than limit of detection	Lower than limit of detection	Lower than limit of detection	0.018
			2013-5-17	20.2	0.590	0.555	1.225	2.120	0.246	0.220	0.494	0.025				0.020
	500m of the midstream of Datong -drainage channel	DT-02#	2013-5-15	21.7	0.615	0.384	0.425	0.363	0.170	0.190	0.436	0.008				0.029
			2013-5-17	21.3	0.655	0.407	0.500	0.343	0.180	0.173	0.530	0.008				0.028
	500m of the midstream of Datong -drainage channel	DT-03#	2013-5-15	20.3	0.580	0.433	0.700	0.378	0.173	0.183	0.520	0.009				0.033
			2013-5-17	20.6	0.515	0.439	0.750	0.363	0.164	0.185	0.459	0.010				0.035
	1000m of the downstream of	DT-04#	2013-5-15	21.4	0.655	0.218	0.400	0.491	0.186	0.180	0.359	0.001				0.027
			2013-5-17	21.4	0.635	0.242	0.425	0.428	0.190	0.198	0.341	0.001				0.030

	Datong -drainage channel														
	1500m of the midstream of Datong -drainage channel	DT-05#	2013-5-15	21.2	0.605	0.181	0.350	0.391	0.186	0.180	0.424	0.001			0.027
			2013-5-17	21.0	0.610	0.204	0.375	0.382	0.179	0.193	0.365	0.001			0.030
	Central pond section of Datong -drainage channel	DT-06#	2013-5-15	23.1	0.635	0.657	1.750	3.050	0.277	0.270	0.545	0.007	0.09		0.029
			2013-5-17	23.0	0.590	0.702	1.800	3.140	0.283	0.278	0.471	0.022	0.08		0.030
	Central pond section of Datong -drainage channel	DT-07#	2013-5-15	23.9	0.605	0.605	1.600	2.880	0.252	0.215	0.483	0.010	Lower than limit of detection		0.010
			2013-5-17	23.4	0.655	0.584	1.525	2.650	0.246	0.258	0.377	0.010			0.013
	Central pond section of Datong -drainage channel	DT-08#	2013-5-15	23.7	0.600	0.616	1.100	2.130	0.290	0.203	0.441	0.010			0.028
			2013-5-17	23.2	0.530	0.598	1.050	1.980	0.282	0.243	0.400	0.011	0.06		0.031
Jiulonggang -	Upstream of	JL-01#	2013-5-16	20.0	0.350	0.778	0.300	0.187	2.575	1.085	3.340	0.014	Lower than		0.023

drainage channel	Jiulonggang - drainage channel		2013-5-18	19.8	0.340	0.744	0.325	0.216	2.500	1.040	3.030	0.013		limit of detection		0.026
	Midstream of Jiulonggang - drainage channel	JL-02#	2013-5-16	20.1	0.410	0.807	0.550	0.178	2.500	1.080	3.140	0.013				0.037
			2013-5-18	20.2	0.420	0.795	0.575	0.193	2.415	1.100	3.105	0.014				0.032

Table 1.2-2 Evaluation of Surface Water Monitoring Results

Water Body	Sampling Location	Code	Monitoring Date	Water Temperature ℃	pH	DO	COD	BOD5	Ammonia Nitrogen	Total P	Total N	Arsenic	Total Lead	Hexavalent Chromium	Total Cadmium	Sulfide
Sundian - drainage channel	Upstream of Sundian -drainage channel	SD-01#	2013-5-16	19.3	0.475	0.905	0.700	1.540	0.253	0.285	0.790	0.040	Lower than limit of detection	Lower than limit of detection	Lower than limit of detection	0.042
			2013-5-18	19.4	0.415	0.856	0.750	1.580	0.250	0.293	0.590	0.039				0.040
	Upstream of Sundian - drainage channel	SD-02#	2013-5-16	19.6	0.560	0.870	0.675	1.250	0.259	0.273	0.650	0.014				0.045
			2013-5-18	19.4	0.510	0.845	0.700	1.360	0.265	0.265	0.545	0.012				0.046
	Midstream of Sundian -drainage channel	SD-03#	2013-5-16	20.1	0.490	0.796	0.600	1.320	0.259	0.228	0.550	0.013				0.036
			2013-5-18	21.0	0.560	0.810	0.625	1.380	0.255	0.248	0.459	0.014				0.038

	Midstream of Sundian-drainage channel	SD-04#	2013-5-16	20.0	0.515	0.806	0.600	1.250	0.238	0.208	0.471	0.027	ction			0.036
			2013-5-18	20.3	0.490	0.796	0.625	1.190	0.232	0.220	0.394	0.026				0.040
	Central pond section of Sundian-drainage channel	SD-05#	2013-5-16	20.3	0.740	0.861	0.950	1.880	0.132	0.540	0.465	0.016				0.092
			2013-5-18	20.2	0.555	0.714	1.000	2.030	0.126	0.565	0.394	0.016				0.089
	Central pond section of Sundian-drainage channel	SD-06#	2013-5-16	20.1	0.560	0.606	0.625	0.236	0.111	0.565	0.500	0.006				0.098
			2013-5-18	21.3	0.480	0.622	0.650	0.197	0.104	0.548	0.477	0.007		0.06		0.098
206 National Road	A pond in the east side of the 206 national road		2013-5-16	20.6	0.510	0.841	0.875	1.910	0.228	0.193	0.459	0.010		Lower than limit of detection		0.017
			2013-5-18	20.4	0.560	0.826	0.775	1.700	0.219	0.225	0.453	0.011				0.022
	A pond in the west side of the 206 national road		2013-5-16	20.4	0.590	0.812	1.625	2.980	3.055	1.148	3.425	0.006		0.08		0.032
			2013-5-18	20.3	0.520	0.792	1.525	2.820	2.965	1.153	3.395	0.005		0.07		0.034

Table 1.2-3 Evaluation of Surface Water Monitoring Results

Water Body	Sampling Location	Code	Monitoring Date	Water Temperature (℃)	Ph value	DO	COD	BOD 5	Ammonia Nitrogen	Total P	total N	Arsenic	Total Lead	Hexavalent Chromium	Total Cadmium	Sulfide
Chenxiang-drainage channel	100m of the upstream of Chenxiang-drainage channel	CX-01#	2013-5-15	20.1	0.680	0.831	1.500	3.010	0.237	0.215	0.394	0.042	Lower than limit of detection	Lower than limit of detection	Lower than limit of detection	0.015
			2013-5-17	20.4	0.635	0.794	1.500	2.950	0.231	0.225	0.406	0.043				0.022
	500m of the midstream of Chenxiang-drainage channel	CX-02#	2013-5-15	19.7	0.470	0.671	2.750	5.550	9.650	20.325	10.800	0.018		0.08		0.153
			2013-5-17	19.8	0.415	0.689	3.000	6.040	9.150	17.575	9.400	0.019		0.09		0.122
	1500m of the downstream of Chenxiang-drainage channel	CX-03#	2013-5-15	20.0	0.560	0.710	3.800	7.140	9.650	20.700	10.600	0.020		0.12		0.139
			2013-5-17	20.2	0.580	0.670	4.250	7.520	9.350	18.900	10.300	0.021		0.10		0.137
	100m of the upstream of Chenxiang-drainage channel	CX-04#	2013-5-15	20.7	0.495	0.718	0.675	1.320	0.237	0.233	0.400	0.011		0.14		0.023
			2013-5-17	20.5	0.510	0.692	0.700	1.540	0.241	0.245	0.412	0.011		0.13		0.025
	500m of the midstream of Chenxiang-drainage channel	CX-05#	2013-5-15	20.3	0.670	0.859	1.500	3.080	0.273	0.215	0.347	0.046		Lower than limit of detection		0.021
			2013-5-17	20.4	0.590	0.823	1.450	2.870	0.268	0.230	0.353	0.044				0.025
	2000m of	CX-0	2013-5-15	18.9	0.440	0.496	4.125	8.840	9.800	2.198	11.10	0.020		0.14		0.123

	the downstream of Chenxiang -drainage channel	6#									0				
			2013-5-17	19.0	0.415	0.514	3.750	7.910	9.500	2.240	10.750	0.017		0.15	0.123
	Central pond section of Chenxiang - drainage channel	CX-07#	2013-5-15	20.6	0.810	0.015	0.675	1.480	0.052	0.050	0.294	0.010		Lower than limit of detection	0.012
			2013-5-17	20.4	0.735	0.060	0.700	1.540	0.055	0.065	0.306	0.007			0.013
	Central pond section of Chenxiang -drainage channel	CX-08#	2013-5-15	21.2	0.855	0.076	1.450	2.900	0.061	0.080	0.259	0.006			0.012
			2013-5-17	21.3	0.845	0.004	1.500	2.990	0.064	0.103	0.271	0.006			0.012
	Central pond section of Chenxiang -drainage channel	CX-09#	2013-5-15	20.8	0.800	0.013	0.500	0.407	0.058	0.023	0.259	0.003			0.010
			2013-5-17	21.0	0.855	0.087	0.500	0.437	0.059	0.045	0.236	0.005			0.012

Table 1.2-4 Result of Surface Water Assessment

Water Body	Parameter	pH	DO	COD	BOD5	Ammonia Nitrogen	Total P	Total N	Arsenic	Total Lead	Hexavalent Chromium	Total Cadmium	Sulfide
Datong -drainage channel	Standard index (Pi) range	0.515-0.705	0.181-0.702	0.35-1.8	0.343-3.14	0.164-0.29	0.173-0.278	0.341-0.545	0.001-0.025	Lower than limit of detection	0.05-0.09	Lower than limit of detection	0.01-0.035

	Exceeding standard No. (each)	0	0	8	8	0	0	0	0	0	0	0	0
	Exceeding standard rate (%)	0	0	50	50	0	0	0	0	0	0	0	0
	Maximum multiple of exceeding standard	0	0	0.8	2.14	0	0	0	0	0	0	0	0
Jiulonggang - drainage channel	Standard index (Pi) range	0.34-0.42	0.744-0.807	0.3-0.575	0.178-0.216	2.415-2.575	1.04-1.1	3.03-3.34	0.013-0.014	Lower than limit of detection	Lower than limit of detection	Lower than limit of detection	0.023-0.037
	Exceeding standard No. (each)	0	0	0	0	4	4	4	0	0	0	0	0
	Exceeding standard rate (%)	0	0	0	0	100	100	100	0	0	0	0	0
	Maximum multiple	0	0	0	0	1.575	0.1	2.34	0	0	0	0	0

	of exceeding standard												
Sundian-drainage channel	Standard index (Pi) range	0.415-0.74	0.606-0.905	0.6-1.0	0.197-2.03	0.104-0.256	0.208-0.565	0.394-0.79	0.006-0.04	Lower than limit of detection	Lower than limit of detection	Lower than limit of detection	0.036-0.098
	Exceeding standard No. (each)	0	0	0	10	0	0	0	0	0	0	0	0
	Exceeding standard rate (%)	0	0	0	83.3	0	0	0	0	0	0	0	0
	Maximum multiple of exceeding standard	0	0	0	1.03	0	0	0	0	0	0	0	0
206 National Road pond	Standard index (Pi) range	0.51-0.59	0.792-0.841	0.775-1.625	1.7-2.98	0.219-3.055	0.193-1.153	0.453-3.425	0.005-0.011	Lower than limit of detection	0.05-0.08	Lower than limit of detection	0.017-0.034
	Exceeding standar	0	0	2	4	2	2	2	0	0	0	0	0

	d No. (each)												
	Exceeding standard rate (%)	0	0	50	100	50	50	50	0	0	0	0	0
	Maximum multiple of exceeding standard	0	0	0.625	1.98	2.055	0.153	2.425	0	0	0	0	0
Chenxiang -drainage channel	Standard index (Pi) range	0.415-0.855	0.004-0.859	0.5-4.25	0.407-8.84	0.052-9.8	0.023-20.7	0.236-11.1	0.003-0.046	Lower than limit of detection	0.05-0.15	Lower than limit of detection	0.01-0.153
	Exceeding standard No. (each)	0	0	12	16	6	6	6	0	0	0	0	0
	Exceeding standard rate (%)	0	0	66.67	88.88	33.33	33.33	33.33	0	0	0	0	0
	Maximum multiple of exceeding	0	0	3.25	7.84	8.8	19.7	10.1	0	0	0	0	0

	standard												

2. Ambient Air Quality Monitoring

Table 2.1-1 Atmospheric Quality Monitoring Results

Monitoring Location	Date	TSP Daily Average	PM10 Daily Average	SO2 （mg/m3）					NO2 （mg/m3）				
				2:00-2:45	8:00-8:45	14:00-14:45	20:00-20:45	Daily Average	2:00-2:45	8:00-8:45	14:00-14:45	20:00-20:45	Daily Average
1# Upwind direction of the dumpsite	2013-5-16	0.736	0.236	<0.007	<0.007	0.007	<0.007	0.006	0.072	0.088	0.094	0.077	0.072
	2013-5-17	0.075	0.039	<0.007	0.007	<0.007	<0.007	0.004	0.132	0.126	0.122	0.075	0.046
	2013-5-18	0.077	0.041	<0.007	0.007	<0.007	<0.007	0.006	0.094	0.120	0.084	0.068	0.053
	2013-5-19	0.096	0.055	0.008	0.007	0.007	0.009	0.009	0.057	0.098	0.087	0.145	0.042
	2013-5-20	0.128	0.077	<0.007	<0.007	0.007	<0.007	0.006	0.122	0.127	0.097	0.097	0.060
	2013-5-21	0.149	0.080	<0.007	<0.007	0.008	<0.007	0.006	0.072	0.146	0.104	0.121	0.035
	2013-5-22	0.137	0.075	<0.007	<0.007	<0.007	0.013	0.007	0.122	0.142	0.094	0.062	0.029
2# Down wind direction of the dumpsite	2013-5-16	0.748	0.402	0.013	0.017	0.018	0.013	0.015	0.072	0.093	0.138	0.132	0.064
	2013-5-17	0.071	0.052	0.020	0.012	0.013	0.013	0.016	0.142	0.116	0.140	0.093	0.067
	2013-5-18	0.091	0.051	0.016	0.017	0.013	0.017	0.016	0.126	0.054	0.113	0.091	0.056
	2013-5-19	0.162	0.092	0.015	0.016	0.019	0.014	0.016	0.146	0.148	0.121	0.104	0.046
	2013-5-20	0.147	0.088	0.017	0.016	0.017	0.014	0.015	0.117	0.132	0.121	0.063	0.040
	2013-5-21	0.156	0.091	0.015	0.019	0.018	0.015	0.018	0.139	0.121	0.064	0.092	0.063
	2013-5-22	0.206	0.110	0.016	0.019	0.018	0.015	0.017	0.094	0.107	0.089	0.116	0.073
Ambient Air Quality Standard (GB3095-1996), and the secondary standards in the modification list		0.3	0.15	0.5				0.15	0.24				0.12

Table 2.1-2 Atmospheric Quality Monitoring Results

Monitoring Location	Date	TSP Daily Average	PM10 Daily Average	SO2（mg/m3）					NO2（mg/m3）				
				2:00 -2:45	8:00 -8:45	14:00 -14:45	20:00 -20:45	Daily Average	2:00 -2:45	8:00 -8:45	14:00 -14:45	20:00 -20:45	Daily Average
3# Down wind direction of the dumpsite	2013-5-16	0.987	0.349	0.024	0.019	0.019	0.017	0.020	0.109	0.088	0.061	0.084	0.049
	2013-5-17	0.066	0.040	0.014	0.016	0.018	0.017	0.016	0.053	0.079	0.070	0.063	0.074
	2013-5-18	0.113	0.063	0.014	0.012	0.017	0.019	0.015	0.084	0.049	0.087	0.061	0.059
	2013-5-19	0.153	0.084	0.017	0.015	0.016	0.019	0.016	0.045	0.072	0.060	0.063	0.040
	2013-5-20	0.159	0.087	0.017	0.015	0.023	0.016	0.018	0.069	0.079	0.090	0.073	0.062
	2013-5-21	0.150	0.080	0.014	0.017	0.015	0.017	0.016	0.093	0.082	0.091	0.077	0.053
	2013-5-22	0.154	0.083	0.019	0.018	0.015	0.022	0.018	0.062	0.066	0.069	0.072	0.057
4# Lianghuai courtyard of Kuangnan Village	2013-5-16	0.801	0.368	0.010	0.016	0.019	0.013	0.014	0.049	0.068	0.054	0.051	0.044
	2013-5-17	0.065	0.044	0.016	0.007	<0.007	0.014	0.010	0.039	0.060	0.044	0.072	0.045
	2013-5-18	0.113	0.065	0.017	0.010	0.016	0.019	0.015	0.077	0.061	0.068	0.049	0.053
	2013-5-19	0.153	0.082	0.013	0.016	0.017	0.015	0.016	0.061	0.060	0.075	0.048	0.044
	2013-5-20	0.159	0.090	0.016	0.017	0.018	0.015	0.016	0.064	0.057	0.068	0.080	0.044
	2013-5-21	0.150	0.137	0.012	0.012	0.015	0.020	0.015	0.074	0.068	0.049	0.064	0.041
	2013-5-22	0.154	0.075	0.010	0.016	0.020	0.014	0.016	0.082	0.076	0.072	0.074	0.057
5# Family community of Datong cement plant	2013-5-16	0.747	0.391	0.016	0.017	0.014	0.016	0.016	0.077	0.060	0.079	0.063	0.100
	2013-5-17	0.068	0.039	<0.007	0.008	0.008	0.007	0.007	0.067	0.070	0.063	0.065	0.068
	2013-5-18	0.100	0.057	<0.007	<0.007	0.014	0.012	0.009	0.047	0.054	0.052	0.075	0.044
	2013-5-19	0.146	0.083	0.010	0.016	0.020	0.014	0.014	0.071	0.069	0.063	0.080	0.036
	2013-5-20	0.157	0.091	0.016	0.017	0.015	0.016	0.017	0.069	0.067	0.073	0.063	0.040
	2013-5-21	0.190	0.112	0.016	0.016	0.013	0.010	0.014	0.088	0.085	0.052	0.062	0.070
	2013-5-22	0.189	0.106	0.011	0.014	0.010	0.008	0.012	0.070	0.076	0.054	0.059	0.075
Ambient Air Quality Standard (GB3095-1996), and the secondary standards in the modification list		0.3	0.15	0.5				0.15	0.24				0.12

Table 2.1-3 Atmospheric Quality Monitoring Results

Monitoring Location	Date	TSP Daily Average	PM10 Daily Average	SO2（mg/m3）					NO2（mg/m3）				
				2:00 -2:45	8:00 -8:45	14:00 -14:45	20:00 -20:45	Daily Average	2:00 -2:45	8:00 -8:45	14:00 -14:45	20:00 -20:45	Daily Average
6# Jiulonggang second company of Dongcheng company	2013-5-16	0.043	0.037	0.008	0.011	0.007	0.008	0.008	0.077	0.074	0.061	0.063	0.042
	2013-5-17	0.330	0.210	0.007	0.008	0.012	0.010	0.010	0.051	0.046	0.044	0.054	0.052
	2013-5-18	0.359	0.188	0.008	0.008	0.007	0.008	0.007	0.056	0.058	0.075	0.044	0.097
	2013-5-19	0.360	0.193	0.011	0.007	0.009	0.007	0.007	0.050	0.052	0.063	0.056	0.072
	2013-5-20	0.199	0.132	0.009	0.012	0.010	0.010	0.010	0.074	0.069	0.048	0.046	0.064
	2013-5-21	0.257	0.137	0.016	0.007	0.009	0.011	0.011	0.062	0.058	0.066	0.069	0.061
	2013-5-22	0.251	0.142	0.007	0.009	0.008	0.010	0.008	0.077	0.056	0.054	0.052	0.053
7# Luzhuang	2013-5-16	0.047	0.054	0.012	0.010	0.008	0.007	0.010	0.060	0.068	0.054	0.077	0.043
	2013-5-17	0.238	0.142	<0.007	<0.007	0.014	0.007	0.008	0.072	0.051	0.044	0.042	0.059
	2013-5-18	0.273	0.160	0.008	0.011	0.007	0.008	0.009	0.061	0.068	0.066	0.063	0.087
	2013-5-19	0.245	0.143	0.007	0.009	0.012	0.010	0.009	0.085	0.069	0.068	0.060	0.065
	2013-5-20	0.165	0.085	<0.007	0.015	0.012	0.010	0.011	0.050	0.053	0.063	0.049	0.054
	2013-5-21	0.176	0.091	0.007	0.009	0.011	0.008	0.010	0.043	0.063	0.059	0.069	0.035
	2013-5-22	0.184	0.099	0.009	0.007	0.009	0.013	0.010	0.055	0.054	0.079	0.057	0.033
8# Huainan 14th middle school (Nanchangjie)	2013-5-16	0.047	0.060	0.010	<0.007	<0.007	<0.007	0.009	0.058	0.063	0.061	0.067	0.073
	2013-5-17	0.465	0.230	0.007	<0.007	<0.007	0.007	0.006	0.077	0.060	0.052	0.046	0.059
	2013-5-18	0.480	0.277	<0.007	0.010	0.008	0.008	0.009	0.044	0.066	0.080	0.061	0.082
	2013-5-19	0.489	0.289	0.008	0.007	<0.007	<0.007	0.007	0.064	0.055	0.048	0.078	0.089
	2013-5-20	0.417	0.232	0.009	0.007	0.010	<0.007	0.008	0.060	0.055	0.053	0.075	0.061
	2013-5-21	0.483	0.258	<0.007	0.009	0.009	0.008	0.008	0.069	0.058	0.064	0.049	0.050
	2013-5-22	0.407	0.231	<0.007	<0.007	0.010	0.011	0.007	0.077	0.054	0.052	0.074	0.036
Ambient Air Quality Standard (GB3095-1996),		0.3	0.15	0.5				0.15	0.24				0.12

and the secondary standards in the modification list						

Table 2.1-4 Atmospheric Quality Monitoring Results

Monitoring point	Date	TSP Daily average value	PM10 Daily average value	SO2（mg/m3）					NO2（mg/m3）				
				2:00 -2:45	8:00 -8:45	14:00 -14:45	20:00 -20:45	Daily average value	2:00 -2:45	8:00 -8:45	14:00 -14:45	20:00 -20:45	Daily average value
9# Tumor hospital of Huainan Eastern Hospital Group	2013-5-16	0.089	0.030	0.010	0.016	0.014	0.016	0.013	0.063	0.065	0.061	0.044	0.039
	2013-5-17	0.431	0.142	<0.007	0.008	0.008	0.007	0.006	0.088	0.065	0.058	0.074	0.060
	2013-5-18	0.404	0.225	<0.007	<0.007	0.014	0.012	0.010	0.049	0.066	0.056	0.054	0.062
	2013-5-19	0.467	0.266	0.010	0.016	0.015	0.016	0.014	0.066	0.069	0.080	0.075	0.075
	2013-5-20	0.417	0.182	<0.007	0.009	<0.007	0.007	0.007	0.062	0.048	0.056	0.061	0.056
	2013-5-21	0.443	0.197	<0.007	<0.007	0.010	<0.007	0.007	0.057	0.066	0.072	0.069	0.047
	2013-5-22	0.401	0.158	0.010	0.009	0.008	0.009	0.008	0.053	0.078	0.049	0.057	0.041
Ambient Air Quality Standard (GB3095-1996), and the secondary standards in the modification list		0.3	0.15	0.5				0.15	0.24				0.12

Monitoring point	Date	Ammonia (mg/m3)				Hydrogen sulfide (mg/m3)			
		2:00 -3:00	8:00 -9:00	14:00 -15:00	20:00 -21:00	2:00 -2:45	8:00 -8:45	14:00 -14:45	20:00 -20:45
1# Upwind direction of the dumpsite	2013-5-16	<0.010	0.101	0.090	0.100	0.005	0.005	0.005	0.005
	2013-5-17	0.019	0.121	0.201	0.149	0.005	0.004	0.007	0.004
	2013-5-18	0.025	0.137	0.111	0.148	0.006	0.007	0.005	0.004
	2013-5-19	0.032	0.108	0.159	0.137	0.004	0.004	0.003	0.005
	2013-5-20	0.101	0.163	0.129	0.132	0.004	0.005	0.006	0.004
	2013-5-21	0.115	0.098	0.151	0.133	0.005	0.003	0.005	0.007
	2013-5-22	0.089	0.180	0.136	0.161	0.006	0.005	0.005	0.005

The “secondary current standard” of the Emission Standards for Odor Pollutants (GB14554—93)	2.0	0.1

Table 2.1-5 Atmospheric Quality Monitoring Results

Monitoring point	Date	Ammonia (mg/m3)				Hydrogen sulfide (mg/m3)			
		2:00-3:00	8:00-9:00	14:00-15:00	20:00-21:00	2:00-2:45	8:00-8:45	14:00-14:45	20:00-20:45
2# Downwind direction of the dumpsite	2013-5-16	0.151	0.180	0.148	0.155	0.005	0.006	0.004	0.005
	2013-5-17	0.159	0.121	0.173	0.184	0.004	0.003	0.004	0.003
	2013-5-18	0.153	0.129	0.190	0.156	0.005	0.005	0.006	0.005
	2013-5-19	0.128	0.172	0.148	0.155	0.004	0.003	0.004	0.003
	2013-5-20	0.151	0.122	0.140	0.163	0.005	0.006	0.006	0.005
	2013-5-21	0.166	0.189	0.168	0.174	0.004	0.005	0.006	0.005
	2013-5-22	0.148	0.156	0.141	0.149	0.005	0.004	0.004	0.005
3# Downwind direction of the dumpsite	2013-5-16	0.192	0.186	0.172	0.189	0.006	0.004	0.009	0.005
	2013-5-17	0.118	0.194	0.166	0.153	0.005	0.004	0.004	0.005
	2013-5-18	0.134	0.185	0.164	0.141	0.006	0.007	0.006	0.007
	2013-5-19	0.107	0.172	0.167	0.141	0.007	0.005	0.004	0.005
	2013-5-20	0.116	0.194	0.146	0.145	0.008	0.006	0.007	0.009
	2013-5-21	0.114	0.166	0.156	0.146	0.006	0.007	0.007	0.007
	2013-5-22	0.118	0.149	0.164	0.140	0.008	0.009	0.007	0.006
(GB14554—93) “secondary current” standard		2.0				0.1			
Monitoring point	Date	Methyl mercaptan (mg/m3)				Odor concentration (non-dimensional)			
		2:00	8:00	14:00	20:00	2:00	8:00	14:00	20:00
1# Upwind direction of the dumpsite	2013-5-17	<0.0005	<0.0005	<0.0005	<0.0005	14	15	17	17
	2013-5-18	<0.0005	<0.0005	<0.0005	<0.0005	14	13	15	15
	2013-5-19	<0.0005	<0.0005	<0.0005	<0.0005	12	12	16	13
	2013-5-20	<0.0005	<0.0005	<0.0005	<0.0005	14	17	14	19
	2013-5-21	<0.0005	<0.0005	<0.0005	<0.0005	12	16	15	15
	2013-5-22	<0.0005	<0.0005	<0.0005	<0.0005	19	13	13	12

	2013-5-23	<0.0005	<0.0005	<0.0005	<0.0005	12	12	17	14
(GB14554—93) “secondary current” standard		0.01				30			

Table 2.1-6 Atmospheric Quality Monitoring Results

Monitoring point	Date	Methyl mercaptan (mg/m3)				Odor concentration (non-dimensional)			
		2:00	8:00	14:00	20:00	2:00	8:00	14:00	20:00
2# Downwind direction of the dumpsite	2013-5-17	<0.0005	<0.0005	<0.0005	<0.0005	13	17	16	16
	2013-5-18	<0.0005	<0.0005	<0.0005	<0.0005	13	13	16	16
	2013-5-19	<0.0005	<0.0005	<0.0005	<0.0005	12	16	13	14
	2013-5-20	<0.0005	<0.0005	<0.0005	<0.0005	13	13	14	11
	2013-5-21	<0.0005	<0.0005	<0.0005	<0.0005	13	14	11	17
	2013-5-22	<0.0005	<0.0005	<0.0005	<0.0005	13	13	12	16
	2013-5-23	<0.0005	<0.0005	<0.0005	<0.0005	14	13	12	14
3# Downwind direction of the dumpsite	2013-5-17	<0.0005	<0.0005	<0.0005	<0.0005	15	11	14	14
	2013-5-18	<0.0005	<0.0005	<0.0005	<0.0005	13	12	12	13
	2013-5-19	<0.0005	<0.0005	<0.0005	<0.0005	17	18	14	18
	2013-5-20	<0.0005	<0.0005	<0.0005	<0.0005	13	13	16	17
	2013-5-21	<0.0005	<0.0005	<0.0005	<0.0005	17	15	16	12
	2013-5-22	<0.0005	<0.0005	<0.0005	<0.0005	11	14	15	15
	2013-5-23	<0.0005	<0.0005	<0.0005	<0.0005	12	15	16	13
(GB14554—93) “secondary current” standard		0.01				30			

Table 2.2 Synchronous Meteorological Observation Results

Date	Time	Air temperature (℃)	Wind Speed (m/s)	Atmospheric pressure (kPa)	Wind direction	Weather conditions
2013-5-17	2:00	16.0	1.5	101.2	North	Cloudy
	8:00	17.5	0.5	101.0	Northeast	Cloudy
	14:00	19.8	1.0	100.9	East	Cloudy
	20:00	19.0	0.8	101.0	Northeast	Cloudy
2013-5-18	2:00	19.2	1.0	100.8	West	Cloudy
	8:00	19.5	1.1	100.8	Northwest	Cloudy
	14:00	20.5	0.8	100.4	West	Cloudy
	20:00	20.0	0.5	100.5	Northwest	Cloudy
2013-5-19	2:00	18.0	1.2	101.0	Southwest	Sunny
	8:00	21.5	1.0	100.9	Southwest	Sunny
	14:00	27.0	2.5	100.6	West	Sunny
	20:00	25.2	2.8	100.3	Southwest	Sunny
2013-5-20	2:00	21.6	1.2	100.6	West	Sunny
	8:00	23.4	1.5	100.4	Southwest	Sunny
	14:00	28.5	1.0	100.4	West	Sunny
	20:00	25.0	0.8	100.5	Southwest	Sunny
2013-5-21	2:00	23.0	1.1	100.6	Southwest	Sunny
	8:00	24.5	1.2	100.4	Southwest	Sunny
	14:00	33.2	1.5	100.2	Southwest	Sunny
	20:00	28.5	1.7	100.4	Southwest	Sunny
2013-5-22	2:00	24.2	1.2	100.6	East	Sunny
	8:00	26.4	1.5	100.4	Southeast	Sunny
	14:00	35.0	1.1	100.3	Southeast	Sunny
	20:00	28.3	1.2	100.4	East	Sunny
2013-5-23	2:00	24.2	1.2	101.1	East	Sunny
	8:00	25.2	2.5	100.8	East	Sunny
	14:00	33.4	2.1	100.5	Southeast	Sunny
	20:00	27.5	1.8	100.7	Southeast	Sunny

Attachment 2 Soil Monitoring Data

Table 1 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item		TR14#	TR15#	TR16#	TR17#	TR18#	TR19#	TR20#	TR21#	TR22#	TR23#	Standard value		
pH value		7.53	8.01	7.58	7.74	7.59	7.54	8.29	8.05	7.84	8.30	PH›7.5	6.5—7.5	<6.5
Hg		0.704	0.016	0.074	0.038	0.161	0.100	0.108	0.099	0.085	0.102	≤1.0	≤0.5	≤0.3
As		7.30	8.69	7.86	11.6	21.5	6.46	7.83	9.34	17.9	13.2	≤25	≤35	≤40
Cu		25	21	45	22	34	48	25	27	46	29	≤100	≤100	≤50
Zn		78.7	58.2	88.7	52.2	55.8	100	92.1	76.8	91.8	63.3	≤300	≤250	≤200
Ni		21	39	54	15	4	62	25	20	51	34	≤60	≤50	≤40
Pb		29.7	25.0	41.2	18.7	24.1	40.4	42.6	23.3	37.5	19.8	≤350	≤300	≤250
Cd		0.11	0.08	0.15	0.03	0.09	0.16	0.46	0.08	0.13	0.06	≤0.60	≤0.30	≤0.30
Cr		45	53	53	39	69	83	23	27	82	83	≤250	≤200	≤150
HCH	α-HCH	3×10-4	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	1.5×10-3	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	3×10-4	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	2.0×10-3	0.0001L	1.5×10-3	3×10-4	0.0001L	4.4×10-3	1.2×10-3	6×10-4	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	δ-HCH	5×10-4	0.0001L	0.0001L	1×10-4	0.0001L	0.0001L	0.0001L	4×10-4	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	0.0001L	0.0001L	3×10-4	0.0001L	1.9×10-3	5×10-4	5.9×10-3	2.25×10-2	0.0001L	6×10-4	≤0.5	≤0.5	≤0.5
	o,p'-DDT	2.0×10-3	0.0001L	0.0001L	0.0001L	0.0001L	4.8×10-3	1.4×10-3	2.9×10-3	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	4.7×10-3	0.0001L	0.0001L	5×10-4	8×10-4	4×10-4	2.6×10-3	1.9×10-3	0.0001L	5×10-4	≤0.5	≤0.5	≤0.5
	p,p'-DDT	7.8×10-3	0.0001L	1.7×10-3	1.4×10-3	1.5×10-3	1.46×10-2	8.7×10-3	1.61×10-2	0.0001L	5×10-4	≤0.5	≤0.5	≤0.5

Table 2 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item		TR24#	TR25#	TR26#	TR27#	TR28#	TR29#	TR30#	TR31#	TR32#	TR33#	Standard value		
pH value		7.86	7.94	7.43	8.20	7.88	6.62	7.46	7.88	5.33	7.85	PH›7.5	6.5—7.5	<6.5
Hg		0.056	0.052	0.196	0.047	0.069	0.104	0.086	0.039	0.073	0.096	≤1.0	≤0.5	≤0.3
As		8.60	11.9	9.84	9.05	12.2	8.49	12.3	9.27	7.79	8.03	≤25	≤35	≤40
Cu		29	27	36	24	28	24	27	26	26	28	≤100	≤100	≤50
Zn		74.2	74.9	99.7	56.0	79.5	48.0	72.7	64.3	49.3	75.6	≤300	≤250	≤200
Ni		27	25	32	12	27	30	14	20	20	16	≤60	≤50	≤40
Pb		25.7	34.5	46.3	21.6	25.7	19.9	34.7	21.4	23.1	25.4	≤350	≤300	≤250
Cd		0.12	0.13	0.17	0.06	0.12	0.04	0.06	0.04	0.09	0.10	≤0.60	≤0.30	≤0.30
Cr		22	26	66	46	24	71	40	33	54	46	≤250	≤200	≤150
HCH	α-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	8×10-4	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	0.0001L	0.0001L	1.6×10-3	0.0001L	0.0001L	0.0001L	8×10-4	1.1×10-3	9×10-4	8×10-4	≤0.5	≤0.5	≤0.5
	δ-HCH	0.0001L	0.0001L	5×10-4	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	1.1×10-3	5×10-4	7.83×10-2	4.51×10-2	5×10-4	0.0001L	1.04×10-2	1.7×10-3	3.1×10-3	1.5×10-3	≤0.5	≤0.5	≤0.5
	o,p'-DDT	0.0001L	0.0001L	8.6×10-3	0.0001L	0.0001L	0.0001L	9×10-4	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	3×10-4	0.0001L	4.0×10-3	0.0001L	0.0001L	0.0001L	2.0×10-3	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDT	1.9×10-3	7×10-4	7.23×10-2	4.2×10-3	8×10-4	0.0001L	5.9×10-3	3.9×10-3	1.9×10-3	1.3×10-3	≤0.5	≤0.5	≤0.5

Table 3 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item		TR34#	TR35#	TR36#	TR37#	TR38#	TR39#	TR40#	TR41#	TR42#	TR43#	Standard value		
pH value		7.24	5.45	7.74	7.05	6.57	7.44	6.94	6.67	7.55	7.35	PH›7.5	6.5—7.5	<6.5
Hg		0.024	0.064	0.094	0.058	0.046	0.035	0.020	0.062	0.035	0.077	≤1.0	≤0.5	≤0.3
As		8.67	8.71	8.37	10.1	6.43	9.10	7.51	6.45	8.38	8.55	≤25	≤35	≤40
Cu		25	27	25	26	23	45	25	22	29	25	≤100	≤100	≤50
Zn		48.6	50.4	50.2	56.2	41.4	94.4	42.3	41.5	61.4	52.9	≤300	≤250	≤200
Ni		25	17	16	26	20	20	17	20	40	26	≤60	≤50	≤40
Pb		20.2	24.6	18.6	25.0	23.7	35.8	20.5	19.5	28.1	23.9	≤350	≤300	≤250
Cd		0.05	0.09	0.03	0.07	0.08	0.10	0.06	0.06	0.46	0.08	≤0.60	≤0.30	≤0.30
Cr		60	58	45	60	50	45	60	50	69	68	≤250	≤200	≤150
HCH	α-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	0.0001L	0.0001L	1.8×10-3	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	δ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	3.4×10-3	2.7×10-3	1.1×10-3	1.4×10-3	1.8×10-3	1.8×10-3	1.8×10-3	9×10-4	6.1×10-3	1.59×10-2	≤0.5	≤0.5	≤0.5
	o,p'-DDT	0.0001L	0.0001L	1.6×10-3	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	0.0001L	0.0001L	2×10-4	0.0001L	0.0001L	0.0001L	4×10-4	0.0001L	0.0001L	2.1×10-3	≤0.5	≤0.5	≤0.5
	p,p'-DDT	1.2×10-3	1.8×10-3	5.4×10-3	7×10-4	1.7×10-3	1.1×10-3	1.0×10-3	5×10-4	3.2×10-3	7.9×10-3	≤0.5	≤0.5	≤0.5

Table 4 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item		TR44#	TR45#	TR46#	TR47#	TR48#	TR49#	TR50#	TR51#	Standard value		
pH value		7.25	7.27	6.96	7.55	7.56	7.32	7.87	7.75	PH›7.5	6.5—7.5	<6.5
Hg		0.063	0.095	0.103	0.023	0.043	0.105	0.080	0.024	≤1.0	≤0.5	≤0.3
As		9.43	8.98	10.3	9.17	7.99	8.62	8.08	8.40	≤25	≤35	≤40
Cu		26	26	27	31	28	32	34	30	≤100	≤100	≤50
Zn		52.7	48.5	62.0	54.7	48.2	84.6	53.7	50.3	≤300	≤250	≤200
Ni		28	8	33	28	23	29	25	30	≤60	≤50	≤40
Pb		40.4	23.2	39.9	21.8	18.2	29.4	20.9	20.4	≤350	≤300	≤250
Cd		0.08	0.07	0.06	0.05	0.07	0.10	0.08	0.05	≤0.60	≤0.30	≤0.30
Cr		62	36	65	77	80	55	73	79	≤250	≤200	≤150
HCH	α-HCH	0.0001L	0.0001L	1.0×10-3	0.0001L	0.0001L	2.4×10-3	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	0.0001L	5×10-4	3.9×10-3	0.0001L	0.0001L	1.8×10-3	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	δ-HCH	0.0001L	0.0001L	5×10-4	0.0001L	0.0001L	1.8×10-3	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	1.23×10-2	5.4×10-3	0.0001L	0.0001L	0.0001L	0.0001L	2.3×10-3	2.5×10-3	≤0.5	≤0.5	≤0.5
	o,p'-DDT	1.6×10-3	0.0001L	1.8×10-3	0.0001L	0.0001L	7×10-4	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	2.0×10-3	0.0001L	2.1×10-3	0.0001L	0.0001L	2.9×10-3	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDT	1.08×10-2	1.7×10-3	1.08×10-2	0.0001L	0.0001L	4.2×10-3	0.0001L	1.4×10-3	≤0.5	≤0.5	≤0.5

Table 5 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item	TR52#	TR53#	TR54#	TR55#	TR56#	TR57#	TR58#	TR59#	TR60#	TR61#	Standard value		
pH value	7.29	7.67	7.70	7.61	7.51	7.48	7.61	7.52	7.66	7.45	PH›7.5	6.5—7.5	<6.5
Hg	0.062	0.034	0.059	0.031	0.073	0.067	0.130	0.070	0.105	0.044	≤1.0	≤0.5	≤0.3
As	7.11	8.76	8.53	7.86	9.62	9.55	8.23	9.22	9.86	5.72	≤25	≤35	≤40
Cu	24	30	31	24	29	31	36	29	30	17	≤100	≤100	≤50
Zn	58.5	49.1	54.6	56.1	51.2	53.8	145	65.0	51.7	47.5	≤300	≤250	≤200
Ni	29	26	28	30	26	25	45	33	32	21	≤60	≤50	≤40
Pb	23.8	20.8	21.6	20.4	23.6	21.0	33.2	24.2	25.5	19.3	≤350	≤300	≤250

Cd		0.08	0.14	0.06	0.03	0.07	0.10	0.39	0.08	0.09	0.03	≤0.60	≤0.30	≤0.30
Cr		47	71	76	74	80	79	62	42	77	43	≤250	≤200	≤150
HCH	α-HCH	3×10-4	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	6×10-4	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	1×10-4	0.0001L	0.0001L	1.1×10-3	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	1.3×10-3	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	9×10-4	1.7×10-3	0.0001L	1.6×10-3	≤0.5	≤0.5	≤0.5
	δ-HCH	3×10-4	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	1.0×10-3	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	0.0001L	8×10-4	2.5×10-3	0.0001L	1.4×10-3	0.0001L	0.0001L	0.0001L	8×10-4	0.0001L	≤0.5	≤0.5	≤0.5
	o,p'-DDT	6.3×10-3	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	7×10-4	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	1.7×10-3	0.0001L	0.0001L	2×10-4	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	4×10-4	≤0.5	≤0.5	≤0.5
	p,p'-DDT	1.35×10-2	0.0001L	1.5×10-3	6×10-4	2.6×10-3	0.0001L	1.5×10-3	0.0001L	0.0001L	1.0×10-3	≤0.5	≤0.5	≤0.5

Table 6 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item	TR62#	TR63#	TR64#	TR65#	TR66#	TR67#	TR68#	TR69#	TR70#	TR71#	Standard value		
pH value	7.44	7.68	7.38	7.47	7.71	7.53	7.44	7.72	7.72	7.94	PH›7.5	6.5—7.5	<6.5
Hg	0.653	0.113	0.103	0.183	0.090	0.199	0.089	0.056	0.088	0.635	≤1.0	≤0.5	≤0.3
As	6.03	10.4	6.73	8.72	9.95	10.8	8.51	9.76	8.18	9.41	≤25	≤35	≤40
Cu	40	29	24	28	34	26	36	31	32	90	≤100	≤100	≤50
Zn	70.4	53.1	63.9	68.0	52.9	57.2	67.9	53.2	124	98.3	≤300	≤250	≤200
Ni	34	28	23	34	35	17	27	34	30	31	≤60	≤50	≤40

Pb		30.6	25.6	25.3	25.2	25.2	19.9	34.8	25.2	36.8	64.2	≤350	≤300	≤250
Cd		0.14	0.09	0.08	0.06	0.07	0.08	0.08	0.10	0.20	0.11	≤0.60	≤0.30	≤0.30
Cr		65	77	49	72	78	70	58	78	64	50	≤250	≤200	≤150
HCH	α-HCH	1.2×10-3	0.0001L	1.1×10-3	4×10-4	0.0001L	1.4×10-3	1.4×10-3	0.0001L	2.1×10-3	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	6.3×10-3	0.0001L	7.4×10-3	0.0001L	0.0001L	3.5×10-3	0.0001L	0.0001L	4.4×10-3	0.0001L	≤0.5	≤0.5	≤0.5
	δ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	5×10-4	0.0001L	0.0001L	1.1×10-3	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	0.0001L	1.6×10-3	0.0001L	0.0001L	1.4×10-3	0.0001L	0.0001L	9×10-4	0.0001L	6.7×10-3	≤0.5	≤0.5	≤0.5
	o,p'-DDT	0.0001L	0.0001L	1.66×10-2	0.0001L	0.0001L	7.5×10-3	0.0001L	0.0001L	1.3×10-3	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	0.0001L	0.0001L	4.4×10-3	0.0001L	0.0001L	2.4×10-3	0.0001L	0.0001L	1.9×10-3	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDT	0.0001L	0.0001L	5.13×10-2	0.0001L	8×10-4	1.74×10-2	0.0001L	0.0001L	6.4×10-3	5.7×10-3	≤0.5	≤0.5	≤0.5

Table 7 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item	TR72#	TR73#	TR74#	TR75#	TR76#	TR77#	TR78#	TR79#	TR80#	TR81#	Standard value		
pH value	7.67	7.89	7.48	8.09	7.28	7.67	7.95	7.76	7.59	7.40	PH›7.5	6.5—7.5	<6.5
Hg	0.148	0.040	0.417	0.176	0.497	0.050	0.080	0.238	0.529	0.367	≤1.0	≤0.5	≤0.3
As	8.75	10.6	10.7	9.95	8.84	9.55	9.11	10.1	7.83	12.1	≤25	≤35	≤40
Cu	35	23	54	61	50	33	32	35	56	79	≤100	≤100	≤50
Zn	75.8	66.8	235	78.0	103	71.0	58.3	85.4	182	387	≤300	≤250	≤200
Ni	7	33	13	22	33	21	29	14	26	26	≤60	≤50	≤40
Pb	25.8	23.4	55.9	68.3	37.7	12.9	20.1	29.4	40.0	174	≤350	≤300	≤250

Cd		0.11	0.04	0.35	0.12	0.14	0.05	0.04	0.13	0.19	0.42	≤0.60	≤0.30	≤0.30
Cr		44	73	61	56	75	47	67	69	72	77	≤250	≤200	≤150
HCH	α-HCH	8×10-4	0.0001L	0.0001L	3.1×10-3	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	1.6×10-3	1.0×10-3	2.7×10-3	6.0×10-3	2.4×10-3	7×10-4	0.0001L	2.2×10-3	0.0001L	4.1×10-3	≤0.5	≤0.5	≤0.5
	δ-HCH	7×10-4	0.0001L	0.0001L	8×10-4	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	2.03×10-2	0.000L	1.85×10-2	7.59×10-2	6.39×10-2	3.2×10-3	8×10-4	2.64×10-2	2.0×10-3	2.23×10-2	≤0.5	≤0.5	≤0.5
	o,p'-DDT	1.9×10-3	4×10-4	1.7×10-3	8.8×10-3	9.5×10-3	0.0001L	0.0001L	2.4×10-3	0.0001L	1.9×10-3	≤0.5	≤0.5	≤0.5
	p,p'-DDD	1.6×10-3	1.0×10-3	2.8×10-3	2.6×10-3	4.1×10-3	0.0001L	0.0001L	1.3×10-3	0.0001L	6.8×10-3	≤0.5	≤0.5	≤0.5
	p,p'-DDT	1.31×10-2	3.9×10-3	1.10×10-2	4.20×10-2	4.36×10-2	1.9×10-3	0.0001L	1.26×10-2	2.0×10-3	1.46×10-2	≤0.5	≤0.5	≤0.5

Table 8 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item	TR82#	TR83#	TR84#	TR85#	TR86#	GF1#	GF2#	GF3#	GF4#	GF5#	Standard value		
pH value	7.96	8.05	8.52	7.80	8.13	8.39	7.35	6.86	7.18	7.67	PH›7.5	6.5—7.5	<6.5
Hg	0.429	0.572	0.302	0.279	0.369	0.114	0.267	0.243	0.440	0.034	≤1.0	≤0.5	≤0.3
As	8.35	6.92	8.51	8.00	7.30	11.1	11.5	10.9	11.7	6.57	≤25	≤35	≤40
Cu	52	53	53	39	54	24	24	32	25	17	≤100	≤100	≤50
Zn	105	115	126	75.3	164	82.8	61.2	67.0	62.9	41.3	≤300	≤250	≤200
Ni	36	23	26	21	21	24	20	31	18	16	≤60	≤50	≤40

Pb		35.0	35.0	40.0	41.5	46.9	64.4	28.1	27.8	28.0	18.6	≤350	≤300	≤250
Cd		0.20	0.17	0.16	0.17	0.23	0.67	0.11	0.12	0.12	0.03	≤0.60	≤0.30	≤0.30
Cr		85	83	75	70	95	48	69	64	62	43	≤250	≤200	≤150
HCH	α-HCH	3.2×10-3	7×10-4	0.0001L	2.1×10-3	2.2×10-3	0.0001L	0.0001L	1.8×10-3	6×10-4	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	2.54×10-2	6.2×10-3	0.0001L	1.24×10-2	5.7×10-3	8×10-4	2.4×10-3	1.40×10-2	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	δ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	1.2×10-3	1.6×10-3	1.5×10-3	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	5.91×10-2	1.18×10-2	3.0×10-3	1.63×10-2	3.02×10-2	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	o,p'-DDT	2.14×10-2	5.0×10-3	0.0001L	1.24×10-2	3.2×10-3	0.0001L	0.0001L	1.07×10-2	7×10-4	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	1.08×10-2	2.6×10-3	0.0001L	4.2×10-3	4.8×10-3	5×10-4	1.4×10-3	2.2×10-3	1.5×10-3	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDT	0.103	1.72×10-2	0.0001L	3.40×10-2	2.51×10-2	5.1×10-3	1.5×10-3	3.33×10-2	1.7×10-3	0.0001L	≤0.5	≤0.5	≤0.5

Table 9 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item	GF6#	GF7#	GF8#	GF9#	GF10#	GF11#	GF12#	GF13#	GF14#	GF15#	Standard value		
pH value	7.79	7.77	7.69	8.23	8.07	8.12	5.79	5.24	7.34	7.58	PH›7.5	6.5—7.5	<6.5
Hg	0.038	0.035	0.115	0.050	0.026	0.088	0.293	0.247	0.146	0.434	≤1.0	≤0.5	≤0.3
As	7.55	6.10	8.42	8.13	8.08	7.67	13.6	5.68	10.6	8.28	≤25	≤35	≤40
Cu	44	18	26	25	23	28	28	30	39	36	≤100	≤100	≤50
Zn	49.6	44.6	71.3	65.2	61.5	79.5	36.0	61.2	73.0	45.9	≤300	≤250	≤200
Ni	12	17	19	21	21	19	11	33	33	6	≤60	≤50	≤40
Pb	21.5	19.4	26.4	20.1	17.3	23.7	36.8	33.0	27.7	18.9	≤350	≤300	≤250

Cd		0.04	0.03	0.14	0.04	0.03	0.06	0.04	0.10	0.08	0.06	≤0.60	≤0.30	≤0.30
Cr		45	51	35	49	46	26	29	25	63	25	≤250	≤200	≤150
HCH	α-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	1.9×10-3	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	0.0001L	0.0001L	0.0001L	5.7×10-3	0.0001L	7×10-4	2.6×10-3	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	δ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	5×10-4	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	1.6×10-3	0.0001L	0.0001L	2.35×10-2	6×10-4	2.49×10-2	1.1×10-3	0.0001L	3.35×10-2	3×10-4	≤0.5	≤0.5	≤0.5
	o,p'-DDT	0.001L	0.0001L	0.0001L	6.8×10-3	0.0001L	2.7×10-3	0.0001L	0.0001L	2.3×10-3	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	0.0001L	0.0001L	5×10-4	6.9×10-3	0.0001L	2.6×10-3	2.7×10-3	0.0001L	1.3×10-3	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDT	5×10-4	0.0001L	1.3×10-3	2.36×10-2	6×10-4	6.79×10-2	0.0001L	0.0001L	1.44×10-2	0.0001L	≤0.5	≤0.5	≤0.5

Table 10 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item	GF16#	GF17#	GF18#	GF19#	GF20#	GF21#	GF22#	GF23#	GF24#	GF25#	Standard value		
pH value	7.74	7.79	7.05	7.12	7.74	7.87	7.71	7.94	8.09	7.77	PH›7.5	6.5—7.5	<6.5
Hg	0.038	0.015	0.099	0.666	0.105	0.047	0.018	0.040	0.024	0.099	≤1.0	≤0.5	≤0.3
As	11.6	5.52	8.28	7.92	9.12	7.24	9.79	7.02	10.9	8.88	≤25	≤35	≤40
Cu	22	23	22	35	38	33	29	34	34	34	≤100	≤100	≤50
Zn	52.2	39.9	62.5	63.1	79.0	60.4	50.5	58.3	66.5	53.0	≤300	≤250	≤200
Ni	15	18	22	30	17	16	19	21	21	34	≤60	≤50	≤40
Pb	18.7	16.5	24.3	34.2	26.5	21.3	28.8	20.9	28.1	26.0	≤350	≤300	≤250

Cd		0.03	0.03	0.09	0.07	0.12	0.07	0.06	0.02	0.04	0.03	≤0.60	≤0.30	≤0.30
Cr		39	55	60	67	71	53	67	34	55	80	≤250	≤200	≤150
HCH	α-HCH	0.0001L	0.0001L	0.0001L	1.0×10-3	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	3×10-4	0.0001L	0.0001L	1.3×10-3	9×10-4	5.6×10-3	4×10-4	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	δ-HCH	1×10-4	0.0001L	5×10-4	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	0.0001L	5.0×10-3	0.0001L	0.0001L	5.1×10-3	9.0×10-3	6×10-4	7×10-4	1.5×10-3	0.0001L	≤0.5	≤0.5	≤0.5
	o,p'-DDT	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	6.4×10-3	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	5×10-4	0.0001L	2.2×10-3	0.0001L	1.0×10-3	2.8×10-3	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDT	1.4×10-3	6×10-4	5.8×10-3	0.0001L	3.6×10-3	2.14×10-2	7×10-4	1.1×10-3	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5

Table 11 Soil Monitoring Result **Unit: mg/lg (except pH)**

Monitoring item	GF26#	External reference point 1#	External reference point 2#	External reference point 3#	External reference point 4#	Standard value		
pH value	7.54	6.67	6.25	5.52	5.46	PH›7.5	6.5—7.5	<6.5
Hg	0.392	0.636	0.144	0.138	0.180	≤1.0	≤0.5	≤0.3
As	7.36	6.64	6.30	6.02	6.21	≤25	≤35	≤40
Cu	54	26	25	23	24	≤100	≤100	≤50
Zn	168	37.8	37.9	36.2	36.1	≤300	≤250	≤200
Ni	30	17	14	13	13	≤60	≤50	≤40
Pb	36.7	21.4	21.0	19.5	20.3	≤350	≤300	≤250

Cd		0.19	0.05	0.05	0.05	0.54	≤0.60	≤0.30	≤0.30
Cr		71	60	66	59	63	≤250	≤200	≤150
HCH	α-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	γ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	β-HCH	3.5×10-3	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	δ-HCH	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
DDT	p,p'-DDE	1.6×10-3	6.6×10-3	5.8×10-3	4.7×10-3	4.9×10-3	≤0.5	≤0.5	≤0.5
	o,p'-DDT	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDD	0.0001L	0.0001L	0.0001L	0.0001L	0.0001L	≤0.5	≤0.5	≤0.5
	p,p'-DDT	3.2×10-3	1.8×10-3	2.2×10-3	2.3×10-3	2.3×10-3	≤0.5	≤0.5	≤0.5

Attachment 3 Groundwater Pollution Predictions after Landfill Closure

1. Risk accident scenario design

As the pollution factors caused by landfill to groundwater is complicated, when designing risk accident, the region with greater risk and may have impact on the surrounding environment should be a key consideration.

According to Solid Waste Sanitary Landfill Geotechnical Engineering and Technical Specifications （CJJ 176-2012）, the formula of average daily amount of landfill leachate is showed below.

As the landfill needs a complete coverage, the catchment area should the one after complete coverage, which is 110000 square meters, according to this formula and the local rainfall, the daily amount of landfill leachate is

$Q=1200\times110000\times0.15/（365\times1000）=54.25m^3/d$

For analyzing impact of migration of different pollutants on groundwater environment at different leakage points inside evaluation area, we used the calibrated flow model and make prediction about how different pollutants enter groundwater when the following accident scene happens. Because the landfill can be divided into the east and west parts and these two parts are almost the same. So we just need to choose one part in simulation, and the scenarios we used in prediction are as follows.

Scenario one: no closure, leachate of east side of landfill leaks;

Scenario two: closure, leachate of east landfill leachate leaks;

This simulation takes different pollutants as prediction factors according to different leakage scenario. The simulated prediction time is 20 years. From the simulation, we get temporal changing process of pollutants concentration so to determine scope and extent of impact on the groundwater environment. In the process of prediction, impact of migration of pollutants to the downstream under the action of groundwater is the key point to be considerate. It means the scope and extent of contamination and is showed by its spatial and temporal distribution.

2. Mathematical model of groundwater flow

（1）Hydrogeological conceptual model

According to hydrogeological conditions in the whole evaluation area, the range of the simulation area is showed as 7.7-9. The simulation area is bordered on the south by surface watershed and other boundaries are outward expansion of about 2km from the landfill, covering an area of about 5km2. The groundwater system includes quaternary unconfined aquifer and karst aquifer composed by limestone and sandstone. From the distribution of contour lines, we know that the depth of unconfined aquifer is between 0.5 to 12 meters.

By conducting Quaternary field surveys and combining with contour lines of simulation area(Figure 7.7-10), we draw Quaternary pore aquifer initial flow field contour map (Figure 7.7-11), from the contour map we can see that the overall groundwater flow direction is from southwest to northeast.

As the natural hydraulic gradient is small in simulation area, groundwater flow field is gentle and seepage conforms to Darcy’s law. All factors of flow change with time, makes the flow unsteady flow. So, we simplify the flow into non-homogeneous anisotropic unstable quasi-three-dimensional groundwater flow system.

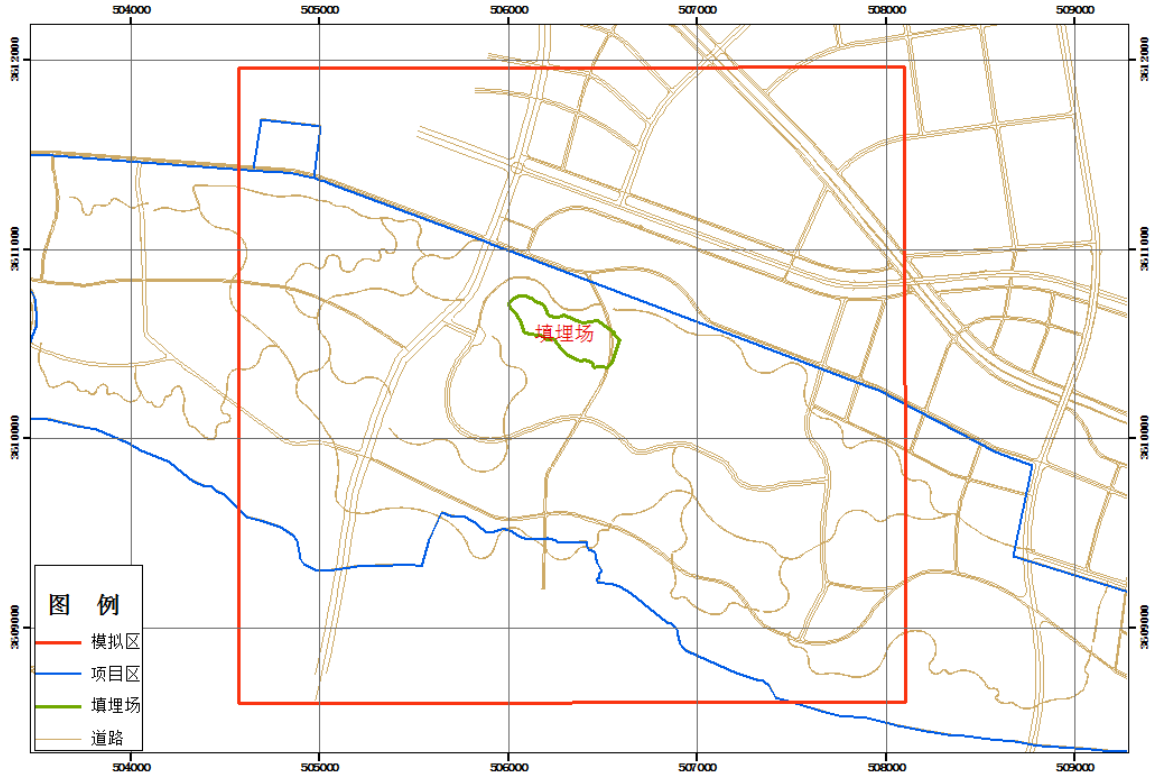


Figure7.7- 9 Range of Simulation Area

图例	Legend
模拟区	Simulation area
项目区	Project area
填埋场	Landfill
道路	Road

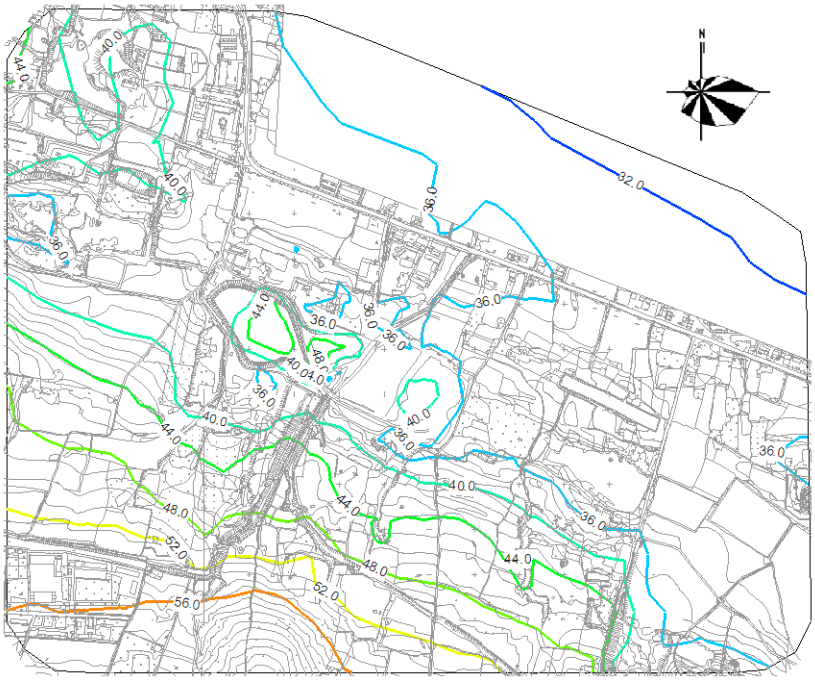


Figure7.7- 10 Surface Elevation Contours

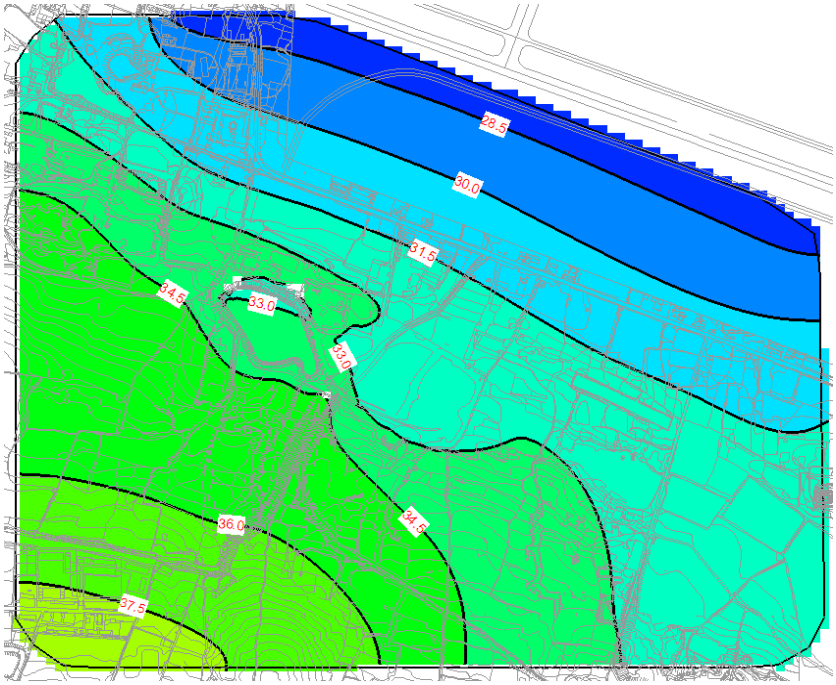


Figure7.7- 11 Groundwater Initial Flow Field Map

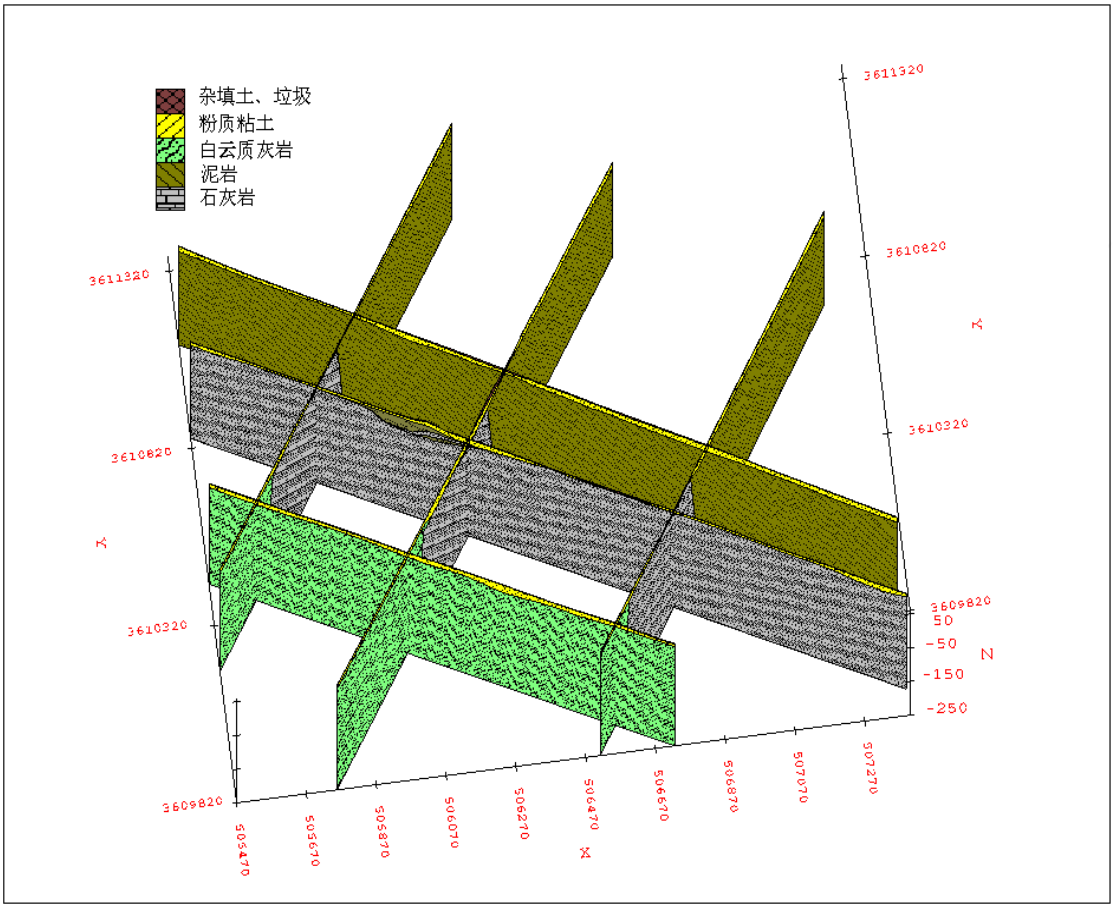


Figure7.7- 12 Stratigraphic Structure of Simulation Area

杂填土、垃圾	**Miscellaneous fill, garbage**

粉质粘土	**Silty clay**
白云质灰岩	**Dolomitic limestone**
泥岩	**Mudstone**
石灰岩	**Limestone**

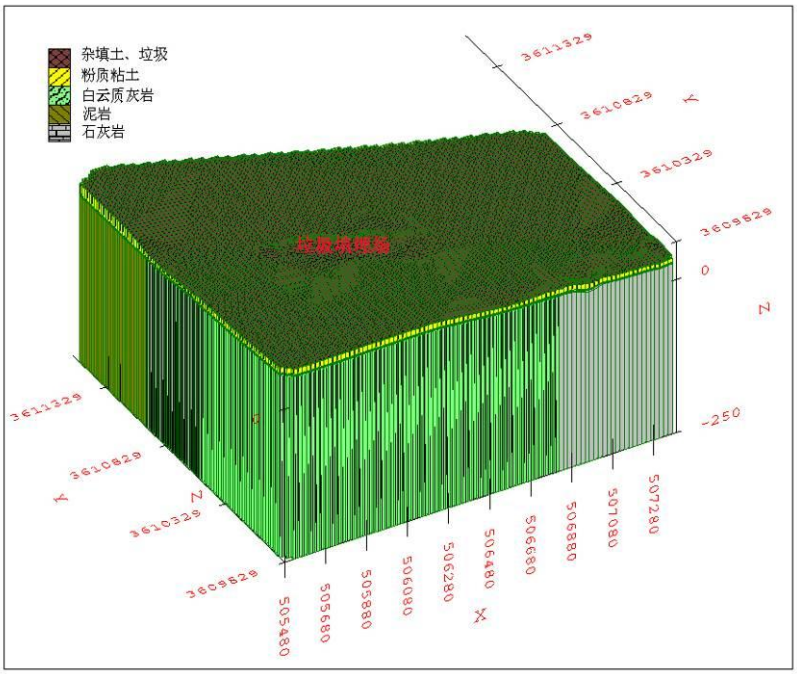


Figure7.7- 13 Meshing schematic of simulation area

杂填土、垃圾	Miscellaneous fill, garbage
粉质粘土	Silty clay
白云质灰岩	Dolomitic limestone
泥岩	Mudstone
石灰岩	Limestone

（2）Mathematical model

Integrating hydrogeological conditions including lithology, groundwater type, groundwater runoff characteristics and hydrogeological conditions with water balance analysis and basing on the current material, we simplify the flow system into non-homogeneous anisotropic unstable quasi-three-dimensional groundwater flow system which is expressed by the following mathematical model:

$$\begin{cases} \dfrac{\partial}{\partial x}(k_{xx}\dfrac{\partial H}{\partial x})+\dfrac{\partial}{\partial y}(k_{yy}\dfrac{\partial H}{\partial y})+\dfrac{\partial}{\partial z}(k_{zz}\dfrac{\partial H}{\partial z})+w=\mu_s\dfrac{\partial H}{\partial t} & (x,y,z)\in\Omega,t>0 \\ H(x,y,z,t)\big|_{t=0}=H_0(x,y,z) & (x,y,z)\in\Omega \\ H(x,y,z,t)\big|_{S_1}=H_1(x,y,z) & (x,y,z)\in S_1,t>0 \\ k_n\dfrac{\partial H}{\partial n}\Big|_{S_2}=q(x,y,z,t) & (x,y,z)\in S_2,t>0 \end{cases}$$

where：

Ω：Groundwater seepage area;

H：Groundwater head（m）;

S1：First kind boundary;

S2：Second kind boundary;

kxx,kyy,kzz：are Permeability coefficient at x,y,z direction respectively（m/d）;

W：Sources and sinks，including rainfall recharge, river recharge, pumping of wells, etc.（m3/d）;

μs：Water storage rate（/m）;

H0(x,y,z)：Initial groundwater level（m）;

H1(x,y,z)：groundwater head function with known first kind boundary（m）;

q(x,y,z)：flow function of unit area with known second kind boundary（m3/d）;

n：Outer normal direction on boundary S.

（3）Identification of aquifer system

①Spatial dispersion

In the process of building model, we generalized the whole region into a unified aquifer composed by Carboniferous and Permian as well as quaternary unconfined aquifer in the vertical direction. Besides, we committed refinement locally. The stratum structure of simulation area is showed in Figure 7.7-12 and the model meshing is showed in Figure 7.7-13.

②Dispose of source and sink terms

The main supply source for phreatic water in the evaluation area is atmospheric precipitation, at the same time, upper stagnant water in garbage is also another source. And it mainly drains to the nearby pond and ditch and the low-lying ground, at the same time, it drains to the lower layer through vertical penetration.

③Boundary condition

Part of the border at the south side of the model is the watershed. Part of it is generalized into constant head boundary. And part of the border at the north side is generalized into constant head boundary too. Other border is generalized into traffic boundary.

The top border of the model is defined as precipitation recharge and evaporation boundary. The mean annual precipitation at evaluation area is about 942.8mm (Rainfall infiltration coefficient α = 0.2).

④Aquifer parameters

In order to portray the hydrogeological conditions of the evaluation area accurately, this model based on hydrogeological map and results of previous studies, commits parameters partition for the evaluation area. By committing fitting analysis between the calculated level and the actual level and regulating the parameters repeatedly, we get the aquifer parameters at last.

（4）Model identification

①Fitting groundwater level

The mathematical model which is based on hydrogeological conditions must reflect the characteristics of the actual flow field. So, before prediction, we should correct the mathematical model (identification), it means correcting its parameters and boundary condition to make it reflect the actual hydrogeological conditions of the calculated area. The groundwater level fitting process line is showed in Figure 7.7-14. The source and sink term includes precipitation and evaporation. After saluting the model, we get the spatial and temporal distribution of water table under the given hydrogeological parameters and equilibrium conditions. Because the parameters partition and the initial parameters fit the actual hydrogeological conditions well, combining with meticulous fitting, the model identification achieve a rather nice result.

Figure7.7-14 Groundwater Level Fitting Process Line

②Hydrogeological parameters

Spacial change of hydrogeological parameters in the simulation area has a rather big impact on groundwater flow field, so we make it the important parameter in fitting. According to the injection test data and hydrogeological conditions, we get the parameter value through model identification. It is showed in Table7.7-13.

Parameter Values of the Simulation Area Table7.7-13

Layers of model	Permeability coefficient (m/d)	Porosity	Dispersivity (m)	Stratum	Remarks
The first layer	0.99	0.35	20	Miscellaneous fill, garbage	Qml
The second layer	0.02	0.70	20	Silty clay	Qal
The third	0.86	0.35	20	Dolomitic	O

layer				limestone	
	0.86	0.35	20	Limestone	C
	2.59	0.30	20	Sandstone	P

3. Simulation of groundwater solute transport

（1）Mathematical model of solute transport

①Control equations

The groundwater solute transport model we build here is a three-dimensional diffusion problem under the influence of three-dimensional flow. The main flow direction is coinciding with the axis. The solution density is constant. Besides, there is local equilibrium adsorption and irreversible dynamic response. The rate of dissolution phase is equal to adsorbed phase, that is, λ1 = λ2. Under this premise, the mathematical model of solute transport three-dimensional hydrodynamic dispersion equation is as follows.

$$\frac{\partial(\theta C)}{\partial t}=\frac{\partial}{\partial x_i}\left(\theta D_{ij}\frac{\partial C}{\partial x_j}\right)-\frac{\partial}{\partial x_i}\left(\theta v_i C\right)+q_s C_S+\sum R_n$$

Where：

C：The concentration of dissolved phase of ingredients in groundwater，ML-3；

θ：Porosity of stratum medium, dimensionless;

t：Time，T；

xi：Distance along the axial of Cartesian coordinates，L；

Dij：Hydrodynamic dispersion coefficient tensor，L2T-1；

Vi：The average actual pore water velocity，LT-1；

qs：Flow of aquifer with unit volume，representatives of the sources and sinks，L3T-1；

Cs：The concentration of ingredients of source or sink，ML-3；

∑Rn：Chemical reactions item，ML-3 T-1；

②Initial conditions

The way we used to simulate the source of pollution is to set concentration boundary, we set the initial concentration at the concentration boundary as C0, and set the concentration at other place as 0mg/L, it is concretely expressed as:

$$\begin{cases}C\left(x_i,y_j,z_k,0\right)=C_0\\C\left(x,y,z,0\right)=0\end{cases}$$

（3）Boundary condition

We set the boundary of all aquifers as second kind boundary condition, and the diffusion flux crossing the boundary is zero, it is concretely expressed as:

$$-D_{ij}\frac{\partial C}{\partial x_j}=0 \qquad \left(\Gamma_2,\ t>0\right)$$

where：Γ2 is the Neumann boundary。

（2） Solute transport parameters

As the existence of hydrodynamic dispersion scale effect, it is hard to get the actual dispersivity through dispersion test indoors or outdoors. So, according to previous research results, as showed in Figure 7.7-15, for the scope of this evaluation area, we chose the dispersivity as 20, which is out of the conservative principles.

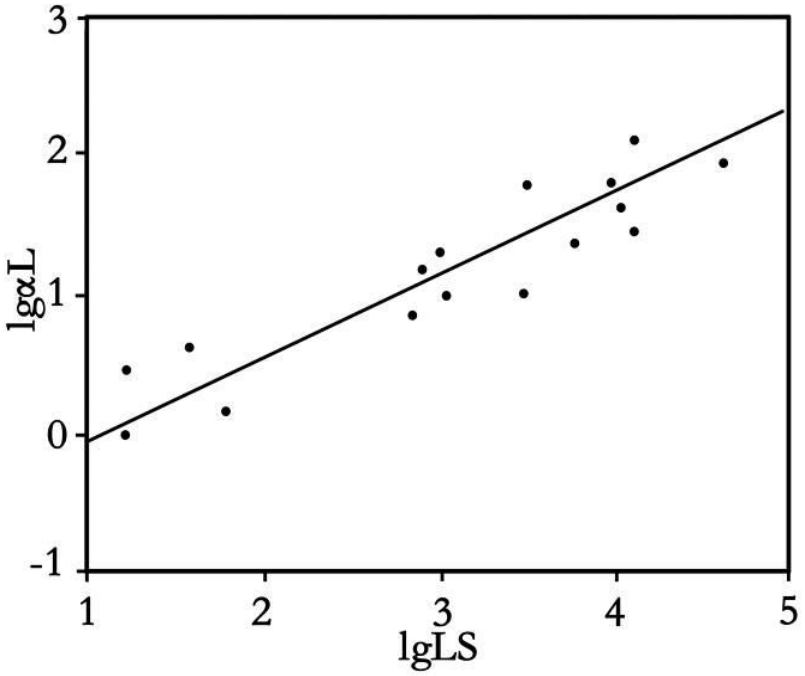


Figure7.7- 15 lgαL-lgLs Figure of Porous Media Numerical Model

（3）Generalization of model condition

We generalized the source of pollution as surface source and set its boundary as concentration boundary, and the position of the source is setting at its actual position.

In order to analyze the impact of migration of different pollutants caused by groundwater on groundwater environment at different leakage points, we used the corrected flow model and made prediction about various pollutants' entering groundwater.

The selection of initial concentration is based on monitoring results.

4. Analysis and prediction of the various pollution scenarios

The organics and inorganics in landfill leachate are not only suffering from physical effect of convection and diffusion, but also controlled by chemistry and microbial action. The migration law of COD and ammonia, etc. in groundwater is very complicated. Except for the convection and diffusion action, there are a variety of chemical action and microbial degradation action.

This simulation is based on Environmental Impact Assessment Guidelines - Groundwater Environment （HJ 610-2011） and the concrete characteristic of this landfill. The chloride, COD, ammonia is chosen as simulation factors. We set the scenarios as a leakage of leachate at the east side of the old refuse landfill and committed analysis. After the landfill is closed, the concentration of the leaky leachate keeps decreasing. Considering the most dangerous scenario, we adopt the maximum concentration in the result of status survey as the initial concentration for all prediction factors. They are showed in Table 7.7-14.

Source Strength of Prediction Factors

Table7.7-14

No.	Leakage point	Prediction points	Initial concentration（mg/L）	Class Ⅲ standard of groundwater（mg/L）
Scenario one	No closure, east side of the landfill	Cl-	1911	250
		COD	580	3
		NH4+	223	0.2
Scenario two	Closed, east side of the landfill	Cl-	1911	250
		COD	580	3
		NH4+	223	0.2

Scene 1：The leachate leakage of the eastern landfill without closing the field

The leakage point

Assuming not closing the field in this situation, the leachate of the eastern landfill occurs to leak. Because of non-point source pollution, the Chloride, COD and Ammonia Nitrogen migrate along with the groundwater.

Leakage source strength

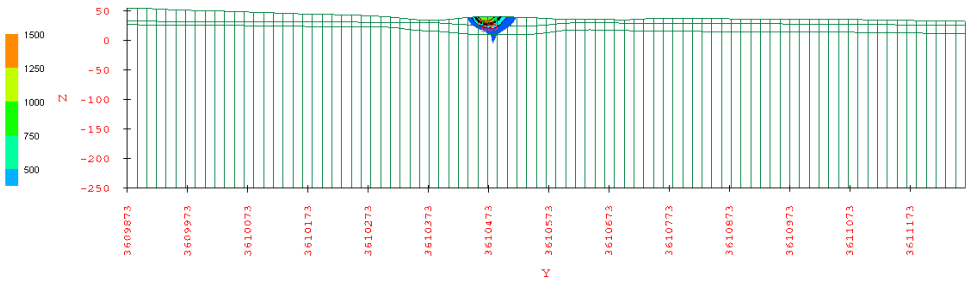
According to the garbage leachate water quality condition, from the security perspective, the concentration of the initial pollution factor all chooses the maximum of water quality monitoring. The concentration flux of Chloride, COD and Ammonia Nitrogen on the upper boundary is, respectively, 1911mg/L, 580mg/L and 223mg/L.

As the enable time of the landfill is more than 20 years, in addition to setting up covering material on the surface of the part of the landfill, most of the landfills do not have any environmental control measures. After the garbage leachate mixes up with the rain, it discharges into open drains and the surrounding area freely. From the perspective of environmental safety, we set the time which the garbage leachate begins to leak to 20 years.

Prediction results and analysis

In the water quality model, the aquifer parameters, the Initial conditions and the boundary conditions are taken into consideration. Using GMS software and operation flow and water quality model, then get the prediction results of chloride, COD and ammonia nitrogen migration, after the leakage of the garbage leachate for 1 year, 10 years, 20 years. The migration ranges of pollutants in the horizontal and vertical direction are shown in Figure 7.7-16 ~ Figure 7.7-24. The migration distance and the concentration of pollutants changes with time during the simulation period, and the changes are shown in table 7.7-15.

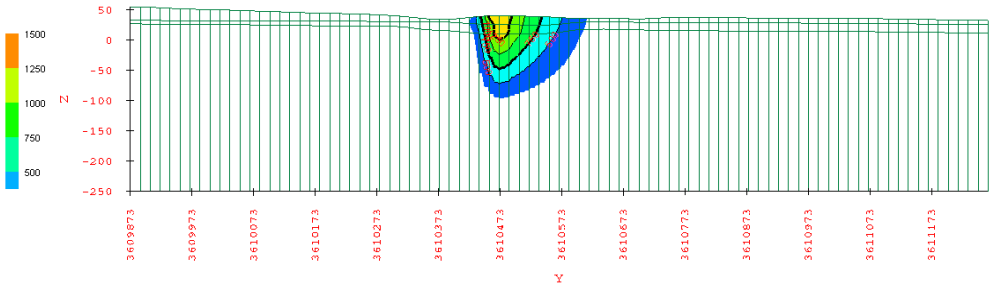
a Level Diffusion Range



b Longitudinal diffusion range

Figure 7.7- 16 Chloride Concentration Distribution for 1 Year after the Leakage (Unit: m)

a Level diffusion range

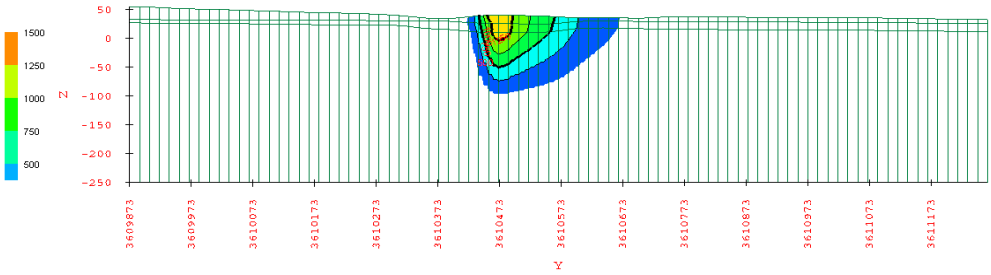


b Longitudinal diffusion range

Figure 7.7- 17 Chloride Concentration Distribution for 10 Years after the Leakage

(Unit: m)

a Level diffusion range

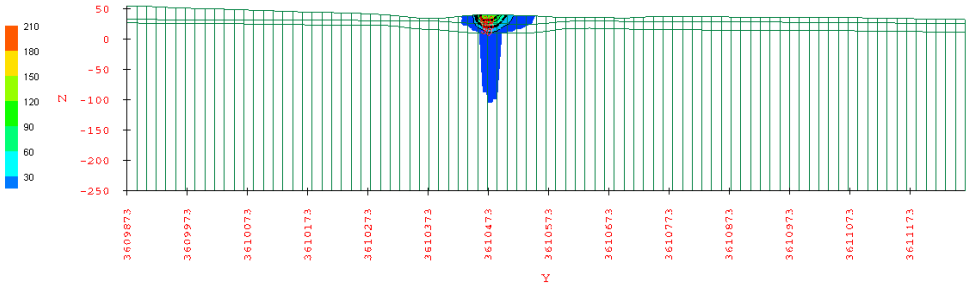


b Longitudinal diffusion range

Figure 7.7- 18 Chloride Concentration Distribution for 20 Years after the Leakage

(Unit: m)

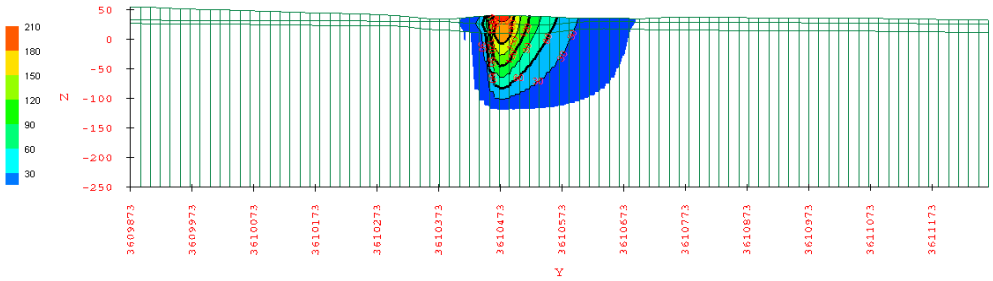
a Level diffusion range



b Longitudinal diffusion range

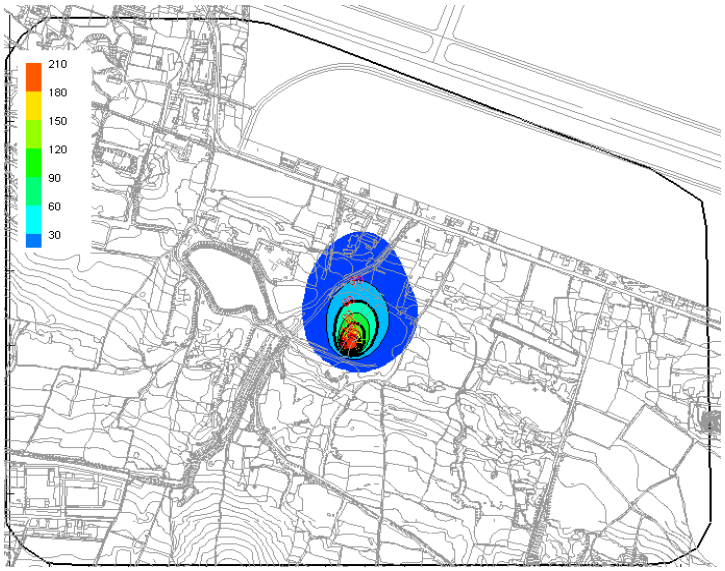
Figure 7.7- 19 COD Concentration Distribution for 1 Year after the Leakage (Unit: m)

a Level diffusion range

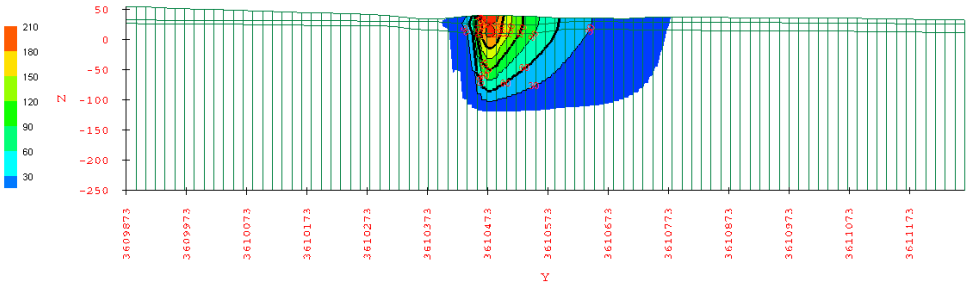


b Longitudinal diffusion range

Figure 7.7- 20 COD Concentration Distribution for 10 Years after the Leakage (Unit: m)



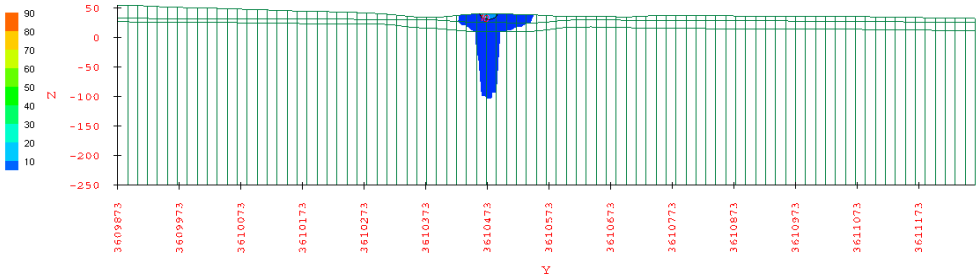
a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 21 COD Concentration Distribution for 20 Years after the Leakage (Unit: m)

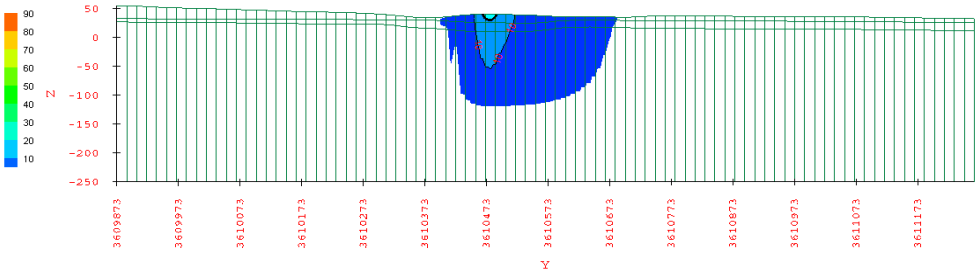
a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 22 Ammonia Nitrogen Concentration Distribution for 1 Year after the Leakage (Unit: m)

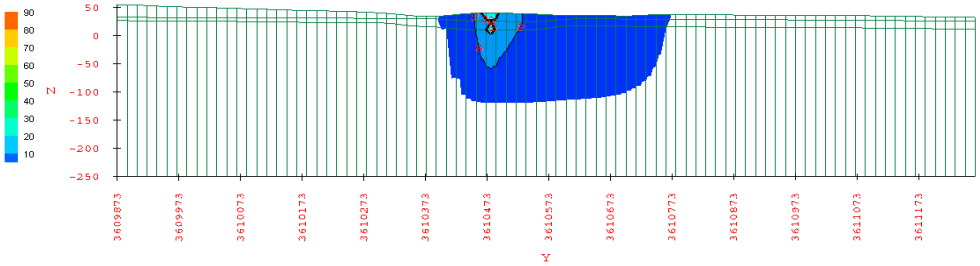
a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 23 Ammonia Nitrogen Concentration Distribution for 10 Years after the Leakage (Unit: m)

a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 24 Ammonia Nitrogen Concentration Distribution for 20 Years after the Leakage (Unit: m)

The Migration Distance and the Concentration of Pollutants with Time Variation during the Simulation Period

Table 7.7-15

Accident Location	Predictive Actor	Time（yr）	Horizontal Distance（m）	Horizontal Distance（m）	Concentration Boundary Prediction （mg/L）

The Eastern Landfill	Cl-	1	50	20	250
		10	146	130	
		20	203	140	
	COD	1	67	25	3
		10	211	155	
		20	299	160	
	NH4+	1	77	30	0.2
		10	218	155	
		20	306	160	

Scene 2： The leachate leakage of the eastern landfill without closing the field

The leakage point

Assuming that building vertical retaining wall around the garbage in this situation, and reducing the lateral overflow of the leachate to the greatest extent, under normal conditions, the leachate of the eastern landfill occurs to leak. Because of non-point source pollution, Chloride, COD and Ammonia Nitrogen migrate along with the groundwater.

Leakage source strength

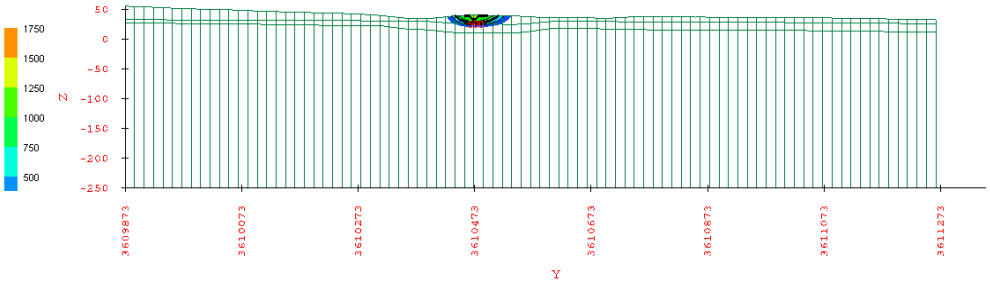
By the garbage leachate water quality condition, from the partial security perspective, the concentration of the initial pollution factor all chooses the maximum of water quality monitoring. The concentration flux of Chloride, COD and Ammonia Nitrogen on the upper boundary is, respectively, 1911mg/L, 580mg/L and 223mg/L.

The refuse landfill has been in use for more than 20 years. Owing to this, no measures of controlling environment has been taken on Datong old refuse landfill except that some landfills have coating material on the surface of the landfill. Garbage leachates mix with rain and then run into the open drainage channel and the surrounding area. Considering the environmental safety, the time when the garbage leachate begins to leak is set to 20 years.

Prediction results and analysis

In the water quality model, the aquifer parameters, the Initial conditions and the boundary conditions are taken into consideration. Using GMS software and operation flow and water quality model, then get the prediction results of chloride, COD and ammonia nitrogen migration, after the leakage of the garbage leachate for 1 year, 10 years, 20 years, the migration ranges of pollutants in the horizontal and vertical direction are shown in Figure 7.7-25 ~ Figure 7.7-33, the migration distance and the concentration of pollutants changes with time during the simulation period, the changes are shown in table 7.7-16.

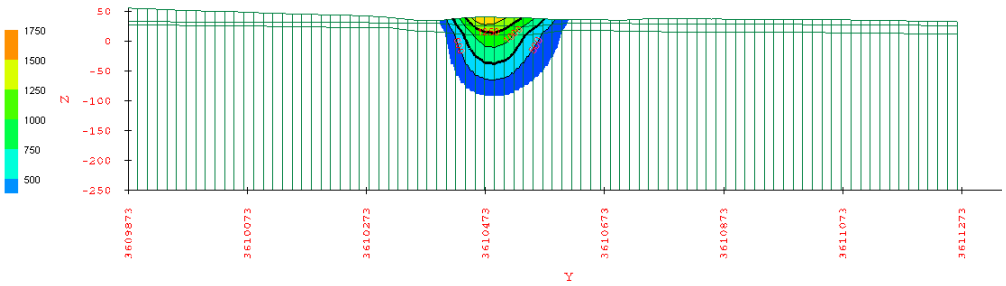
a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 25 Chloride Concentration Distribution for 1 Year after the Leakage (Unit: m)

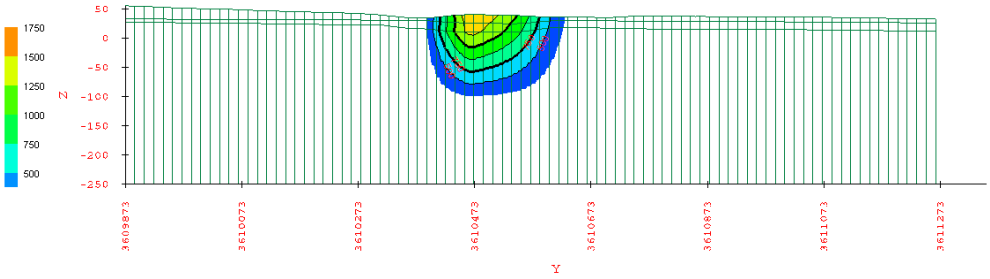
a Level diffusion range



b Longitudinal diffusion range

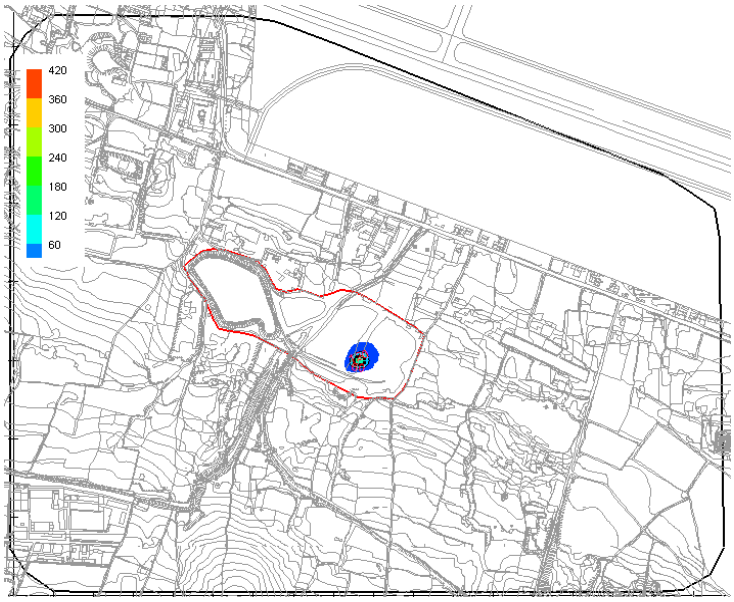
Figure 7.7- 26 Chloride Concentration Distribution for 10 Years after the Leakage (unit: m)

a Level diffusion range

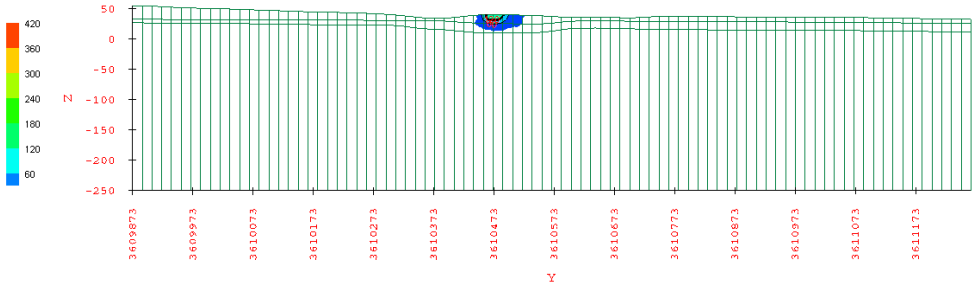


b Longitudinal diffusion range

Figure 7.7- 27 Chloride Concentration Distribution for 20 Years after the Leakage (Unit: m)



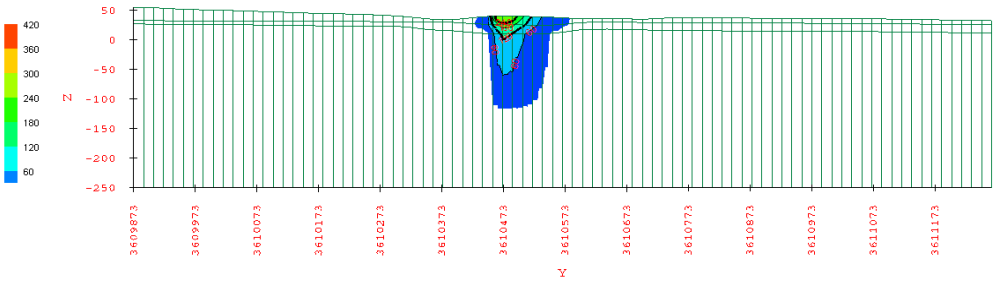
a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 28 COD Concentration Distribution for 1 Year after the Leakage (Unit: m)

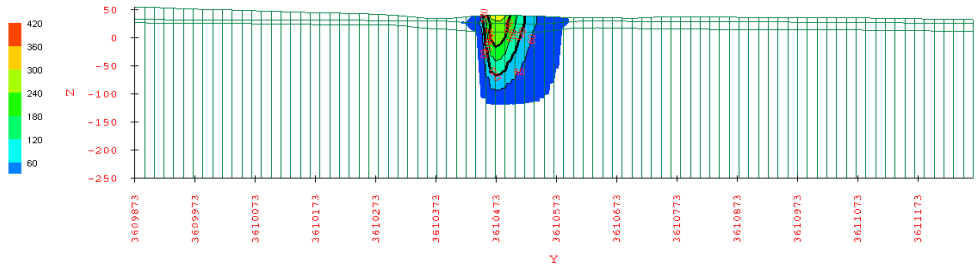
a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 29 COD Concentration Distribution for 10 Years after the Leakage (Unit: m)

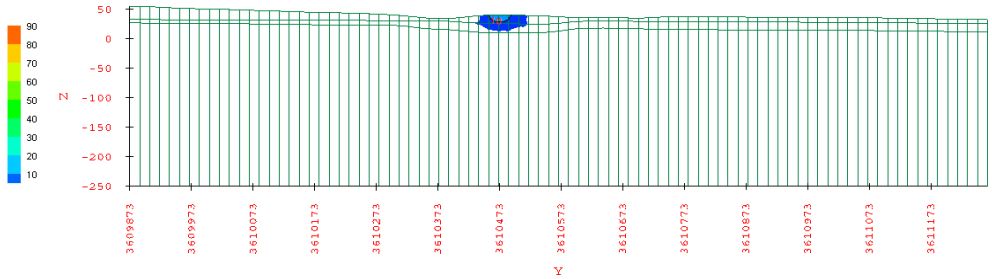
a Level diffusion range



b Longitudinal diffusion range

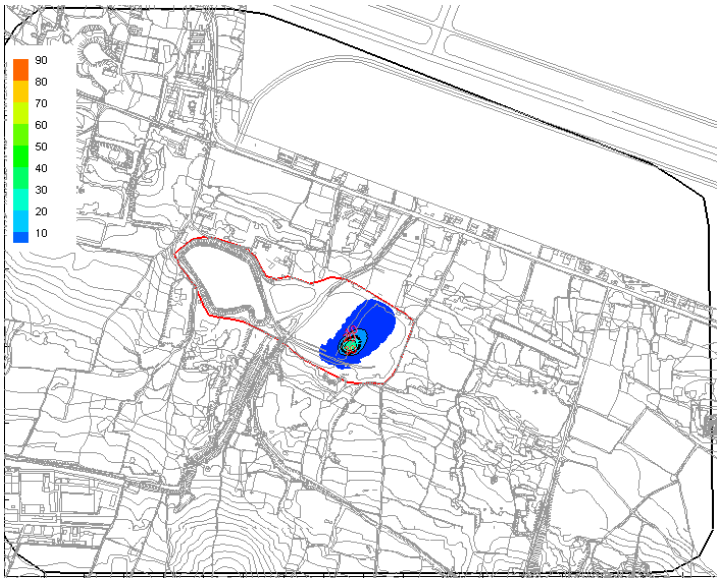
Figure 7.7- 30 COD Concentration Distribution for 20 Years after the Leakage (Unit: m)

a Level diffusion range

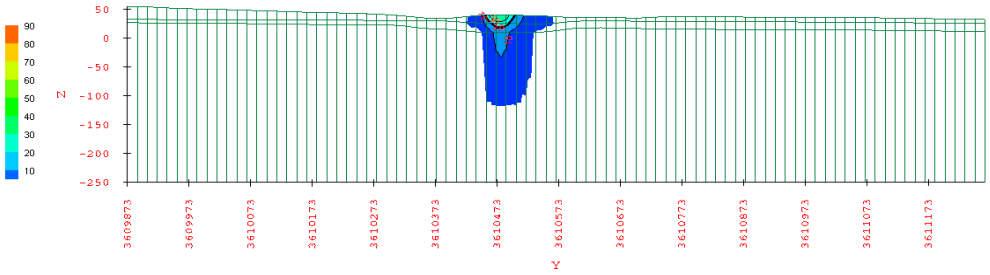


b Longitudinal diffusion range

Figure 7.7- 31 Ammonia Nitrogen Concentration Distribution for 1 Year after the Leakage (unit: m)



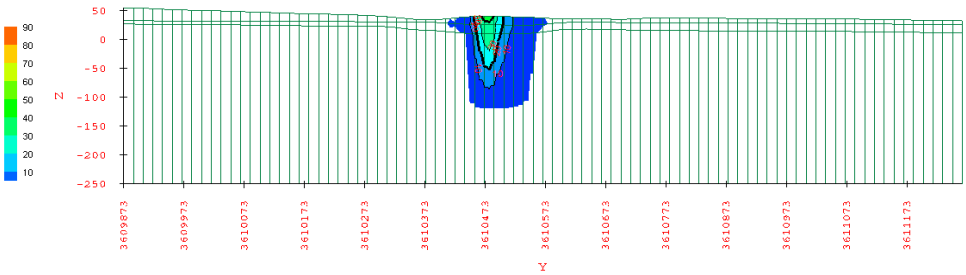
a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 32 Ammonia Nitrogen Concentration Distribution for 10 Years after the Leakage (unit: m)

a Level diffusion range



b Longitudinal diffusion range

Figure 7.7- 33 Ammonia Nitrogen Concentration Distribution for 20 Years after the Leakage (unit: m)

The Migration Distance and the Concentration of Pollutants with Time Variation during the Simulation Period

Table 7.7-16

Accident Location	Predictive Actor	Time（yr）	Horizontal Distance（m）	Horizontal Distance（m）	Concentration Boundary Prediction

					（mg/L）
The Eastern Landfill	Cl-	1	45	20	250
		10	137	140	
		20	156	150	
	COD	1	49	130	3
		10	127	155	
		20	146	160	
	NH4+	1	42	25	0.2
		10	123	155	
		20	139	160	

（3）Predicting results

The structural features of the municipal solid waste landfills may cause serious pollution to the underground water. To analyze the impact of landfill leachate in landfill areas leaking into underground and migrating with underground water on the surrounding underground water environment, a survey of the underground water status was carried out. Apart from that, with the revised water flow model, two situations were set out, ie, 1) keeping the current status——not closing the landfills, and 2) closing the landfills with certain measures.

Through the above survey and prediction, the contrasts of landfills leachate migration between the current status and after closing landfills are laid out in table7.7-17. Through the contrasting analysis of data, the following conclusions are obtained.

1. Under the situation of not closing landfills, with the time expanding, landfills leachate in landfills spreading to the downstream continuously. After 20 years, as to the horizontal spreading distance, COD is at most about 300 m, Cl- is about 200 m and NH4+ is about 306 m; as to the vertical direction, with the time going by, through the slow permeation leachate can enter the claypan, but the concentration is low.

2. Under the situation of closing the landfills with certain measures, that is to build vertical barricades, avoiding the leachate overflowing crosswise. The landfills leachate in the landfills can be limited within the landfills area well by barricades. After 20 years, referring to the horizontal distances, the maximum distance of COD, NH4+ and Cl- are 146 m, 139 m and 156 m respectively. Seen from that, the vertical barricades can limit the leachate within the landfills area, whose spreading distances are 50% of those when not building barricades. In this way, the horizontal spreading of leachate can be avoided effectively. In vertical direction, it can limit the spreading of landfills leachate with high concentration, but leachate with low concentration can spread downward.

The Predicted Result of Landfills Leachate Permeating Chart7.7-17

Place of the accident	Predictive factors	Time（yr）	The horizontal distances of not closing landfills(m)	The horizontal distances of closing landfills(m)	The vertical distances of not closing landfills(m)	The vertical distances of closing landfills(m)	The predicted concentration limit（mg/L）
The east landfills	Cl-	1	50	45	20	20	250
		10	146	137	130	140	

		20	203	156	140	150	
	COD	1	67	49	25	130	3
		10	211	127	155	155	
		20	299	146	160	160	
	NH4+	1	77	42	30	25	0.2
		10	218	123	155	155	
		20	306	139	160	160	