ADB

Initial Environmental Examination

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PRC: Dynagreen Waste-to-Energy Project
IEE for the Jixian Waste-to-Energy Plant

Prepared by Tianjin Environmental Impact Assessment Center and Dynagreen Environmental Protection Group Company Limited for the Asian Development Bank

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Municipal Solid Waste Incineration Power Generation Project in Ji County, Tianjin City

Environmental Impact Report

(Draft)

Tianjin Environmental Impact Assessment Center

August 2014

ABBREVIATIONS

ADB	Asian Development Bank
AQG	Air Quality Guideline
As	Arsenic
JEMS	Jixian Environmental Monitoring Station
JEPB	Jixian Environmental Protection Bureau
JPMO	Jixian Project Management Office
BOD5	5-day biochemical oxygen demand
C&D	Construction and demolition
CaCO3	Calcium carbonate
Cd	Cadmium
CESMT	Community Environmental Supervision & Management Team
CH3SH	Methyl mercaptan
Cl	Chloride
CN	Cyanide
CNY	Chinese Yuan
Co	Cobalt
CO	Carbon monoxide
COD	Chemical oxygen demand
Cr	Chromium
Cr6+	Hexavalent chromium
CSS	Combined sewer system
Cu	Copper
DO	Dissolved oxygen
DEH	Digital Electro Hydraulic Control
EIA	Environmental impact assessment
EIR	Environmental Impact Report
EIRF	Environmental Impact Registration Form
EIT	Environmental Impact Table
EMP	Environmental Management Plan
EPB	Environmental Protection Bureau
EDI	Electrodeionization
F	Fluoride
FSR	Feasibility Study Report
FYP	Five Year Plan
GDP	Gross domestic product
GHG	Greenhouse gas
GRM	Grievance redress mechanism
HEPA	High Efficiency Particulate Air

HRSG	Heat Recovery Steam Generator
Hg	Mercury
I	Iodide
IMn	Permanganate index
Mn	Manganese
MBR	Membrane Bio—Reactor
MSW	Municipal solid waste
NH3-N	Ammonia nitrogen
N	Nitrogen
NO2	Nitrogen dioxide
NO2 -	Nitrite
NO3 -	Nitrate
PRC	People's Republic of China
PAM	Polyacrylamide
Pb	Lead
pH	Measure of acidity (<7) and alkalinity (>7) based on hydrogen ion concentration
RO	Reverse Osmosis
RP	Resettlement Plan
SO2	Sulfur dioxide
SPS	Safeguard Policy Statement
SS	Suspended Solids
SNCR	Selective Non-Catalytic Reduction
TDS	Total dissolved solids
TN	Total nitrogen
TP	Total phosphorus
TPH	Total petroleum hydrocarbon
TSP	Total suspended particulate
UASB	Up flow Anaerobic Sludge Blanket
UF	Ultra-Filtration
WHO	World Health Organization
WWTP	Wastewater Treatment Plant
Zn	Zinc

WEIGHTS AND MEASURES

oC	Celsius
µ	micron
g/L	microgram per liter
Bq/L	Becquerel per liter
dB	decibel
km	kilometer
km2	square kilometer
kW	kilowatt
L	liter
L/s	liter per second
m	meter
m 2	square meter
m 3/a	cubic meter per annum
m 3/d	cubic meter per day
m 3/s	cubic meter per second
mg/kg	milligram per kilogram
mg/L	milligram per liter
mg/m3	milligram per cubic meter
no./L	number per liter
NTU	nephelometric turbidity unit
t	metric ton
t/a	ton per annum
t/d	ton per day
t/y	ton per year

CONVERSION UNIT

1 hectare = 15 mu
1 mu = 666.7 m2

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1. Executive Summary

1.1 Project Overview

Tianjin Dynagreen Renewable Energy Co., Ltd. plans to invest and build municipal solid waste incineration power generation project in Ji County, Tianjin City, and is located in northeast of Xijiuhu Village, Bieshan Town, Ji County (former No.1 Cement Factory). With an investment of RMB 299,954,600, first phase of the project will be designed with a daily waste treatment capacity of 700 tons and annual electricity generation of 82,000,000 Kwh, which will be achieved by 2 sets of 350t/d three-drive grate waste incinerator, a set of 12MW steam turbine generator unit and flue gas cleaning system. The remaining generated electricity will be sold through external power network after supplying to the project itself. The project is scheduled to commence in June 2014, and completed in December 2015. The trial operation will start from January 2016 to March 2016.

1.2 Environment Characteristics of Construction Area

1.2.1 Environmental Protection Target

The atmospheric environment protection targets cover 11 villages and under-construction villa district within 2.5km from the project, among which 5 are within territory of Ji County, Tianjin Citynamely; XijiuHu, Nanchouzhuang, Douzhuangzi, Dongmaozhuang and Zhouzhuangzi. The other 5 villages, Dongjiuhu, Xiaopanggezhuang, Dapanggezhuang, Shilingcun Village, Xiaobaishan Village and Cuipingshanhu Villa District are within territory of Tangshan City in Hebei Province.

1.2.2 Ambient Air Quality

(1) Existing Environmental Conditions

In 2012, the annual average content of SO_2 and NO_2 in Ji County has met the Class II standard specified in the Ambient Air Quality Standard (GB3095-1996); while the content of PM_{10} exceeds the standard. According to the statistic data, among 362 effective monitoring days of 2012 in Ji County, there are only 287 days in which the content meets or outperforms the class II standard, 28 days less than 2011 and occupying 79.3% of the total monitoring days.

(2) Status quo monitoring

Conventional indicator: in the ambient air of project construction area, the status quo of SO_2, NO_2, NO_x and CO has met the hourly value and average daily value in class II standard specified in the Ambient Air Quality Standard (GB3095-1996); the monitored value of PM_{10} and $PM_{2.5}$ goes beyond the average daily concentration in the standard. The highest exceeding point locates in Panggezhuang Village, by exceeding 1.94 times; and the maximum exceeding point of $PM_{2.5}$ locates in the villa district, by 1.79 times.

Odor factor: concentration of ammonia and H_2S at the project site meets the "maximum allowable concentration of hazardous substance in air of residence" requirement specified in Hygienic Standards for Design of Industrial Enterprises (TJ36-79); odor concentration and status quo of methyl mercaptan can meet the control standard value of odorous pollutants specified in Emission Standards for Odorous Pollutants (DB12/—059—95).

Other factors: concentration of HCl, Pb and Hg at the project site and surrounding monitoring points meets the "maximum allowable concentration of hazardous substance in air of residence" requirement specified in Hygienic Standards for the Design of Industrial Enterprises (TJ36-79); Dioxin meets the requirement of reference standard while the concentration of Cd at the monitoring point is below 8.50×10^{-7} mg/m^3.

1.2.3 Sound environment quality

Daqin Railway locates to the south of project site, the noise is subject to Environmental Quality Standard for Noise for industrial areas (Class 4a) (GB3096-2008) while the noise at the other factory boundaries implements the class II standard for industrial areas. The monitoring result shows that, the noise and environmental noise at night around the project site meets class II and class 4a standard requirements specified in Environmental Quality Standard for Noise (GB3096-2008) for industrial areas.

1.2.4 Status quo of underground water

The ground water quality at the project site and deep ground water quality in Panggezhuang is at a relatively low quality.

1.2.5 Status quo of soil

The soil environment quality at the proposed factory site has met class II

standard specified in Environmental Quality Standard for Soils (GB15618-95), showing it is not polluted. The monitoring value of Dioxin in soil ranges from 0.22 to 1.2 ngTEQ/kg.

1.3 Environment impacts during construction period

(1) The project construction would have certain impact on the ambient air quality, so the construction unit should strictly implement the environmental protection requirements specified in Regulations of Tianjin Municipality on the Prevention and Control of Air Pollutants, Interim Administrative Measures of Tianjin Municipality for Prevention and Control of Fugitive Dust at Construction Site, Regulations of Tianjin Municipality on Civilized Construction Management in Construction Projects, 21 Construction Bans of Tianjin Municipality and Tianjin Fresh Air Action Plan to minimize construction impact.

(2) Environmental impact made by engineering activity in the construction period is permanent. Most of the other impacts are temporary, with the impacted environmental factor may be recovered by appropriate prevention and control measures.

1.4 Ambient air impact assessment conclusion and treatment measures

1.4.1 Discussion for pollutant emission compliance

(1) After disposing the exhaust gas by Selective Non-Catalytic Reduction (SNCR) and lime spray drying reaction tower slaked lime, activated carbon injection bag type dedusting technology, emission concentration of pollutants can meet the design requirements and up-to-standard emission.

(2) The 80-m height of chimney stack meets the requirements of Standard for Pollution Control on the Municipal Solid Waste Incineration of 60m; inner diameter (single tube) of the chimney should be within 1.75m.

1.4.1 Predicted hourly concentration

At northwest side of project site (see map below), the hourly peak concentration of NOx and HCl in scope of evaluation exceeds the standard limit value. However the low exceeding probability will not exert significant adverse impact on ambient air quality; hourly peak concentration of SO_2 is 0.0060mg/m^3 and CO is 0.0088mg/m^3, which are within hourly concentration

limits specified in Ambient Air Quality Standards (GB3095-2012).

Maximum concentrations of HCl, SO_2, NO_2 and CO at the environmental protection destination are all controlled within the one-time (or one-hour) concentration limit specified in Hygienic Standards for Design of Industrial Enterprises (TJ36-79) Ambient Air Quality Standards (GB3095-2012).

1.4.2 Predicted daily average value

The maximum daily average ground-level concentration of HCl($1.5*10^{-4}$mg/m3), SO_2($6*10^{-4}$mg/m3), NO_x($1*10^{-3}$mg/m3), flue gas($1.1*10^{-3}$mg/m3) and CO($5*10^{-4}$mg/m3) within the evaluation scope are all controlled within the daily average concentration limit specified in Hygienic Standards for Design of Industrial Enterprises (TJ36-79) Ambient Air Quality Standards (GB3095-2012).

The maximum concentration of HCl, SO_2, NO_x, flue gas and CO at the project's environmental protection destination are all controlled within the daily average concentration limit specified in Hygienic Standards for Design of Industrial Enterprises (TJ36-79) Ambient Air Quality Standards (GB3095-2012). The daily average concentration of Dioxin at environmentally sensitive areas meets Japanese annual average concentration standard (0.6 pg/m^3).

1.4.3 Long-term impact prediction

Seasonal and annual Pb mean value and maximum ground-level concentration of other pollutants within evaluation scope meets corresponding requirements of concentration limits specified in class II of Ambient Air Quality Standard (GB3095-2012); long-term impact of pollutants takes a low proportion and will not exert significant impact on the regional ambient air quality (see table below).

Pollutants	Predicted value	Accounting standard rate（%）	Superposition value	Standard values	Reference Standard
Flue gas	5.71× 10-4	0.571	0.1158	0.10	GB3095-2012
SO2	2.28× 10-3	0.038	0.048	0.06	
NOx	5.71× 10-3	0.114	0.0087	0.05	
Pb（winter）	9.92× 10-5	9.92	10.2×10-5	0.001	
Pb（spring）	4.15×10-5	4.15	4.47×10-5		
Pb （summer）	4.61×10-5	4.61	4.93×10-5		
Pb（fall）	5.21×10-5	5.21	5.53×10-5		
Pb*	4.66× 10-5	9.32	4.98×10-5	0.0005	
dioxin	2.85× 10-3	0.475	0.369	0.6	Japan Standard

Air pollutant has little impact on sensitive areas; annual average concentration of dioxin at the environmentally sensitive area meets the Japanese annual average concentration standard (0.6 pg/m$^{3)}$.

1.4.4 Prediction on boundary impact of malodorous gas

According to comparison with similar projects, such as some of our projects in operation, Changzhou project and Haining project, NH_3, H_2S and odor concentration at the boundary of project site meets concentration limits at factory boundary specified in Emission Standards for Odorous Pollutants.

1.4.5 Environment protective distance

The project needs to set a 300 m environmental protective distance; the ambient environment meets the requirements to set protective distance.

1.4.6 Air pollution prevention and control measures

(1) Incineration flue gas

a. Implement the environmental protection measures in strict accordance with the design document, mainly disposing the pollutant in flue gas by adopting SNCR +lime spray drying reaction tower +slaked lime, activated carbon injection + bag type dedusting technology; ensure the up-to-standard emission of NO_x by controlling incineration conditions and adopting SNCR system.

b. Control the waste incineration conditions, including temperature, residence time of flue gas and flue gas oxygen content so as to reduce generation and emission of dioxin.

c. Install flue gas on-line monitoring system to monitor temperature of flue gas, soot, HCl, SO_2, NO_X, CO and network the system with the environmental protection bureau of the district.

d. Release the incineration flue gas through 80 m stack chimney and emission outlet and ensure that concentration values of flue gas meets the standard.

e. The flue gas emission requirements must be clearly defined before purchasing flue gas disposal equipment to make sure the purchased equipments meet project's requirement of stable up-to-standard emission and long-term normal operation.

(2) Malodorous gas

a. The waste unloading hall must be kept sealed and the exhaust gas refuse storage pit must be brought in incinerator for incineration. The malodorous gas should be prevented from going out by measures of installing sealed chamber and air curtain.

b. Allocate the garbage transport vehicles in a scientific way to prevent malodorous gas from going out in process of vehicle waiting outside the garbage unloading hall.

c. In overhaul process, malodorous gas should be ventilated from the refuse storage pit with draught fan through a special air duct, and then discharge

to outside environment after treated with activated carbon absorption process.

d. A 300m environmental protective distance is required by the project, any environmentally sensitive building such as residential area, school and hospital are prohibited within the distance. According to the current situation, there is no environmentally sensitive building within the protective distance.

(3) Exhaust gas in lime and cement storage silo

Exhaust gas in lime and cement storage bin should be discharged after being purified by silo top bag-type dust remover to standard.

(4) Oil fume in canteen

Install oil fume filter to filter it to standard before discharging.

1.5 Water environment impact conclusion and treatment measure

1.5.1 Water environment impact

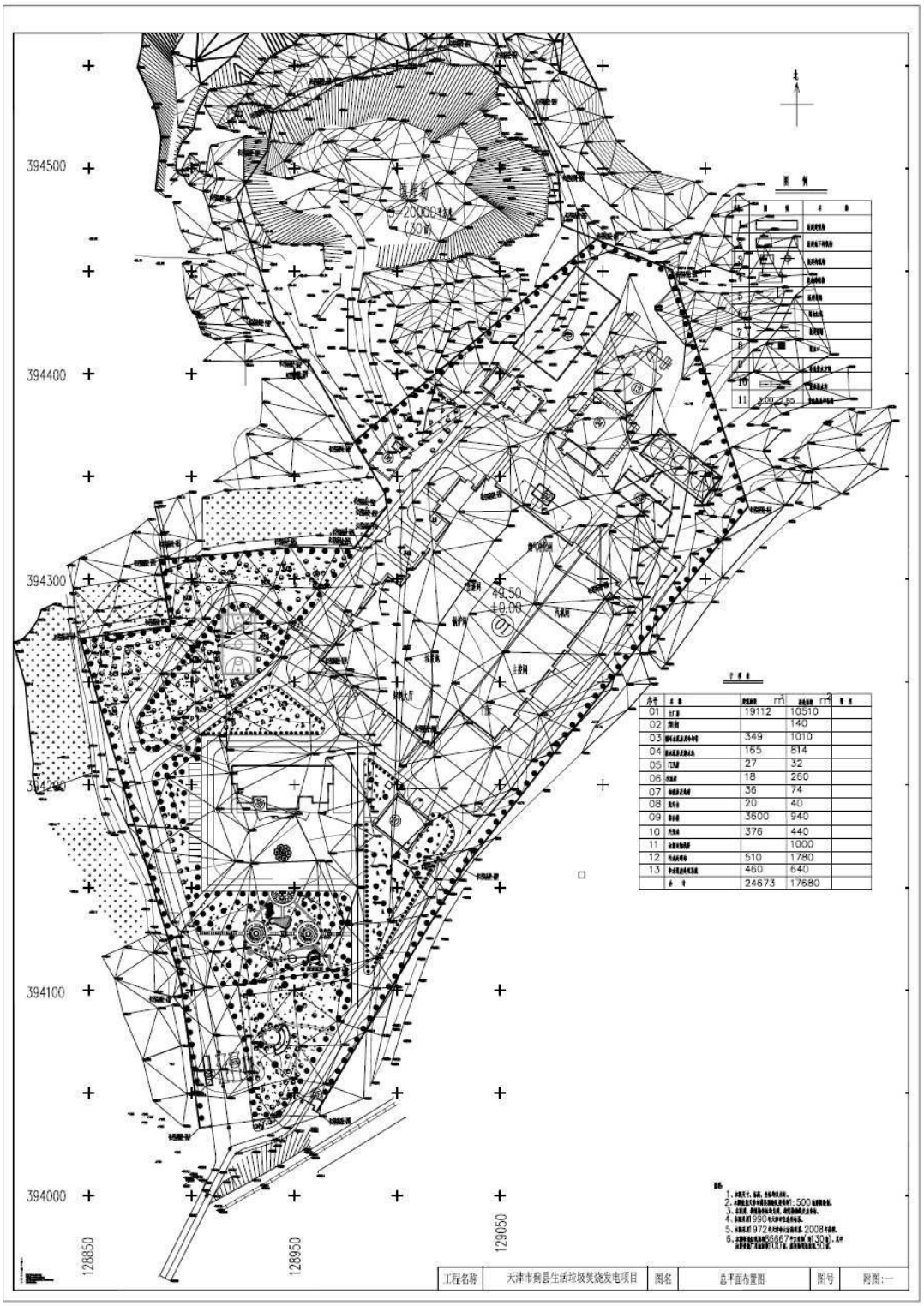
Landfill leachate, wash water and domestic waste water in this project should be reused instead of expelling after being treated by using adjustmentair floatationUASBMBR biochemical technology. As per the result of water balance system analysis, this project can realize zero discharge of waste water.

1.5.2 Waste water treatment measure

Build a set of sewage disposal system to recycle the processed industrial wastewater and domestic waste water, instead of discharging outside.

1.6 Noise impact conclusion and treatment measure

(1) During operation, by the south boundary close to Daqin Railway, the noise impact value at day time and night time can meet the class IV standard; noise impact value at day time by east, west and north boundary can meet class II standard specified in Emisson Standard for Industrial Enterprises Noise at Boundary (GB12348－2008); Noise at night time by the east and north boundary exceeds limit in class II standard, due mainly to the short distance from cooling tower, sewage pump plant, raw water pump plant and other public utility of this project to the boundary, which greatly increases the noise by the east and north boundary.



(2) Forest land to the east and north side of project; the project has no sound sensitive target at surrounding area; it is about 1.4 km away from the Shiling Village, the nearest sensitive area by the east and 2.1km from the villa area, the nearest sensitive area by the north. That is to say, the noise caused during operation will not disturb the people if some necessary

prevention and control measure is taken.

(3) The intermittent noise caused by boiler exhaust system has great influence on the surrrounding sound environment; the sound value at night can meet limit in class II standard of Environmental Quality Standard for Noise (GB3096-2008) at a distance of 800m from the project. After equipping silencer with 40 dB(A) noise reduction, the influence outside the factory boundary will be reduced to below 40 dB(A).

(4) It is suggested that reserve funds be established to install sound barrier, if needed. In case sound sensitive buildings will be constructed near the east and north boundary or the noise cannot meet the standard, the sound barrier measure will be taken to ensure the boundary noise is up to the standard. The project has reserved 540,000 yuan for a 270 m sound barrier.

1.7 Environmental impact conclusion and treatment measures for solid waste

(1) General waste

Slags will be sent to Huanmei Waste Treatment Plant in Ji County for landfill treatment; the other solid wastes include metal and waste wrappage collected from slag pit, municipal solid waste and spent activated carbon, among which the metal and waste wrappage collected from slag pit can be sold while the sludge in leachate treatment station, municipal solid waste and spent activated carbon from stench absorption device will be incinerated. Secondary pollution will not happen as long as the appropriate measure is taken. The slag will be made into bricks and the leachate will be sent to the leachate treatment station for purification. The activated carbon absorption and SNCR treatment methods will also be adopted.

(2) Hazardous waste

Fly ash, as a kind of hazardous waste, should be sent to Huanmei Waste Treatment Plant in Ji County for landfill after curing process and passing inspected by a qualified unit; if not qualified in such inspection, the construction unit should entrust a qualified unit to dispose. The facilities used for transportation and storage of fly ash, curing workshop and curing equipments must be totally airtight to avoid fugitive dust emissions..

(3) Control the incineration conditions to ensure the loss of ignition no more than 5%.according to《GB18485-2001 municipal solid waste incineration standard》.

1.8 Environmental risk prediction conclusion and preventive measures

1.8.1 Atmospheric environment risk

(1) Potential risk: Equipment failure of SNCR denitration system, deacidification reaction tower, activated carbon injection device, bag-type dust remover and other equipment in a single purification system. Equipment failure that can be restored within 30 minutes will still meet the environmental standards.

(2) In case failure is not restored in 30 minutes, the equipment must be stopped for maintenance.

(3) The project management in operation phase must be improved. The equipments must be efficiently cared and maintained to avoid or minimize accident rate.

1.8.2 Water environment risk

Once the sewage treatment equipment breaks down, the leachate will not be disposed up to standard. In such case, the leachate have to be stored in leachate pool or adjustment tank temporarily. The capacities of leachate pool and adjustment tank are 260m^3 and 1500 m^3, respectively, and adequate for 15 days storage of the leachate.

1.9 Public participation

In EIA process, the related contents are publicized on newspaper or network prior to distributing public participation questionnaires to collect public opinion. A total of 200 questionnaires are distributed, and all of them are returned. According to the statistical results, most of the public participated in the random survey have a general understanding of significance of the project construction, and have no objection. The public concerns a lot the fugitive dust and construction waste generated in construction period. 96.5% of the public are supportive to the project.

1.10 Total amount of pollutant emission

The air pollutants in this project are generally from flue gas caused by waste incineration while the water pollutants come from landfill leachate and wash

water of discharge platform. The quantity of pollutant discharged is: nitric oxide 205.12t/a, soot: 20.51t/a. Landfill leachate, wash water and domestic waste water in this project should be reused instead of expelling after being treated by using adjustment+air floatation+UASB+MBR biochemical technology. As per the result of water balance system analysis, this project can realize zero discharge of waste water. **Investment in environmental protection**

The total investment in environmental protection of this project is at RMB 46,300,000, taking up 15.4% of total investment. The investment is mainly used in pollution prevention and control technologies during construction and operation phases of the project such as waste gas purification, wastewater treatment, discharge outlet standardization, installing on-line monitor device, sound insulation and noise reduction, fly ash curing and factory area greening

2. Policy, Legal and Administrative Framework2.1 State laws

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

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

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

(4) Law of The People's Republic of China on The Prevention And Control of Environmental Noise Pollution (October 29, 1996);

(5) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution Caused by Solid Waste (December 29, 2004);

(6) Law of the People's Republic of China on Appraising of Environment Impacts (October 28, 2002);

(7) Circular Economy Promotion Law of the People's Republic of China (January 1, 2009);

(8) Cleaner Production Promotion Law of the People's Republic of China (Revised in 2012);

(9) Land Administration Law of the People's Republic of China (August 28, 2004);

(10) Emergency Response Law of the People's Republic of China (November 1, 2007);

(11) Water and Soil Conservation Law of the People's Republic of China (March 1, 2011).

2.2Environmental protection policies and regulations

(1) Decree No.253 of the State Council in 1998 "Regulations on the Administration of Construction Project Environmental Protection";

(2) GF[2011] No.9 "Notice of the State Council on Approving and Transmitting Opinions of Ministry of Urban-Rural Development of the People's Republic of China and other departments on Improving Urban Municipal Solid Waste Treatment";

(3) Regulations of Tianjin Municipality on Prevention and Control of Air Pollution (November 2004);

(4) Categorized Administrative List of Environmental Impact Assessment for Construction Projects;

(5) No.58 Decree of Tianjin Municipal People's Government "Administrative Measures of Tianjin Municipality on Environmental Protection in Construction Projects";

(6) Promulgated by the State Environmental Protection Administration by Notice No.28 [2006] " Interim Procedure on Public Participation in Environmental Impact Assessment";

(7) Interim Procedure of Tianjin Municipality on Prevention and Control of Fugitive Dust on Sites of Construction Projects;

(8) Decree No.67 [2004] of Tianjin Municipal People's Government "Administrative Measures of Tianjin Municipality on Prevention and Control of Water Pollution".

(9) Decree No.6 [2003] of Tianjin Municipal People's Government "Administrative Measures of Tianjin Municipality on Prevention and Control of Environmental Noise Pollution".

(10) Decree No.1 [2008] of Tianjin Municipal People's Government "Regulations of Tianjin Municipality on Municipal Solid Waste Management";

(11) Decree No.100 [2006] of Tianjin Municipal People's Government "Provisions of Tianjin Municipality on Administration of Civilized Construction of Engineering Projects", (come into effect on June 1, 2006);

(12) Regulations of Tianjin Municipality on Use and Administration of Urban Drainage and Recycled Water;

(13) "Provisions of the Tianjin Municipality on Promoting the Clear Production";

(14) JHBJL No.71 Order [2007] of Tianjin Environmental Protection Bureau "Notice on Promoting Standardization Control of Discharge Outlets in Our City";

(15) JHBJL No.57 Order [2007] of Tianjin Environmental Protection Bureau "Notice on Publishing "Technical Requirements for Standardization of Discharge Outlet of Pollution Source in Tianjin City";

(16) "Renewable Resources Law of the People's Republic of China"

(17) JHBGH No.398 Order [2010] of Tianjin Environmental Protection Bureau "Letter on Adjustment of "Division of Applicable District Division in Tianjin Municipality for "Environmental Quality Standard for Noise";

(18) Tianjin Urban-Rural Construction & Transport Commission “21 Construction Bans”;

(19) JZF[2013] No.35 “Notice of Tianjin Municipal People’s Government on Printing and Issuing Tianjin Fresh Air Action Plan”;

(20) HF [2013] No.104 “Notice on Printing and Issuing “Detailed Rules for the Implementation of the Air Pollution Prevention and Control Action Plan in Beijing-Tianjin-Hebei and the Surrounding Areas”;

2.3 Technical guides and standards for environmental impact assessment

(1) “Technical guidelines for environmental impact assessment——General”, HJ2.1-2011;

(2) “Technical guidelines for environmental impact assessment——Atmospheric environment”, HJ/2.2-2008;

(3) HJ/T2.3-93；“Technical guidelines for environmental impact assessment——Surface water environment”, HJ/T2.3-93;

(4) HJ2.4-2009；“Technical guidelines for environmental impact assessment——Sound environment”, HJ2.4-2009;

(5) “Technical guidelines for environmental impact assessment——Ecological environment” HJ19-2011;

(6) “Technical Guidelines for environmental risk assessment of construction projects”, HJ/T 169-2004;

(7) National Standard of the People's Republic of China “Standard for pollution control on the municipal solid waste incineration” (GB18485-2001);

(8) National Standard of the People's Republic of China “Standard for pollution control on the landfill site for municipal solid waste” (GB16889-2008).

2.4Planning and engineering data

(1) “Urban Master Planning of Tianjin Municipality” (Year 2005-2020);

(2) No.62〔2006〕 Letter of State Council “Approval of the State Council on urban master planning of Tianjin Municipality”;

(3) “Layout planning of environmental sanitary facility in Tianjin Municipality (Year 2009-2020)”, Tianjin Urban Planning & Design Institute, Tianjin Environmental Sanitation Engineering Design Institute.

(4) “Layout planning of environmental sanitary facility in Tianjin Municipality (Year 2009-2020) Environmental impact report”, Tianjin Environmental Impact Assessment Center;

(5) “Notice on publishing “Municipal solid waste treatment and pollution prevention control technology and policy”, JC [2000] No.20 order of Ministry of Housing and Urban-Rural Development, Ministry of Environmental Protection and Ministry of Science and Technology.

(6) “Notice on further deepening environment impact assessment management of biomass power generation project” HF[2008] No.82, Ministry of Environmental Protection, National Development and Reform Commission, National Energy Bureau;

(7) “Technical code for projects of municipal waste incineration” (CJJ90-2009);

(8) Commitment Letter of Ji County Transportation Bureau on Constructing Roads to Municipal Solid Waste Incineration Power Generation Project;

(9) Outline of the environmental impact assessment and minute of expert review for this project;

(10) Technical contract for evaluation work executed by construction unit and Tianjin Environmental Impact Assessment Center.

2.5 Asian Development Bank (ADB) Environmental and Social Requirements

The Ji County Waste to Energy Project has been determined to be category B for environment, B for involuntary resettlement and B for Indigenous Peoples based on Asian Development Bank's Safeguard Policy Statement 2009 (SPS). This category entails environmental impacts that are temporary and reversible, which can be prevented by implementing mitigation measures. This IEE has been prepared under the provisions of the ADB's SPS (2009) which requires a number of considerations, including: (i) project level grievance redress mechanism, including documentation in the environmental management plan (EMP); (ii) occupational and community health and safety requirements including emergency preparedness and response); (iii) economic displacement that is not part of land acquisition; (iv) meaningful consultation and participation; and (viii) an EMP which comprises implementation schedule. Since land acquisition has taken place in 2012 and prior to ADB financing,

a separate Social Audit Report has been prepared to comply with ADB's SPS SR4 requirements.

The PRC domestic EIA has been prepared initially for PRC approval processes and therefore are required to use PRC standards throughout for water quality, air quality, noise and effluents. The ADB's SPS promotes the use of Country Safeguard Systems (CSS), however, the application of CSS requires an equivalence and acceptability assessment followed by ADB Board approval. Accordingly, in order to follow with this policy, this IEE will compare the critical PRC impact standards (effluents and emissions from subcomponents) with the International Finance Corporation's (IFC) Environmental Health and Safety Guidelines .

In accordance with ADB's Social Protection Strategy (2001), the project, including its contractors and subcontractors, will also comply with China Labor Law and relevant international core labor standards.

Environment, Health and Safety (EHS) Guidelines

The principles and standards of the IFC's Environmental, Health and Safety Guidelines (2007) have been endorsed by the ADB's Safeguard Policy. The general guidelines, in company with the Industry Sector Guidelines, will provide the context of international best practice and will contribute to establishing targets for environmental performance. The sector guideline referenced is the general EHS Guidelines (covering occupational health and safety and community health and safety) and the EHS Guidelines for Waste Management Facilities. The air, noise and water quality standards in the EHS guidelines will also provide justification for the use of PRC standards.

The design and technology of the proposed project will meet the national standards and the requirements laid out in the IFC's EHS sector guidelines.

Occupational and community health and safety, as laid out in the IFC's EHS guidelines, will be an assessment element for the project.

2.6 Assessment factor

(1) Air

Status quo assessment: PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, HCl, H_2S, NH_3, odor concentration, methyl mercaptan, dioxin ;

Impact assessment: soot, SO_2, NO_x, CO, HCl, heavy metal (Cd, Hg and Pb), blackness of flue gas, H_2S, NH_3, odor concentration, methyl mercaptan, dioxin ;

(2) Water

Surface water: dissolved oxygen, permanganate index, BOD, ammonia nitrogen, petroleum, total lead, total mercury, volatile phenol;

Factory area sewage, pH, SS, COD_{Cr}, BOD_5, ammonia nitrogen, total phosphorus, total mercury, total cadmium and total lead;

Underground water: pH, NH_3-N, NO_3^-, NO_2^-,permanganate index , Cd, Cr^{6+}, Pb, As, Cu, Zn, Hg, volatile phenol, chloride and total coliform group.

(3) L_{Aeq}。 Noise: $L_{Aeq.}$

(4) Soil: pH, Cd, Cr, Cu, As, Hg, Pb, Zn, Ni and dioxin.

2.7 Assessment standard (refer to attachment 8 to 20)

1.14.1 Standards for atmospheric environmental impact assessment

1. Ambient Air Quality Standards (Class II), GB3095－2012;
2. “Maximum allowable concentration of harmful substance in air of residential areas” specified in Hygienic Standards for Design of Industrial Enterprises, TJ3679;
3. Standard for Pollution Control on the Municipal Solid Waste Incineration, GB18485－2001;
4. Emission Standards for Odorous Pollutants, DB12/－059－95;
5. Integrated Emission Standard of Air Pollutants, GB16297－1996;
6. Refer to Japanese standard of annual average concentration (0.6pgTEQ/m^3) to conduct assessment on status quo of dioxin;
7. Emission Standard of Cooking Fume (Trial), GB18483-2001.

Please refer to table 11-14-1～table 1-14-6 for specific limit values.

Table 1-14-1 Ambient Air Quality Standards

Pollutans	Concentration limit (mg/m^3)		
	Average in 1 hour	Daily average	Annual average
$PM_{2.5}$	—	0.075	0.035
PM_{10}	—	0.15	0.07
SO_2	0.50	0.15	0.06

NO_x	0.25	0.10	0.05
NO_2	0.20	0.08	0.04
CO	10.00	4.00	—
Pb	—	0.001（seasonal average）	0.0005

Remark: please implement [2008] Np. 82 for annual average value of dioxin.

Table 1-14-2 Maximum allowable concentration of harmful substance in air of residential areas

Name of pollutant	Maximum allowable concentration（mg/m^3）	
	Single	Daily average
NH_3	0.20	—
H_2S	0.01	—
HCl	0.05	0.015

Table 1-14-3 Emission limits of air pollutants by incinerator

Serial number	Item	Unit	Definition	National standard GB18485-2001
1	Soot	mg/Nm3	Determined average value	80
2	Blackness	Ringelmann, grade	Determined value	1
3	CO	mg/Nm3	Hourly average	150
4	NO_X	mg/Nm^3	Hourly average	400
5	SO_2	mg/Nm^3	Hourly average	260
6	HCl	mg/Nm^3	Hourly average	75
7	Hg	mg/Nm^3	Determined average value	0.2
8	Cd	mg/Nm^3	Determined average value	0.1
9	Pb	mg/Nm^3	Determined average value	1.6
10	Dioxin *	TEQng/ N m^3	Determined average value	0.1*

*: Refer to HF [2008] No.82 document “The announcement on the BIO-MASS power projects” to determine the emission concentration of dioxin.

Table 1-14-4 Boundary standard for odorous pollutants

Pollutants	H_2S mg/m^3）	NH_3（mg/m^3）	Odor concentration (dimensionless)	Methyl mercaptan (mg/m^3）
Boundary limit	0.03	1.0	20	0.004

Table 1-14-5 Integrated Emission Standard of Air Pollutants

Pollutants	Concentration limit	Emission rate limit*	
		18m height	24m height

PM (dust)	120mg/m^3	4.94kg/h	12.74kg/h

Table 1-14-6 Emission Standard of Cooking Fume

Scale	Small scale	Medium scale	Large scale
Base number of cooking range	≥1，＜3	≥3，＜6	≥6
Maximum allowable emission concentration mg/m^3	2.0		
Minimum removal efficiency of purification facility ％	60	75	85

2.8 Standards for noise impact assessment

1. Environmental Quality Standard for Noise (Class II), GB3096－2008, daytime 60dB(A), nighttime 50dB(A);
2. Emission Standard for Industrial Enterprises Noise at Boundary, GB12348－2008; Implement class II standard for north, east and west boundaries, daytime 60dB (A), night time 60dB (A); implement class 4a standard for the south boundary adjacent to Daqin Railway, day time 70dB (A), night time 55dB (A);
3. Implement Emission Standard of Environment Noise for Boundary of Construction Site, GB12523-2011 for construction noise, the standard limits are 70dB (A) for day time and 55dB (A) for night time. The maximum sound level at night time should not exceed the limit value by 15dB (A) or above.

2.9 Standards for water environment impact assessment

(1) Employ Quality Standard for Ground Water, GB/T14848-93 to conduct status quo assessment for ground water, see table 1-14-7. Ground water is classified into following categories:

Category I: mainly to reflect the natural low background content of chemical composition of ground water, suitable for various purposes.

Category II: mainly to reflect the natural background content of chemical composition of ground water, suitable for various purposes.

Category III: take the human health baseline value as reference, mainly suitable for centralized source water, industrial and agricultural water.

Category IV: based on agricultural and industrial water requirements. In

addition to use as agricultural and industrial waste water, it can be used as drinking water after being properly treated.

Category V: Not suitable for drinking, can be used for other purposes.

Table 1-14-7 Quality Standard for Ground Water (Unit: mg/L, excluding pH and total coliform group)

Item No.	Standard value / Category / Project	Category III	Category IV	Category V
1	pH	6.5～8.5	5.5～6.5，8.5～9	<5.5，>9
2	Ammonia nitrogen (NH_4)	≤0.2	≤0.5	>0.5
3	Nitrate(calculated by N)	≤20	≤30	>30
4	Nitrite (calculated by N)	≤0.02	≤0.1	>0.1
5	Permanganate index	≤3.0	≤10	>10
6	Cadmium	≤0.01	≤0.01	>0.01
7	Chromium (hexavalence)(Cr6+)	≤0.05	≤0.1	>0.1
8	Lead	≤0.05	≤0.1	>0.1
9	Arsenic	≤0.05	≤0.05	>0.05
10	Copper	≤1.0	≤1.5	>1.5
11	Zinc	≤1.0	≤5.0	>5.0
12	Mercury	≤0.001	≤0.001	>0.001
13	Volatile phenol	≤0.002	>0.01	>0.01
14	Chloride	≤250	≤350	>350
15	Total coliform group（/L）	≤3.0	≤100	>100

(2) Treat the waste water with sewage treatment system to meet standard of Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Water Consumption (GB/T 18920-2002), and then reuse it in greening and workshop washing process, see table 1-14-8 for standard limits.

Table 1-14-8 Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Water Consumption (All units are in mg/L, excluding pH)

Serial number	Item	Road cleaning	Urban greening
1	pH value	6.0～9.0	
2	chroma ≤	30	
3	Smell	barely harmless	
4	Turbidity/NTU ≤	10	10
5	TDS/(mg/L) ≤	1500	1000
6	BOD_5/(mg/L) ≤	15	20
7	Ammonia nitrogen /(mg/L)	10	20
8	Anionic surfactant/(mg/L) ≤	1.0	0.5

9	Iron /(mg/L) ≤	——	—
10	Manganese/(mg/L) ≤	——	—
11	DO/(mg/L)	1.0	
12	Total residual chlorine /(mg/L)	After contact for 30min≥1.0，end of pipe network≥0.2	
13	Total coliform group (A/L) ≤	3	

2.10 Standards for soil impact assessment

Environmental Quality Standard For Soils, GB15618－1995 is adopted for soil impact assessment, refer to table 1-14-9 for details.

Table 1-14-9 Standards for soil impact assessment (mg/kg)

Class / pH value of soil / Item		Class 1	Class 2			Class 3
		Natural Context	<6.5	6.5~7.5	>7.5	>6.5
Cadmium	≤	0.20	0.30	0.30	0.60	1.0
Mercury	≤	0.15	0.30	0.50	1.0	1.5
Arsenic paddy field	≤	15	30	25	20	30
Dry field	≤	15	40	30	25	40
Copper farmland	≤	35	50	100	100	400
Orchard	≤	—	150	200	200	400
Lead	≤	35	250	300	350	500
Chromium paddy field	≤	90	250	300	350	400
Dry field	≤	90	150	200	250	300
Zinc	≤	100	200	250	300	500
Nickel	≤	40	40	50	60	200

Class 1 standard: the limit values set to protect the regional natural ecology and maintain the soil environment quality in the natural context.

Class 2 standard: the limit values to ensure agricultural production and protect human health.

Class 3 standard: the critical value of soil to ensure agricultural and forestry production and normal growth of plants.

2.11 Standard for pollution control on hazardous waste storage

The project implements Standard for Pollution Control on Hazardous Waste Storage, Standard for Pollution Control on Hazardous Waste Storage,

GB18597-2001 for the fly ash generated in flue gas purification process.

2.12 Environmental risk standard

According to HF [2008] No.82 document entitled “Notice on further deepening environment impact assessment management of biomass power generation project”, dioxin accidents and risk assessment standard should be handled and implemented by following the daily tolerable intake level, 4pgTEQ/kg. Daily allowable intake level through breathing should be 10% of the daily tolerable intake level.

2. Project Description and Engineering analysis

2.1 Construction scale

The municipal solid waste incineration power generation project in Ji County, Tianjin City (phase 1) intends to set two incineration-flue gas purification lines with treatment capacity of 350 ton per day as well as 1 set of 12MW steam turbine generator unit, in order to generate power through incinerating municipal solid waste. Each line in the refuse incineration plant runs for 8,000 hours each year, and the total capacity of the incineration plant per year is 233,000 ton.

2.2 Basic information of waste

2.2.1 Supply of municipal solid waste

Municipal solid waste is the major raw material used in the project. Municipal solid wastes in Tianjin City include: kitchen waste, brick and ceramic, plastic, metal, paper and wood . This project mainly focuses on the municipal solid waste in Ji County, treating about 233,000 ton each year. Those wastes are sent to the municipal solid waste incineration plant in Ji County by Municipal Appearance Environment Management Committee of Ji County.

2.2.2 Physical composition of waste

According to the design document, the physical compositions of municipal solid waste in Ji County are listed as below. The physical composition o the MSW are decided by sampling method.

Table 2-2-1 Physical compositions of municipal solid waste in Ji County

ITEM	ORGANICS		INORGANICS		RECYCLABLE						KITCHEN WASTE	MIX	OTHER	TOTAL
Content（%）	Animal	Plant	Dust	Bricks and ceramics	Paper	Plastic and rubber	Textile fabric	Glass	Metal	Wood				
	1.50	2.72	1.29	1.42	13.79	16.84	2.57	2.39	0.34	0.76	22.29	25.85	8.24	100

Volume weight of waste: 300～650kg/m^3

Water content: 40～60%

2.2.2 Heat value of waste

The design document shows that the lower heat value of municipal solid waste in Ji County is about 5300kJ/kg.

The lower heat value (LHV) is designed by incinerator as below:

Lower heat value of waste at rated design point:　6280kJ/kg (1600kcal/kg)

LHV range adaptive to the incinerator: 4200～7500kJ/kg

(1000～1800 kcal/kg)

According to the data provided by construction unit, the raw waste should be transported to and stored in the waste storage tank in front of the factory area by a garbage truck prior to entering the incinerator. After going through filtration and fermentation in the waste storage tank, the heat value of waste will rise to some extent.

Besides, the heat value of municipal solid waste is closely related to people's living standard and fuel structure. With the continuous improvement of people's living standard as well as the gradual increase of urban fuel gas, the combustible compositions in the municipal solid waste grows gradually, along with the rise of waste heat value.

2.3 Configuration of incineration line and incinerator

2.3.1 Configuration of incineration line

According to the design document, 350 ton/day ×2 configuration scheme will be adopted in phase 1 of this project, which will treat 700 ton municipal solid waste each day, and 233,000 ton per year.

2.3.2 Configuration of waste heat boiler

Waste heat boiler used in the projects takes an internationally commonly used configuration parameters of heat waste boiler, that is superheated steam pressure of 4MPa, superheated steam temperature of 400℃, feed water temperature of 130℃ and boiler efficiency ≥80%.

2.3.3 Configuration of steam turbine generator unit

The project generates power by waste incineration heat and the steam turbine generator unit will not participate in grid network peaking. All the power generated will be put in network except for serving itself. The project has 1 set of medium-temperature and medium-pressure condensing steam turbine sets of 12MW installed capacity.

2.3.4 Configuration parameters of incinerator

Please see table 2-2-2 for configuration parameters of incinerator.

Table 2-2-2 Configuration parameters of incinerator

Equipments	Parameter	Quantity
Incinerator	Quantity	2 set
	Rated treatment capacity per set	350 ton/day
	Maximum treatment capacity per set	385 ton/day

	Rated mechanical load of grate	283kg/m^2·h
Waste heat boiler	Quantity	2 set
	Superheated steam pressure	4.0MPa
	Superheated steam temperature	400℃
	Maximum continuous rating	26.8t/h. set
	Feed water temperature	130℃
	Boiler efficiency	≥80%
Steam turbine generator unit	Quantity	1 set
	Power	12MW
	Inlet steam temperature	435℃
	Inlet steam pressure	3.82 MPa

2.3.5 Cooling method of condenser

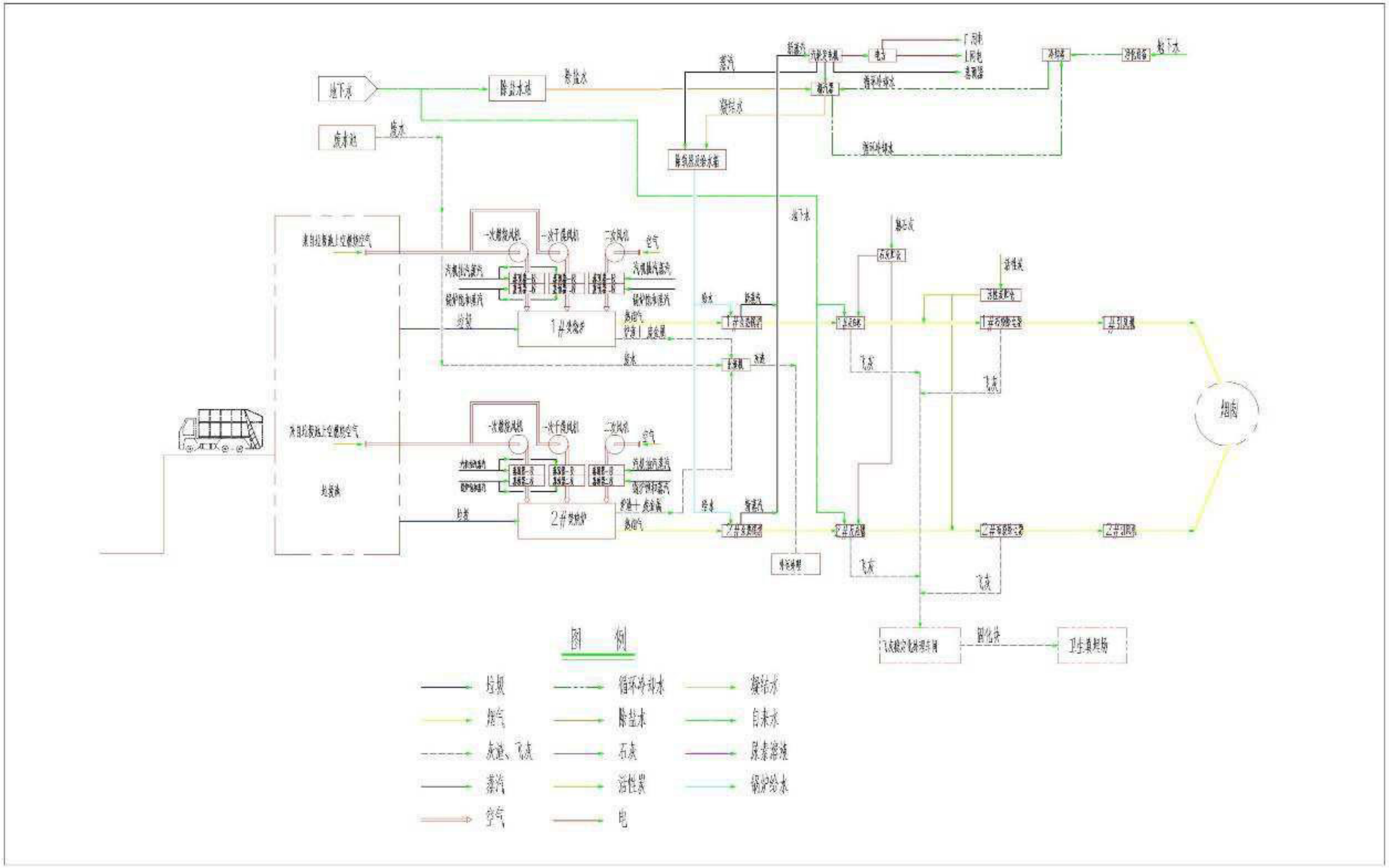
The condenser has two cooling methods: water cooling and air cooling. Water cooling method is supposed to be adopted in this project, and the ground water will be used as cooling water.

2.3.6 Configuration of by-pass system

No by-pass steam condensation system will be set in phase 1 of the project. The waste heat boiler is equipped with a temperature and pressure reducer. Once an accident happens, the steam will enter in circulating cooling water system by way of temperature and pressure reducer.

2.4 Procedure of municipal solid waste incineration system

See figure 2-4-1 for the working procedure of municipal solid waste incineration system.



Please provide English translation of labels in the flow chart.

Figure 2-4-1 Flow chart of waste incineration system

2.4.1 Waste receipt and storage system

(1) System introduction

Municipal waste should be transported to the plant by special garbage truck, and then accept inspection to confirm if the acceptance criteria is met. The construction waste will be forbidden to enter the plant. After passing the inspection, the garbage truck will go through the truck automatic weighing device, plant road and the trestle to enter in the two-level unloading hall in the front of main plant. The unloading hall is located indoor to avoid rain and diffusion of malodorous gas. The waste storage tank is designed to a maximum capacity of 16595 m^3, capable of storing up to 10-days of waste. There is an exhaust inlet installed by the side of incinerator above the waste storage tank for the purpose of indrawing odor in the tank as combustion air in the incinerator and putting waste storage tank in negative pressure state, thus to avoid the accumulation and release of foul odor and methane gas. In addition, a ventilation and deodouring system is set on the top of waste storage tank to ensure the odor stored in the tank to be purified and deodorized by deodorization device prior to discharge to avoid pollution during shutdown of incinerator. Also, the waste storage tank also has leachate collection, storage and transportation system. Please see figure 3-4-2 for the procedure of leachate treatment system.

(2) Deodorization measures for waste unloading hall and waste storage tank

a) The ground of waste unloading hall adopts anti-seepage measures, with the osmotic coefficient $K \leq 10^{-7}$cm/s.

b) Above the passage leading from waste storage tank to the main plant there is a sealed chamber. By supplying air to the sealed chamber to keep it in positive pressure state, the odor will be prevented from entering into the main plant; all passages leading from the waste storage tank to the outside are equipped with sealed chamber.

c) Set turncock at corresponding part of unloading platform in order to clean the floor polluted in unloading process. The floor is designed with a certain slope for ease of discharge of washing water from the drainage ditch to drainage tray on platform.

d) Set an air curtain in front of entrance to the unloading hall to prevent odor to escape from the unloading hall.

e) Set an exhaust inlet of primary air on the top of waste storage tank. The primary air fan of incinerator will draw in the odor from the tank for the use of incineration, thus to put waste storage area in negative pressure state to avoid odor from overflowing.

f) In process of overhaul, a special air duct will be set to indraw odor from the waste storage tank through a deodorizing fan, and discharge into atmosphere after deodorizing and filtering with activated carbonspraying deodorization liquid.

g) Set a combustible gas detector in the waste storage tank. Once it is detected to exceed the standard, the deodorization fan will be started automatically to feed odor into the activated carbon absorption device in deodorization system. After deodorization treatment completed, discharge it into atmosphere.

h) Waste unloading gate will separate unloading platform from the waste storage tank, in order to prevent dust, odor and insects in the tank from entering into the platform. Therefore, the unloading gate is required to be highly air-tight. To ensure the waste collecting vehicle to work smoothly during centralized running period, the unloading gate should be able to open and close quickly.

See table 2-4-1 for names, specifications and quantities of major equipments in waste receipt system.

Table 2-4-1 Names, specifications and quantities of main equipments in waste receipt system

Serial number	Equipment name	Specification of equipment	Quantity	Remarks
1	Waste weighing system			
1.1	Weighbridge	Pressure sensor, weighing capacity of 50t, division value of 20kg	2	
2	Waste unloading system			
2.1	Electrically operated gate to the unloading hall	Net electricity output (N)=5.5kW	2	
2.2	Air-tight gate	3.8×5m	6	
2.3	Unloading gate inductor		13	
2.4	Electrically operated gate at grabbing and overhaul site	N=5.5kW	2	
3	Refuse crane			
3.1	Double-beam grab crane	Lifting capacity: 11 t Grabbing capacity: 6.3m^3	2	1 for use and 1 for

Serial number	Equipment name	Specification of equipment	Quantity	Remarks
		Operation: automatic/semi-automatic		spare
4	Deodorization system in waste storage tank		1	
4.1	Activated carbon absorption deodorization device		1	
4.2	Deodorization fan	Q=15000Nm^3/h, N=150kW	1	
5	Leachate removal system			
5.1	Sewage pump		2	

2.4.2 Waste incineration system

(1) Waste incineration procedure

It adopts grate incinerator and works in the following procedure: waste grab crane grabbing waste→feed hopper→feed trough→hydraulic pusher→drying zone of grate→ignition zone→combustion→burn-out, after sufficient burning, the slag remaining from sufficient burning will be discharged by slag extractor. The ignition load of slag ≤5%. In order to fully decompose dioxin in flue gas, it must be ensured that the flue gas willstay in the combustion chamber for above 2 seconds under the temperature of above 850 ℃.

(2) Design parameters of incinerator

See table 3-4-2 for design parameters of incinerator.

Table 3-4-2 Design parameters of incinerator

Serial number	Item		Design parameter
	Treatment capacity	Rated	14.58t/h
		Maximum	16.04t/h
		Minimum	10.21t/h
2	LHV for design		6280kJ/kg（1500kcal/kg）
3	LHV applicable scope		4200～7500 kJ/kg（1000～1800kcal/kg）
4	Grate type		Completely continuous combustion grate
5	Operation load range		60～110%
6	Annual operation time		≥8000h
7	Quantity of incinerator		2 sets
8	Annual feeding waste quantity		233,000 ton
9	Ignition loss of slag		≤5%

10	Flue gas temperature at combustion chamber outlet	850～950℃
11	Flue gas temperature at incinerator outlet	900～1000℃

(3) Ignition and combustion-supporting system

The role of ignition burner is to raise the temperature at the incinerator outlet to the required temperature of above 850℃) using fuel oil when the incinerator has no waste to ignite. The next step is to feed waste into the incinerator to avoid the waste in the incinerator from burning under low temperature, thus causing the air pollutants to exceed the limit. Every incinerator is equipped with two sets of ignition burner fueled by light diesel fuel No. (7MW), which is supplied from oil depot. And the oil consumption is 270l/h, and consumption of oil per ignition and annual total consumption are not stable..

Auxiliary burner is used under the circumstance of incinerator blowing out or LHV not reaching 850℃. In such case, the auxiliary burner will inject auxiliary fuel, light diesel fuel No.0 to ensure the temperature of flue gas above 850℃ for at least 2s. Light diesel fuel No.0 is stored in a 30m^3 oil storage tank buried in the ground.

(4) Combustion air system

Combustion air system is composed of a primary and secondary air system.

Primary air is composed of primary dry air, primary combustion air and primary burn-out air. Primary blast main draws out air from the upside of waste storage tank, and divides it into primary dry air and combustion air, which will be heated by the steam preheater to 220℃ prior to entering in the drying and combustion combined chamber at the bottom of grate. And then it will enter in the combustion chamber through air shutter in chambers. Primary burn-out air, which is drawn out from the boiler room by the primary burn-out fan, will be sent into the public burn-out chamber at the bottom of grate. Primary air also has a function of cooling the fire grate segment, and its volume is controlled by speed regulation transducer and ventilation door of primary air fan.

Secondary air is derived from air in boiler room by secondary air fan. After being heated by secondary air preheater (air temperature ～220℃), it will be injected the combustion chamber via the secondary nozzle above the front and rear arch, to mix the air with flue gas and start secondary combustion of combustible gas, thus to minimize the level of CO in flue gas. In the meantime, the flue gas will remain at a temperature of 850℃ for more than 2 sec, in order to ensure complete decomposition of dioxin. Volume of secondary air is controlled by speed regulation transducer and ventilation door of primary air fan. Secondary air heating steam and level-1 heating steam is achieved by stage 1 extraction of steam turbine while the level-2 heating steam is from the saturated steam in drum.

Table 2-4-3 lists the names, specifications and quantities of major equipments in incineration system, and figure 2-4-3 shows the working procedure of incineration system.

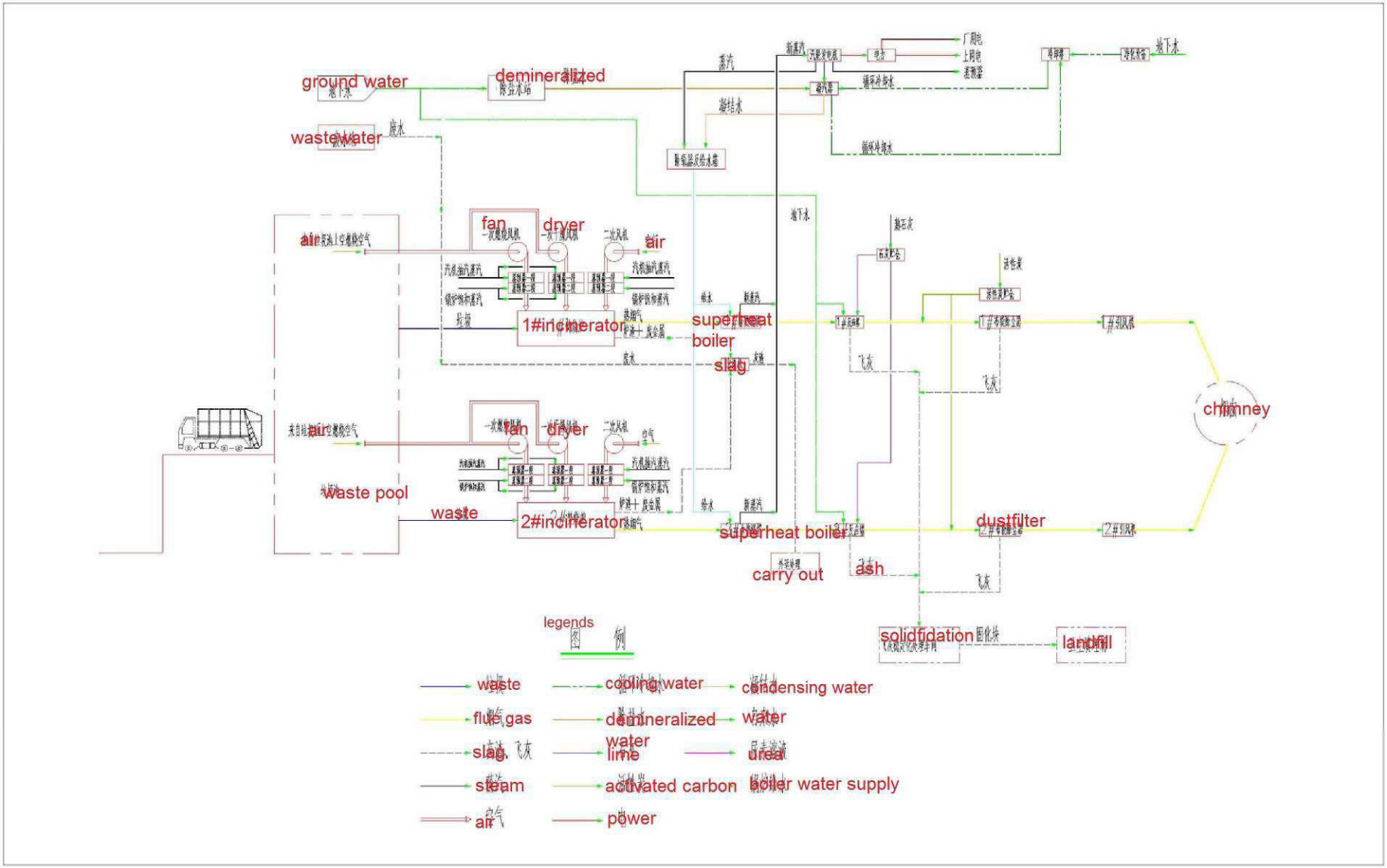


Figure 2-4-3 Flow chart of waste incineration system

Table 2-4-3 Names, specifications and quantities of major equipments in incineration system

Serial number	Equipment name	Model and specification	Quantity
1	Incinerator system	SLC-QWNT-350	
1.1	Feed hopper	V=6.3m^3	2
1.2	Slide pipe and cooling system		3
1.3	Fire grate type	Reverse grate	
1.4	Level of reverse grate		13
1.5	Ignition burner	N=7MW	6
2	Combustion air system		
2.1	Primary drying fan	Blast capacity: 19620m^3/h Pressure head: 6609Pa Motor power: 75kW variable frequency motor	2
2.2	Primary combustion fan	Blast capacity: 30157m^3/h Pressure head: 7464Pa Motor power: 110kW variable frequency motor	2
2.3	Primary burn-out fan	Blast capacity: 6440m^3/h Pressure head: 5840Pa Motor power: 30kW variable frequency motor	2
2.4	Secondary air fan	Flow: 19319m^3/h Pressure head: 6056Pa Motor power: 55kW variable frequency motor	2
2.5	Draught fan	Flow: 131940m^3/h Pressure head:5975Pa Motor power:315kW variable frequency motor	2
2.6	Primary dry air steam-air preheater	Type: two-stage heat exchanger	2
2.7	Primary combustion air steam-air preheater	Type: two-stage heat exchanger	2
2.8	Secondary air steam-air preheater	Type: two-stage heat exchanger	2

2.4.3 Waste heat boiler

Each incinerator is equipped with a waste heat boiler for purpose of generating superheated steam for steam turbine generator by absorbing the heat generated by waste incineration. The waste heat boiler is a natural circulation boiler with a single drum.

See table 2-4-4 for names, specifications and quantities of major equipments in waste heat boiler system.

Table 2-4-4 Names, specifications and quantities of major equipments in waste heat boiler system

Serial number	Equipment name	Model and specification	Quanti ty
1	Waste heat boiler	SLC350-4.0/450-31.1	2
1.1	Evaporation system	Provided with boiler	
1.2	Superheater	Provided with boiler	
1.3	Attemperater	Provided with boiler	
1.4	Economizer	Provided with boiler	
1.5	Air preheater	Provided with boiler	
2	Boiler		
2.1	Intermittent blowdown flash tank	DP-3.5	1
2.2	Continuous blowdown flash tank	LP-3.5	1
2.3	Condensate collector	Provided with steam turbine	
2.4	Drain flash tank	V=3m^3	1
2.5	Drain tank	V=20 m^3	1
2.6	Drain pump	Q= 25m^3/h，H=80m	2
3	Boiler water dosing system		
3.1	Mechanical mixing solution tank	V=1.0m3	2
3.2	Diaphragm metering pump	Q=60L/h，P=10MPa	3

2.4.4 Steam turbine generation system

The generator system is composed of main steam system, main feed system, recovery steam extraction system, steam sealing system, drain system, circulating water system, vacuum pumping system, turbine condensate system, by-pass condensation system and auxiliary equipments.

(1) Main steam system and by-pass system

Live steam from the boiler enters in the turbine steam room through the main throttle valve, the waste steam will enter in the condenser and condensed into water, which will be injected to the sealing heater, deaerator and other regenerative systems by the condensate pump.

During the maintenance of steam turbine generator unit, incinerator has to continue to burn the waste and the waste heat boiler has to keep running, for such reason, a by-pass vapour condensation system is needed. First phase of project did not set a by-pass system. But in the second phase of project, a set of 6MW

turbine is added after construction, and both the 12MW and 6 MW turbine condensers are set with by-pass steam interfaces. When the turbine shut down accidentally or boiler starts working, the main steam will enter in the condenser of unmaintained turbine through a by-pass temperature and pressure reducer to be into water, or be recycled.

(2) Steam extraction system

Steam used in deaerator, air heater and gas reheater is extracted by turbine through regeneration extraction opening.

(3) Drain and blow-down system

Drain in turbine body, steam seal pipeline, steam extraction pipeline and regulating valve stem will be used to the drain flash tank. Drain transfers by the following order: drain with the highest pressure is most distant from drain flash tank or condenser.

See table 2-4-5 for technical-economic indicators of the plant.

Table 2-4-5 Technical-economic indicators of the plant

Serial number	Item	Unit	Numerical value
1	Annual waste feed quantity of incinerator	Ten thousand	23.31
2	Boiler capacity	kg/h	53600
3	Steam feed quantity of turbine	kg/h	53600
4	Steam discharge quantity of turbine	kg/h	42600
5	Quantity of chemical supplementary water	kg/h	1200
6	Feed water quantity of boiler	kg/h	58800
7	Steam consumption of air preheater (steam extraction)	kg/h	7320
8	Saturated steam quantity of air preheater	kg/h	4660
9	Steam consumption of deaerator	kg/h	3200
10	Auxiliary fuel oil consumption	kg/h	100
11	Annual running hours	h	8000
12	Annual power generation at design point	kWh	8.159×10^{7}
13	Station service power consumption rate	%	20

See table 2-4-6 for names, specifications and quantities of major equipments in steam turbine generation system.

Table 2-4-6 Names, specifications and quantities of major equipments in steam turbine generation system

Serial number	Equipment name	Model and specification	Quantity	Remarks
1	Steam turbine generator unit			
1.1	Extraction condensing steam turbine	N12-3.8	1	
1.2	Generator	QF-12-2	1	Supplied by manufacturer of steam turbine
1.3	Generator air cooler	450KW	1	Supplied with generator
1.4	Exciter	Without exciter		Static silicon controlled excitation
1.5	Condenser	N-1200-8	1	Supplied together with steam turbine
1.6	Condensation pump	4N6×2	2	One for use and one for spare
1.7	Pressure oil filter		1	
2	Deaeration water feed system	Capacity 75t/h, outlet water temperature 130℃, medium-pressure revolving film deaerator	1	
2.1	Thermal deaerator	V=30m^3	1	
2.2	Feed-water tank	V=30m^3	1	Provided together with deaerator

2.4.5 Slag treatment system

In this project, slag mainly refers to the residue from waste incineration and the quantity depends on the waste component. In the first phase of project, about 140t slags come out every day, mainly composed of MnO, SiO_2, CaO, Al_2O_3, Fe_2O_3 and little unburned organic matters and waste metals. Grate-type incinerator is adopted in this project to ensure ignition loss of slag ≤5%.

Each incinerator is equipped with one set of hydraulic slag extractor. After the waste

goes through complete combustion in process of grate movement, the slag will be discharged by slag extractor, transported to slag pit by slag extractor and vibrating conveyer, and then loaded into the slag truck by grab crane to transport out. The slags can be used for comprehensive utilization, or sent to landfill. An electromegnatic iron removal device is installed above the vibrating conveyer to collect the magnetic metal scrap from the slags.

Slag output of the project is 140t/d; the effective storage volume of the slag pit in incineration workshop is 840m^3, capable of storing 6 days' slags.

2.5 Flue gas purification process

2.5.1 Parameters and emission standard of flue gas

According to the design document, the quantity and composition of flue gas discharged from the waste heat boiler in this project is list below:

Flue gas quantity (2 sets of waste heat boiler) : 128200Nm^3/h;

Temperature: 220℃

Composition: H_2O—21.27% (volume)
CO_2—10.23% (volume)
O_2—9.46% (volume)
N_2—58.04% (volume)

According to the design document, main pollutants and concentration in the flue gas are shown in table 2-5-1.

Table 2-5-1 Main pollutants and concentration in the flue gas

Name of pollutant	Variation range (mg/Nm^3)
Soot	8000～10000
HCl	800～1500
SO_2	500～800
HF	50
NO_X	300～400
CO	≤200
Pb+Cu+As+Sb	50～100
Hg	≤1
Cd	≤4
Dioxin	Less than 5(ngTEQ/Nm^3)
Note: Content of dry basis and O_2 is calculated as 11%.	

See the below table for designed pollutant emission target and emission standard to be implemented.

Table 2-5-2 Designed emission target and emission standard in the project

Serial	Pollutant	Unit	National	Designed	Observed values

number			standard	value	Changzhou	Binhai
1	Soot	mg/Nm^3	80	20	2.6～9.4	1.4～4.1
2	HCl	mg/Nm^3	75	30	0.017～33.3	2.03～24.5
3	HF	mg/Nm^3	-	5	—	—
4	SO_2	mg/Nm^3	260	80	20～24	32.8～43.5
5	NO_X	mg/Nm^3	400	200	246～249	151～198
6	CO	mg/Nm^3	150	100	70～82	None detected
7	Hg	mg/Nm^3	0.2	0.05	1.47×10^{-5}～4.46×10^{-5}	8.1×10^{-6}～3.56×10^{-3}
8	Cd	mg/Nm3	0.1	0.05	2.0×10^{-3}	8.1×10^{-5}～2.64×10^{-3}
9	Pb	mg/Nm3	1.6	1.6	0.04L	1.2×10^{-3}～4.52×10^{-2}
10	Flue gas blackness	Ringelmann grade	1	1.0	<1	<1
11	Dioxin	$ngTEQ/Nm^3$	0.1*	0.1*	—	—

*Implement as per HF[2008] No.82 document "The announcement on the bio-mass power projects".

The data is based on the monitoring on emission from incinerator chimney of Changzhou Dynagreen Environmental Protection and Thermal Electricity Co., Ltd. and monitoring data of waste incineration power plant project in Binhai New District provided by Tianjin Environment Monitoring Center in August 2012. Changzhou Dynagreen Environmental Protection and Thermal Electricity Co., Ltd. has a treatment capacity of 1050t/h, and the waste incineration power plant runs smoothly at time of monitoring. The flue gas purification system of Changzhou Dynagreen Environmental Protection and Thermal Electricity Co., Ltd. adopts the combined process of "dry deacidification+activated carbon injection+bag-type dust remover", without denitrification treatment process. Treatment capacity of waste incineration power plant project in Binhai New District is 1500t/h, the flue gas purification system adopts the combined process of "SNCR system+semi-dry deacidification+activated carbon inject+bag-type dust remover". This project adopts the same flue gas treatment process as the waste incineration power plant project in Binhai New District, superior to the one adopted by Changzhou Dynagreen Environmental Protection and Thermal Electricity Co., Ltd.

There are 10 kinds of pollutants taken into account by the project design, among which

design objectives for “flue gas blackness” and “Pb” conform to the national emission standard, while the design objectives for the rest of the pollutants are stricter than the national standard limit. This report will work in accordance with design value and take it as the basic data for calculating total emission of pollutants.

2.5.2 Flue gas purification process

Each waste incineration line has one set of flue gas purification system, totaling 2 sets of independent flue gas purification system. Flue gas purification is mainly aimed at controlling acid gas, PM, heavy metal and organics in flue gas in accordance with designed emission targets. The system is composed of equipments applied in acid gas removal, PM gathering, NO_x, organics and heavy metal removal processes. It adopts the combined process of “SNCR+lime slurry spray drying reaction tower+slaked lime, activated carbon injection+bag-type dust remover”, which involves the following equipments and systems: denitrification system, lime powder injection system, activated carbon injection system, bag-type dust remover system, fly ash collection, transportation and storage system.

(1) Denitrification system (SNCR system)

Nitric oxide is produced from waste incineration. Its formation is dependent on the temperature and air content in incinerator, and it is normally produced above the temperature of 1200℃. In this project, the concentration of nitric oxide can be controlled within 400mg/Nm^3 by means of controlling combustion temperature between 850 to 1050℃ as well as the excess air coefficient.

SNCR method is to inject 25% ammonia hydroxide into the flue gas, and enable it to react with NO_x in high temperature zone (900～1100℃), thus to remove NO_x by reverting it to N_2 and H_2O.

$4NO+4NH_3+O_2=4N_2+6H_2O$

$4NO+4NH_3+O_2=4N_2+6H_2O$

Figure 3-5-1 shows SNCR system procedure; table 2-5-3 lists main equipments.

Table 2-5-3 Names, specifications and quantities of main equipments in SNCR system

Serial number	Equipment name	Model and specification	Quantity	Remarks
1	Ammonium hydroxide storage tank	V=30m^3	1	
2	Ammonium hydroxide	Q=30m^3/h，H=20m	1	

Serial number	Equipment name	Model and specification	Quantity	Remarks
	injection pump			
3	Ammonium hydroxide transfer pump	Q=500L/h，P=1.0MPa	2	1 for use 1 for spare
4	Soft water transfer pump	Q=1.2m^3/h，P=1.0MPa	2	1 for use 1 for spare
5	Nozzle	Q=100L/h;P≧0.2MPa	12	6 nozzles per set

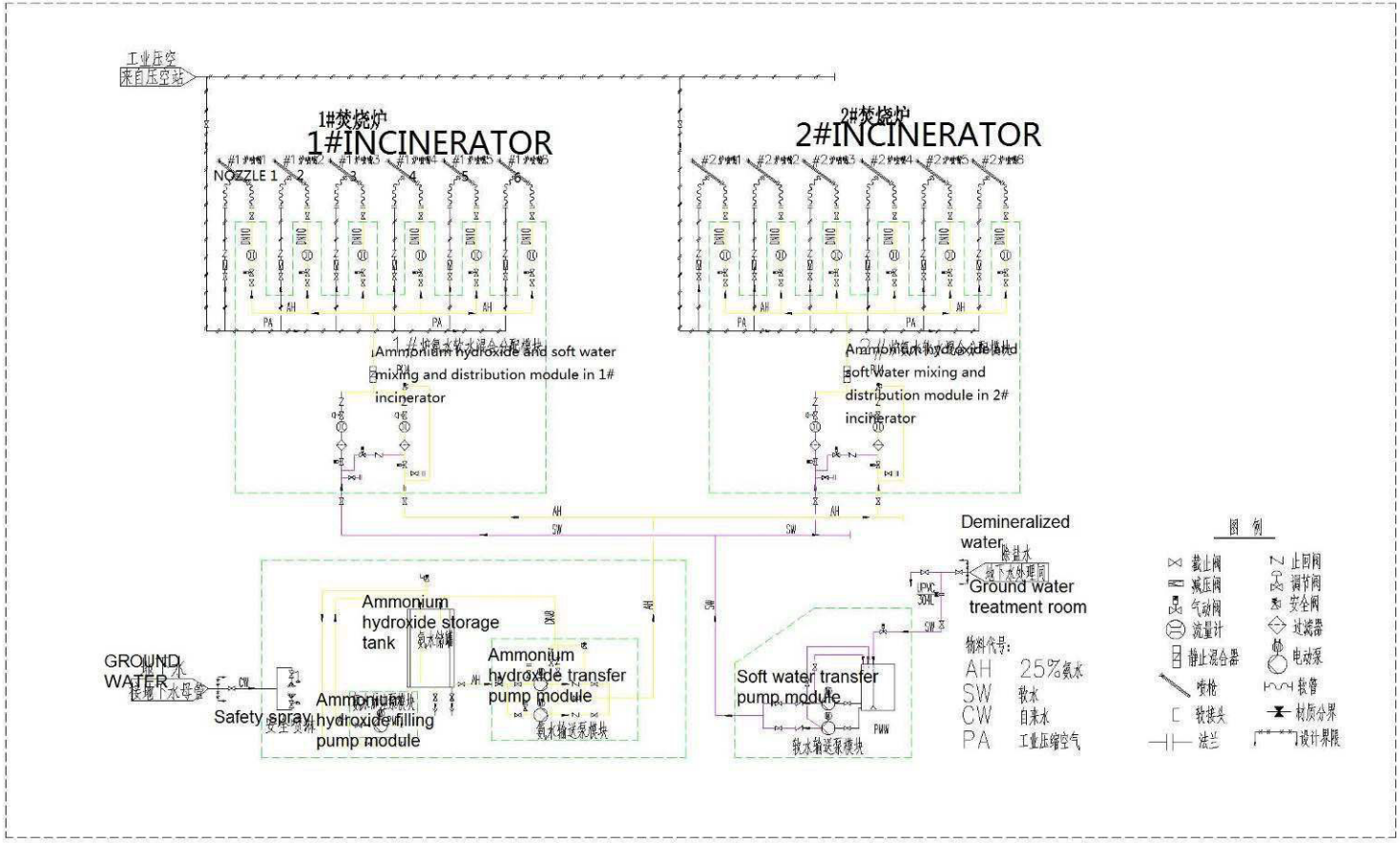

1#INCINERATOR
2#INCINERATOR
NOZZLE 1
Ammonium hydroxide and soft water mixing and distribution module in 1# incinerator
Ammonium hydroxide and soft water mixing and distribution module in 2# incinerator
Demineralized water
Ground water treatment room
Ammonium hydroxide storage tank
Ammonium hydroxide transfer pump module
Ammonium hydroxide filling pump module
Soft water transfer pump module
GROUND WATER
Safety spray
物料代号:
AH 25%氨水
SW 软水
CW 自来水
PA 工业压缩空气
图 例

Figure 2-5-1 Flow chart for SNCR system process

(2) Deacidification reaction tower

Transport lime by tank truck from the outside and store in the lime storage silo. Import the lime powder into the digestion tank by quantative screw conveyer and mix it with water to prepare lime slurry (with concentration of 25%). The lime slurry will flow into the slurry storage tank and become into 15% (10%~17%) lime slurry by adding water. The lime slurry pump will then send it into the mechanical rotary atomizer driven by high-speed motor at the top of semi-dry deacidification reaction tower. By action of the powerful centrifugal force, the absorbent lime slurry will be fully atomized. The atomizer has a great advantage in atomizing absorbent lime slurry.

Through heat recovery by waste heat boiler, the temperature of flue gas in incinerator reaches 190～230℃. After that, it enters from the upside of rotary spray drying and deacidification reaction tower to fully contact and react with lime slurry droplet injected from the rotary atomizer located on the top of tower, to produce calcium salt in powder form. The goal is to lower the temperature and remove harmful gas such as SO_2 and HCl from the flue gas.

The mixture of atomized lime slurry results to the following chemical reactions with high-temperature flue gas in the rotary spray drying and deacidification reaction tower.

$Ca(OH)_2+2HCl=CaCl_2+2H_2O$

$Ca(OH)_2+SO_2=CaSO_3+H_2O$

$Ca(OH)_2+SO_3=CaSO_4+H_2O$

The moisture in droplet will be evaporated, thus to produce some drier in powder form (with main compositions such as $CaCl_2$, $CaSO_3$, $CaSO_4$, $Ca(OH)_2$ and soot, which are all collected by the bag dust collectors at the bottom and back of tower.

Firstly, inject $Ca(OH)_2$ in the gas duct. The agent will react with acid gas in the gas duct, production of which will enter in the filter together with unreacted agent, so as to continue reaction with acid gas on the surface of

filter bag to achieve a better deacidification efficiency. On the other side, the collected reaction product will be sent to the silo together with dust by some conveying equipment.

(3) Activated carbon injection system

Dioxin can be produced and discharged in course of waste incineration, so the activated carbon will be injected into the flue gas duct before filter to remove the heavy metal and dioxin to ensure the emission concentrations of heavy metal and dioxin are within the national emission standard.

Since activated carbon has a great specific surface area, the required purification efficiency will be achieved as long as it is mixed uniformly with flue gas for sufficient time. After being injected into the duct, the activated carbon starts absorbing dioxin, Hg and other heavy metals in the duct, not yet reaching saturation. After that, it enters in the bag-type dust remover together with flue gas and attaches to the surface of filter bag to make full contact with flue gas going through the bag surface. In this way, the heavy metals and dioxin will be removed completely.

Activated carbon used in this project is transported to storage silo in the flue gas purification system by a special truck arranged by supplier. The activated carbon storage silo are supported with high and low level meter, hopper filter, vacuum release valve, hopper wall vibrator and utility holes. The capacity of activated carbon storage silo is enough for use of above 10 days(nearly 3.5 tons). Each flue gas purification system is feed independently and added with activated carbon continuously, with add amount controlled is controlled by buffer hopper and quantative screw feeder. Activated carbon is injected by a venturi injector into the outlet duct of reaction tower. The amount of activated carbon used is adjusted according to the change in boiler load and monitoring data of dioxin in laddering method. The compressed air used for activated carbon injection is supplied by air compressor plant.

(4) Bag-type dust remover system

It adopts off-line high-pressure pulse dedusting bag-type dust remover to remove fly ash from the flue gas efficiently.

(5) Gas duct system

Incinerator, waste heat boiler, spray drying deacidification reaction tower

and bag-type dust remover all run at a negative pressure. For each production line, a draft fan is arranged by the end of flue gas treatment line so as to keep the whole system under negative pressure. The duct fan is equipped with frequency converting control device, which realizes automatic operation for duct fan according to the negative pressure signal of incinerator. The air volume of duct fan is as much as 120% of the maximum calculated air volume; the pressure head is designed for 120% of the maximum calculated pressure loss.

(6) Chimney

A double-barreled steel chimney composed of 2 steel chimneys will be built for each line. The chimney is 80m, with 1.7m inner diameter of outlet. The outlet temperature is 150℃.

2.5.3 Fly ash treatment system

In this project, there is fly ash produced in flue gas purification process with the output (before curing) of 21t/d, 7,700 t/a. After curing process, the output of wet ash arrives at 10,700t/a.

Fly ash and cement are transported from their respective silo to dosing machine by an airtight screw conveyer while the chelating agent solution and water are also injected from their respective transfer pumps into the dosing machine on a proportional basis. In the dosing machine, various powdery matters, chelating agent solution and water are mixed adequately to meet the requirement and then kneaded into a shape. Fly ash mixture in steady state should meet the following requirements: moisture content no more than 30%; content of dioxin below 3μgTEQ/Kg; the leaching agent prepared as per HJ/T300 Solid Waste-Extraction Procedure for Leaching Toxicity-Acetic Acid Buffer Solution Method should meet requirements specified in GB16889-2008 Concentration Limits for Leachate Pollutants in terms of concentration of hazardous ingredients in leachate. After being approved by a qualified unit, it will be sent by a conveyor to the curing slot for temporary storage prior to burning in landfill. Hereon, Huanmei Waste Treatment Plant in Ji County, Tianjin City has issued a fly ash treatment commitment, as shown in

attachment 6.

See table 2-5-4 for names, specifications and quantities of main equipments in fly ash treatment system.

Table 2-5-4 Names, specifications and quantities of main equipments in fly ash treatment system

Serial number	Equipment name	Model and specification	Quantity	Remarks
1	Fly ash storage silo	Φ6000x10500mm	1	1. Used in phase 1 and 2
2	Filter at top of fly ash storage silo	PMD-4（A）	1	
3	Filter fan	C4-68 2.8A	1	
4	Discharging spiral at bottom of fly ash storage silo	LS315	1	
5	Cement storage silo	V=30m^3	1	
6	Filter at top of cement storage silo	CH3M24	1	
7	Cement feeding device	YXD200	1	
8	Spiral conveyer	LS200	1	
9	Dosing machine	MEO750	1	
10	Humidifier tank	V=3m^3	1	
11	Humidifier pump	Q=6.5m^3/h,N=0.75kW	2	
12	Chelating agent storage tank	V=3m^3	1	
13	Chelating agent transfer pump	Q=6.5m^3/h,N=0.75kW	2	

2.5.4 Equipment arrangement

Flue gas purification system is composed of flue gas purification room and storage room. The former locates deacidification reaction tower, bag-type dust remover while the later locates storage silos for lime, cement, activated carbon and fly ash.

2.6 Public utilities

2.6.1 Water supply and drainage and waste water treatment system

2.6.1.1 Water supply and drainage system

(1) Water supply system

The project has divided the water source into two parts. At present,it uses ground water as source for drinking water and part of production system. However, this will be replaced with tap water once the project area is covered

by municipal water supply network. Hereon, the construction unit has commissioned Tianjin Runye Water Resource Development Technology Consulting Co., Ltd to prepare "Water Resources Evaluation Report for Municipal Solid Waste Incineration Power Generation Project in Ji County, Tianjin City", which is later approved by Ji County Water Authority. The project's intake quantity of ground water is 2301 m^3/d, 8.39×10^5 m^3/a; the sewage water discharged from cooling tower will be used for washing waste unloading area, washing boiler room, flue gas purification and greening; the reused water volume is $1287m^3/d$, $4.7\times10^5m^3/a$.
See table 2-6-1 and 2-6-2 for water-consumption links and their water consumption.

Table 2-6-1 Consumption of ground water (to be replaced by municipal water in the future)

Serial number	Type of water use	Water consumption(m^3/d)
1	Domestic water	18
2	Lab	2
3	Demineralized water preparation	110
4	Incinerator chute jacket	14
5	Camera cooling	24
6	Fan cooling	72
7	Steam &water sampling device	600
8	Pump cooling	96
9	Circulating cooling water supplementing	1365
Total		2301

Table 2-6-2 Reused water volume

Serial number	Type of water use	Water volume(m^3/d)
1	Slag removal	106
2	Lime-slag area washing	1
3	Boiler room washing	3
4	Flue gas purification room washing	2
5	Waste unloading area washing	5
6	Sewage channel room washing	1
7	Flue gas purification	192
8	Greening	55
9	Car washing	10
10	Fly ash curing	20
11	Unforeseen water consumption	100
12	Circulating cooling water supplementing	792

(2) Water drainage system

In this project, rain water and sewage water is discharged separately. The rainwater is discharged out of the factory through the rainwater pipe network.

Domestic wastewater and industrial waste water is discharged into the sewage treatment station in the factory; part of the water will be used to wash plastics and fields, instead of discharging outside. Please see figure 2-2-1 for the project water balance.

In this project, rain water and sewage water is separated. Sewage water system is composed of domestic wastewater system, industrial wastewater system and leachate system. Since the project site has no drainage pipeline network, all the domestic wastewater, industrial wastewater and leachate will be reused after processed in the sewage treatment station, instead of discharging out.

Rainwater on the steel grid roof of main workshop is discharged by siphonic pressure flow roof rainwater drainage system, at a design recurrence interval of 10 years. Other workshops, comprehensive buildings and pump houses with small roof adopt gravity drainage system at a design recurrence interval of 5 years. On the road in the whole plant, 6mm initial rainwater will be discharged into rainwater collection pool before entering in the sewage treatment station.

2.6.1.2 Waste water treatment system

All of the domestic wastewater, industrial wastewater and leachate will be put into reuse after treatment, instead of discharging out. They are treated with process of anaerobic+MBR+nanofiltration, with a treatment scale of 240m^3/d. Please refer to table 2-6-3 for designed inlet and outlet indexes.

Table 2-6-3 Inlet and outlet indexes designed for domestic wastewater treatment station

Waste water quality index	pH	$CODc_r$	BOD_5	SS	NH_3-N
Inlet water quality	6～9	80000	40000	4000	2500

After being treated by sewage treatment system to meet the standard of Reuse of Recycling Water for Urban and Water Quality Standard for Urban Miscellaneous Water Consumption, all wastewater will be reused for greening and washing workshop, without discharging out. Sludge produced in course of waste water treatment will be incinerated.

2.6.1.3 Circulating cooling water system

Circulating cooling water system has set three circulating water pumps, two for

use and the other one for spare. Two mechanical draft cooling towers are adopted for cooling purpose.

2.6.2 Compressed air station

Compressed air station, located below the unloading hall, is mainly used for cleaning observation hole of incinerator, auxiliary combustion for incinerator, boiler cleaning, leachate collecting, safety and rotary atomizer cooling, bag-type dust remover back flushing, activated carbon injection, pneumatic valve and chemical water treatment. There are three sets of water-cooling screw air compressor set in the station, each of 23m^3/min rated output and 0.8MPa outlet pressure. In normal case, two sets of them will be used and the other one as a standby.

2.6.3 Fuel oil supply system

Light diesel oil No. 0 is used to ignite the incinerator and also serves as auxiliary fuel. A centralized oil depot and oil pump room will be built for the plant, with the oil tank laid underground. Each incinerator will need 24t fuel oil for cold start-up, and 12t for hot start. Let's say the incinerator cold starts for 2 times, hot starts for 2 times, 1 set of 30m^3 horizontal oil tank installed in the oil depot can satisfy 1 ignition demand of two incinerators.

2.6.4 Demineralized water preparation system

Demineralized water is prepared by the process of pretreatment+RO+EDI. Ground water serves as raw water, with designed water inflow of 110m^3/d, design water make-up of 86m^3/ d. About 24m^3/d concentrated water is produced; it will be collected in the concentrated water tank for slag removal water make-up after ph value adjustment process. Th required PH value is 6 to 9.

2.6.5 Heating and ventilation engineering

2.6.5.1 Heating and cooling

The project adopts 95/70℃ hot water supplied from heat exchanger in main workshop as indoor heating medium; in other buildings such as control room, equipment room and comprehensive building, there are electrical air-conditioner adopted for cooling in summer.

2.6.5.2 Ventilation

Please see table 2-6-4 for ventilation design of main buildings.

Table 2-6-4 Ventilation design of main buildings

Serial number	Building name	Ventilation type	Remarks
	Combustion room, steam turbine room	Natural air inlet, natural ventilation	Natural ventilator on the roof
2	Leachate collection room	Introduce the gas into incineration cesspit	Introduced into the incinerator together with waste gas in the cesspit
3	Accumulator room, transformer room, Power distribution room, electrical equipment room	Natural air inlet,mechanical ventilation	Axial flow fan
4	Air compressor room	Natural air inlet, mechanical ventilation	Axial flow fan
5	Deaerator bay, sewage treatment station, demineralizer station, mechanical workshop, slag pit	Natural air inlet, mechanical ventilation	Axial flow fan
6	Oil pump room	Natural air inlet, mechanical ventilation	Axial flow fan

2.6.6 Fire-fighting engineering

In the factory, there is a 648m^3 fire pool (combined with clean water reservoir) surrounded with looped water supply network of DN200 pipe diameter. Fire hydrants are arranged on the ground with distance of 150m or below.

2.6.7 Electrical engineering

The project generator produces 10kV output, which is raised to 35kV by main transformer and sent to Yanliu transformer station at 3.5km distance from the southwest side of the project site to connect to the system and send the extra power into the system. The project has set two main transformers, 1# main transformer 16000KVA, 2# main transformer 8000KVA.

2.6.8 Automatic control engineering

The project makes centralized control of boil-turbine and monitors the incineration system, flue gas purification system, thermodynamic system and electrical system with a set of DCS system that has functions of data collection system, manufacturing process adjustment and control system, equipment sequence control system and interlock protection. The operation parameters such as temperature, pressure, flow, oxygen content and water level as well as equipment operating status will enter into the process control station to realize automatic continuous measurement and automatic adjustment on the operation parameters as well as monitoring on operating status of major equipments.

2.7 Auxiliary materials, fuel and power consumption

See the below table for details on auxiliary materials, fuel consumption and source in this project.

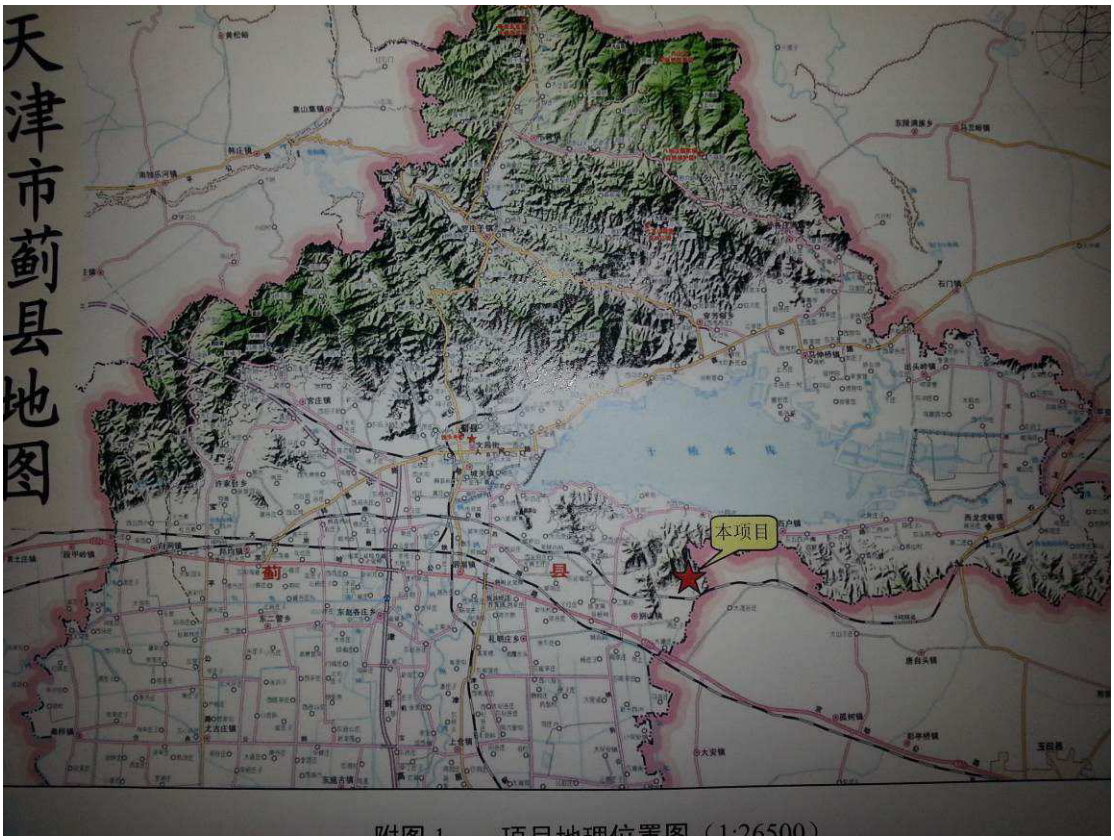
Table 2-7-1 Details on auxiliary materials, fuel consumption and source

Serial number	Name of auxiliary material	Consumption	Source
1	Slaked lime	3730t/a	Tendering
2	Activated carbon	100t/a	Tendering
3	Chelate	583t/a	Local purchase
4	Cement	1166t/a	Local purchase
5	25% ammonia solution	932 t/a	Local purchase
6	Diesel oil No.0	100m^3/a	Local purchase
7	Fresh water	$9.13\times10^5 m^3$/a	Ground water
8	Electricity	1.63×10^7 kWh	Own factory

3. Baseline Environment Conditions

3.1 Physical Environment

3.1.1 Geographic location



附图 2　大气评价范围及周边环境保护目标分布图

Tianjin City is located on the eastern part of North China Plain, in the lower Haihe River Basin, bordering the Bohai Sea in the east and leaning against the Yanshan Mountain in the north, with the geographic coordinate range of north latitude 38°33′57″～40°14′57″, east longitude 116°42′5″～118°3′31″. The municipality is 189 km long from north to south and 117 km wide from east to west, with a total land area of 11,919.7 sq km. Most of the municipality, except

for north area in Ji County, is plain, covering 94% of the total land area. The urban built-up area is 374.3 km^2, taking up 3.14% of the total area.

Ji County is situated at the joint between Yanshan Mountains and North China Plain, bordering Zunhua and Yutian in the east, meeting Sanhe, Dachang, Xianghe, Pinggu in the west, adjacent to Ji County in the south and Xinglong in the north. The county covers a total area of 1470km^2, 1/6 and 1/3 of which is plain and depression, and the rest is mountain and hill. The county has a convenient transportation, with Jingqin Railway traversing from east to west, Jinji Railway leading directly to Tianjin and Jishen, Jingchengand Bangxi Road going through.

The project is located in northeast to Xijiuhu Village, Bieshan Town, Ji County, the original site of No.1 Cement Plant in Bieshan Town, Ji County. The cement plant has already been dismantled and the site selected is unused land. To the west, north and east side of the project site is forest land; to the north side is Daqin Railway, 16m distanced from the project site by the outer rail. Please see attached Figure 1 for the geographic location of the project.

3.1.2 Natural environment overview

Ji County is geographically higher in the north and lower in the south. Jishanding is the peak of Tianjin City, located at the joint between north of

geopark and Xinglong County at 1078.50m above sea level, while the Fujun Mountain at the south side of geopark is only 350m above sea level, differing by 728.50m. In the region, there are several geomorphic types as follows: middle mountain, low mountain, hill, broad valley, basin and valley. Middle and low mountains are mainly distributed along the Great Wall and distribution area of quartzite, dolomite and sandshale by the north side, with altitude ranging from 300～500m.

Ji County is rather rich in ground water resource, which can be divided into quaternary pore waster and karst interstitial water, which is mainly stored in sinian suberathem dolomite and the interstitial water in mountainous area or under quaternary plain. The quaternary interstitial water is of great quantity and quality, normally explored at the depth of 50－100m. But now, the ground water presents a downward trend due to years' overdraft. Basement interstitial water is mainly stored in sinian suberathem dolomite and dolomite limestone in mountainous area or under quaternary plain, with mineralization degree around 0.25-0.35g/l, and fluoride content of 1.5-3mg/l. It is classified as HCO_3 －, Ca^{2+}, Mg^{2+} type water.

3.1.3 Climate characteristics

Ji County is located in northmost section of Tianjin City, as the heartland of Beijing, Tianjin, Tangshan and Chengde. It has temperate subhumid continental monsoon climate, with four distinct seasons（spring: Mar to Jun, summer: Jun to Sep, fall: Sep to Dec, winter: Dec to Mar） and rain and heat appearing at the same period. It is cold and dry in winter, hot and rainy in summer, windy and sandy in spring and autumn, with no significant change in temperature. In a whole year, there are 195 frost-free days and 2757.5 hours of sunshine. The annual average temperature stays at 12.5℃; average temperature in January of winter is -5.5℃; average temperature in July of winter is 26℃. The extreme maximum and minimum temperatures are 41.7℃ and -20.3 ℃ representatively. For the last years, the annual average evaporation from water surface is 1601mm, staying at a high level, especially during April to June when the climate is dry and rainless, the evaporation covers 43.4％ of the annual evaporation. In past several years, the

year-to-year temperature variation is small, but the temperature variation throughout the year is remarkable. The maximum depth of frozen ground is 0.81m, the longest freezing day is 105.

The precipitation amount varies greatly by year, and is not distributed evenly throughout the year. Most precipitation is concentrated in July to September, covering more than 76% of the annual precipitation, averaged at 615.3mm, one of the rainiest belt in north China. The average wind speed of Ji County over the past years is 1.7m/s, the maximum wind speed is 17.3m/s. Influenced by barrier action made by Yanshan Moutain together with the deep valleys, high mountains and steep slopes in the district, the wind is rather slow and weak.

3.2 Social environment overview

3.2.1 Population

Ji County is located in northmost section of Tianjin City, as the heartland of Beijing, Tianjin, Tangshan and Chengde. The county covers 1590 sq km, including 26 towns, 1 urban street office, 949 administrative villages and 15 neighborhood committees, with a total population of 800,000.

3.2.2 Natural resources

Ji County is built on mountains, in the north of city are mountains and building material industrial, and in the south is plain. The city is low lying, with a relatively high ground water level, resulting in flood threat. The northern area to the city suffers restriction for development due to its location adjacent to Fujun Mountain. The county owns 876,000 mu farmland, covering 40% of its total area. And the main food crops are wheat, corn, sorghum. Ji County is rich in natural resource, with remarkable coal reserves in the southern area, and multiple mineral resources in northern area. Besides, Ji County supplies cement, lime and sand to Tianjin City as a building material base.

Ji County is full of scenic spots and historic sites, such as Dule Temple, Ancient Greay Wall and Tiancheng Temple, and has a broad nature preservation region: Upper Proterozoic National Nature Reserve, Baxianshan National Nature Reserve, Panshan National Nature Reserve . above all, Yuqiao Reservoir and Luanheming Channel serve as water transfer station of

Tianjin City.

3.2.3 Social economy

Ji County is a member of first open coastal counties determined by the state, the first national demonstration area in green food as well as national demonstration county in integrated mountain development. In recent years, it has gained fast development in national economy and coordinated progress in agriculture, industry and the tertiary industry, with an increasingly complete industrial structure.

In 2012, Ji County has achieved RMB 29,152,000,000 GDP, RMB 2,650,000,000 of which is created by the first industry, RMB 9,665,100,000 by the second industry and the rest RMB 16,836,000,000 by the tertiary industry.

Ji County keeps raising the level of industrial operation quality. A number of key enterprises have reached a new higher level in terms of technical equipment, product quality, scale and efficiency. There are up to 270 enterprises in the county that have generated annual turnover of over RMB 5,000,000. Traditional industries have improved a lot in industry reform and high and new technology industry develops at high speed with a significant increase in overall industry quality and market competiveness. The tourism industry of Ji County has become the leader of the tertiary industry; business trade, information and consulting and other service industries are booming; self-employed and private businesses also hold a strong momentum of economic development. Beyond that, it has made remarkable achievement in infrastructure and ecological environment, and sound development in all kinds of social programs.

3.3 Status quo of environment quality

3.3.1 Survey and monitor on status quo of ambient air quality

3.3.1.1 Survey on status quo of conventional factor

The monitoring data on conventional monitoring point in Ji County in 2012 is taken as basis for status quo of ambient air quality, as listed in table 3-3-1.

NO.	LOCATION	distance	Monitoring frequency
1	PROJETCT SITE	0	Daily sampling at least
2	dongjiuhu	1360	20 hours , at least 45

3	Shilling cun	1440	minutes every hour for 7 days , take daily average
4	xijiuhu	1030	
5	xiaopanggezhuang	1170	
6	Villa area	2200	

附图 2　　大气评价范围及周边环境保护目标分布图

Table 3-3-1 Statistics data of conventional monitoring for ambient air in Ji County in 2012　　mg/m^3

Item / Month	SO_2			NO_2			PM_{10}		
	Average	Range	Over-limit ratio %	Average	Range	Over-limit ratio %	Average	Range	Over-limit ratio %
January	0.066	0.23-0.156	3.3	0.053	0.015-0.098	0	0.164	0.006-0.497	40.0
February	0.061	0.029-0.125	0	0.046	0.014-0.102	0	0.100	0.010-0.311	13.8
March	0.038	0.003-0.090	0	0.043	0.012-0.080	0	0.118	0.015-0.261	19.4
April	0.035	0.003-0.118	0	0.040	0.013-0.072	0	0.187	0.035-0.568	46.7
May	0.040	0.009-0.085	0	0.046	0.022-0.070	0	0.159	0.050-0.314	41.9
June	0.038	0.014-0.072	0	0.038	0.024-0.061	0	0.099	0.033-0.246	10.0
July	0.027	0.014-0.066	0	0.048	0.019-0.099	0	0.092	0.024-0.302	6.5
August	0.023	0.013-0.037	0	0.028	0.010-0.051	0	0.081	0.008-0.196	6.5
September	0.029	0.011-0.067	0	0.018	0.007-0.040	0	0.069	0.010-0.188	3.4
October	0.033	0.014-0.067	0	0.017	0.011-0.024	0	0.107	0.019-0.231	20.0
November	0.061	0.022-0.098	0	0.019	0.010-0.024	0	0.098	0.024-0.186	23.3
December	0.102	0.050-0.176	10.0	0.022	0.007-0.045	0	0.101	0.021-0.220	16.7
Average in 2012	0.046	0.003-0.176	1.1	0.035	0.007-0.102	0	0.115	0.006-0.568	20.7
Standard value	0.060	-	-	0.080	-	-	0.100	-	-

The monitoring is performed by the environmental protection department. It can be seen from the monitoring result that, annual average of SO_2 and NO_2 in 2012 has withinthe standard of GB3095-1996 Ambient Air Quality Standards (class II); annual average of PM_{10} exceeds the requirement in GB3095-1996 Ambient Air Quality Standards (class II). The statistic data shows that, the effective monitoring day in 2012 is 362, covering 79.3% of the total effective monitoring days, up to or over 287 days at good level specified in class II standard and 28 days less than that in 2011.

3.3.1.2 Monitor on status quo of ambient air

(1) Monitoring point arrangement

Table 3-3-2 Atmospheric status monitoring point layout and monitoring factors .

No.	Geographic location	Direction	Setting principle	Distance (m)	Monitoring factor	Remarks
1	Factory site	—	——	0	Odor concentration, H_2S, NH_3, HCl, methyl mercaptan, dioxin,	Observe air pressure, wind direction, wind

					SO_2, NO_2 , NO_x, CO, HCl, $PM_{2.5}$, PM_{10}	speed and temperature simultaneously
2	DONGJIUHU	South	Crosswind	1360	SO_2、NO_2 、NO_x、CO、HCl、$PM_{2.5}$、PM_{10}	
3	Shiling Village	East	Up the prevailing wind direction	1440	Dioxin, SO_2, NO_2 , NO_x, CO, HCl, $PM_{2.5}$, PM_{10}, Hg, Cd, Pb	
4	Xijiuhu	Southwest	Down the prevailing wind direction	1030		
5	Xiaopanggezhuang	Southeast	Crosswind	1170		
6	Villa district	North	Crosswind	2200		

(2) Monitoring frequency:

PM_{10}, $PM_{2.5:}$ sampling at least 20 hours each day for 7 continuous days to get the daily average.

SO_2, $NO_{2,}$ CO, NO_x: sampling at least 20 hours each day, 45 minutes or more in each hour, for 7 continuous days to get the daily average and one-time value.

HCl, odor concentration, methyl mercaptan, H_2S, NH_3: Continuously monitor for 3 days, 4 times each day.

Dioxin: Continuously monitor for 2 days, 1 time each day.

Hg, Cd, Pb: Continuously monitor for 3 days.

(3) Monitoring result

a. Conventional factors

See table 3-3-3 for monitoring result of conventional factors.

Table 3-3-3 Status quo monitoring result for conventional factors. Unit: mg/m^3

Factor / Monitoring point location	PM_{10}	$PM_{2.5}$	SO_2		NO_2		NO_x		CO	
			Daily average	One-hour value	Daily average	One-hour value	Daily average	One-hour value	Daily average	One-hour value
Factory center	0.315～0.366	0.070～0.199	0.005～0.013	0.007～0.059	0.006	0.015	0.006	0.015	0.3L～0.4	0.3～0.5
Dongjiuhu	0.319～0.383	0.057～0.134	0.008～0.013	0.007～0.086	0.006	0.015	0.006	0.015	0.3～0.5	0.3～0.6
Shiling Village	0.249～0.423	0.091～0.190	0.004～0.015	0.007～0.14	0.006	0.015	0.006	0.015	0.3L～0.4	0.3～0.5
Xijiuhu	0.297～0.420	0.051～0.189	0.004～0.014	0.007～0.10	0.006	0.015	0.006	0.015	0.3～0.5	0.3～0.6
Panggezhuang	0.268～0.441	0.031～0.182	0.008～0.016	0.007～0.16	0.006	0.015	0.006	0.015	0.3～0.4	0.3～0.6
Villa district	0.342～0.393	0.088～0.209	0.008～0.014	0.007～0.080	0.006	0.015	0.006	0.015	0.3～0.4	0.3～0.5
Standard value	0.15	0.075	0.15	0.5	0.08	0.12	0.1	0.25	4	10
Exceed or meet standard	Exceed standard	Exceed standard	Meet standard	Meet standard	Meet standard	Meet standard	Meet standard	Meet standard	Meet standard	Meet standard

It can be seen from the monitoring data that, the status quo of SO_2, NO_2, NO_x, CO in ambient air in the project construction area meets the requirements on one-hour value and daily average specified in GB3095－2012 Ambient Air Quality Standards (class II); Monitoring results of PM_{10} and $PM_{2.5}$ exceed the daily average concentration specified in GB3095－2012 Ambient Air Quality Standards (class II); The maximum exceeding point for PM_{10} is located in Panggezhuang Village, exceeding by 1.94 multiples; the maximum exceeding point for $PM_{2.5}$ is located in the villa district, exceeding by 1.79 multiples.

b. Odor factor

See table 3-3-4 for monitoring result of odor factors at factory site.

Table 3-3-4 Status monitoring result of odor factors at factory site Unit: mg/m^3

Factor / Monitoring point location	Odor concentration (dimensionless)	Methyl mercaptan	H_2S	NH_3
Factory site	<10	0.0002 L	0.005 L	0.01L
Standard value	20	0.004	0.01	0.20
Meet standard or not	Meet standard	Meet standard	Meet standard	Meet standard

It can be seen from the monitoring result that, no methyl mercaptan, H_2S and NH_3 were detected in ambient air at the project site; the odor concentration is detected to be less than 10. Concentrations of ammonia and H_2S both meet the one-time value limit given in “maximum allowable concentration of harmful substances in air of residence” in TJ36-79 Hygienic Standard of Industrial Enterprise Design; status quo of odor concentration and methyl mercaptan meets the control standard value of odorous pollutants in environment specified in DB12/—059—95 Emission Standards for Odorous Pollutants.

c. Other factors

Refer to table3-3-5 for monitoring results of HCl, Hg, Cd, Pb and dioxin at monitoring points in factory center, Shiling Village, Xijiuhu, Dongjiuhu, Panggezhuang and villa district.

Table 3-3-5 Monitoring results of other factors Unit: mg/m^3

Factor / Monitoring poi location	HCl	Hg	Cd	Pb	Dioxin ($pgTEQ/m^3$)
Factory center	0.006 L	2.13×10^{-7} L	8.50×10^{-7} L	6.39×10^{-6}L	0.29～0.31
Shiling Village	0.02 L	2.13×10^{-7} L	8.50×10^{-7} L	6.39×10^{-6}L	0.41～0.44
Xijiuhu	0.02 L	2.13×10^{-7} L	8.50×10^{-7} L	6.39×10^{-6}L	0.38～0.41
Villa district	0.02 L	2.13×10^{-7} L	8.50×10^{-7} L	6.39×10^{-6}L	0.27～0.30
Panggezhuang	0.02 L	2.13×10^{-7} L	8.50×10^{-7} L	6.39×10^{-6}L	0.40～0.45
Standard value	0.05	0.0003	—	0.0007	0.6
Meet standard or not	Meet standard	Meet standard	—	Meet standard	Meet standard

The monitoring result shows that, the concentration of HCl, Pb and Hg at monitoring points at or surrounding the factory site meets the one-time value

limit given in “maximum allowable concentration of harmful substances in air of residence” in TJ36-79 Hygienic Standard of Industrial Enterprise Design; Concentration of dioxin also meets the requirements of reference standard. Concentrations of Cd at monitoring points are all below 8.50×10^{-7} mg/m$^{3.}$

3.3.2 Monitor on status quo of sound environment quality

(1) Monitoring point arrangement

Set a monitoring point at midpoints of east, south, west and north boundaries.

附图 2　　大气评价范围及周边环境保护目标分布图

(2) Monitoring frequency

Monitoring it at noon time and night time for 3 continuous days.

(3) Monitoring data

Collect and sort the noise monitoring results, and list it in table 3-3-6.

Table 3-3-6 Environmental noise monitoring result　　dB(A)

Time / Location	Noon time	Night time	Standard
East boundary	40.8～41.2	30.9～32.6	60/50
South boundary	40.5～41.5	31.8～32.3	70/55
West boundary	39.9～41.1	30.3～33.1	60/50
North boundary	40.6～41.3	31.2～32.8	60/50

To the north side of the project site locates Daqin Railway, thus the noise at south boundary implements Class 4a standard of GB3096-2008 Environmental Quality Standard for Noise. The status quo of noise at other boundaries meets Class II standard. According to the monitoring result, the noise at boundaries surrounding the factory site and environmental noise at night time meets Class II and Class 4a standard specified in GB3096-2008 Environmental Quality Standard for Noise.

3.3.4 Monitoring and assessment on status quo of ground water

3.3.3.1 Assessment method

It makes evaluation by adopting the comprehensive evaluation method given in Quality Standard for Ground Water (GB/T14848-93) as follows:

$$F = \sqrt{\frac{\overline{F}^2 + F_{max}^2}{2}}$$

$$\overline{F} = \frac{1}{n}\sum_{i=1}^{n} F_i$$

Among which: $\overline{F}$—average of evaluation marks Fi for each single constituent.

F_{max}—the maximum value of evaluation marks Fi for each single constituent.

n— number of items.

Determine the evaluation marks Fi for single constituents and quality level classification according to Quality Standard for Ground Water as shown in table 4-3-7 and table 4-3-8.

Table 4-3-7 Evaluation marks for single constituents

Category	I	II	III	IV	V
Fi	0	1	3	6	9

Classify quality level of ground water based on F value according to table 3-3-8.

Table 3-3-8 Classification of ground water level

Level	Excellent	Good	Qualified	Unqualified	Bad
F	<0.80	0.8~<2.50	2.5~<4.25	4.25~<7.20	>7.20

3.3.4.2 Assessment and analysis on status quo of ground water

Monitoring position: set a monitoring point at project site and well in Panggezhuang Village

Monitoring frequency: sample for 2 days, each time in the morning and afternoon.

Monitoring result: see table 3-3-9 for the monitoring result of ground water in this area.

Table 3-3-9 Monitoring results of ground water quality in construction area

Unit: mg/l

Monitoring item	Project site			Well in Panggezhuang Village		
	Average monitoring value	Category	Fi	Average monitoring value	Category	Fi
PH value	7.80	I	0	7.59	I	0
Permanganate index	0.60	I	0	0.64	I	0
Nitrate	34.53	V	9	97.05	V	9
Nitrite	0.003L	III	3	0.003L	III	3
Ammonia nitrogen	0.038	III	3	0.037	III	3
Hexavalent chromium	0.004L	I	0	0.004L	I	0
Arsenic	0.001 L	I	0	0.001 L	I	0
Cadmium	0.0001 L	I	0	0.0001 L	I	0
Lead	0.0001 L	I	0	0.0001 L	I	0
Copper	0.010 L	I	0	0.010 L	I	0
Volatile phenol	0.001L	I	0	0.001L	I	0
Mercury	0.00005L	I	0	0.00005L	I	0
Chloride	12.78	I	0	44.65	I	0
Zinc	0.026	I	0	0.011	I	0
Total coliform	Not	I	0	Not	I	0

group	detected			detected		

According to the statistic result of Fi, the water quality coefficient for shallow groundwater at project site and deep ground water at Panggezhuang Village F=6.40, saying the ground water is at a low level.

3.3.5 Survey on status quo of soil

Please see table 3-3-9 for setting of soil monitoring point and monitoring factor of this project and see 3-3-10 for the monitoring result.

Table 3-3-9 List of status quo monitoring points for soil

No.	Geographic location	Monitoring factor	Remarks
1	Factory site	pH, Cu, Pb, Zn, Hg, Cr, Cd, As, Ni, dioxin	Note: take a surface soil sample(0～20cm) and a basement soil sample (80～100cm) at monitoring points within factory. Sample dioxin as per the technical specification.
2	Farmland to northwest side of Shiling Village	Dioxin, Pb, Hg, Cr	
3	Farmland to northwest side of Xiaopanggezhuang	Dioxin, Pb, Hg, Cr	
4	Farmland to east side of Xijiuhu	Dioxin, Pb, Hg, Cr	

Table 3-3-10 Status quo monitoring results for soil in the region Unit: mg/kg, excluding pH value and dioxin

Monitoring point	Soil depth(m)	pH	Cu	Pb	Zn	Hg	Cr	Cd	As	Ni	Dioxin （ngTEQ/kg）
Factory site	0～20cm	7.57	18.8	22.1	54.3	0.021	59.9	0.20L	14.8	25.9	0.22
	80～100cm	7.32	19.6	30.3	62.8	0.026	62.6	0.20L	15.3	28.5	0.42
Farmland to northwest side of Shiling Village		—	0.031	34.5	—	—	76.3	—	—	—	1.1
Farmland to northwest side of Xiaopanggezhuang		—	0.020	24.9	—	—	58.8	—	—	—	0.80
Farmland to east side of Xijiuhu		—	0.035	25.1			69.5				1.2
Standard value			100	300	250	0.5	200	0.3	30	50	—

The soil environment quality in planned project site has reached Class II standard specified in Environmental Quality Standard for Soils (GB15618-95), showing that soil at the project site was not polluted. The monitoring result of

dioxin in the soil is basically ranged from 0.22 to 1.2 ngTEQ/kg. According to the monitoring data produced in EIA for Dagang Waste Incineration Plant in Hangu District, Tianjin City, the monitoring result of dioxin in soil is basically ranged between 1.2 and 7.1 ngTEQ/kg, the lowest value of which is the highest value in this evaluation monitoring result.

4. Atmospheric environmental impact assessment

4.1 Weather data analysis on conventional pollution

4.1.1 Climate overview

Ji County is located in northernmost section of Tianjin City, as the heartland of Beijing, Tianjin, Tangshan and Chengde. It has temperate subhumid continental monsoon climate, with four distinct seasons and rain and heat appearing at the same period.

4.1.2 Surface meteorological data

The evaluation is based on 20 years record material of Tianjin Ji County Weather Station to make an analysis on surface meteorological data.

(1) Wind speed in each month

Please see table 6-6-1 for the average wind speed in each month and year.

Table 4-1-1 Average annual and monthly wind speed over the past years Unit: m/s

Period	1	2	3	4	5	6	7	8	9	10	11	12	Year
Average wind speed	1.6	1.7	1.9	2.1	2.0	1.9	1.7	1.5	1.5	1.5	1.5	1.5	1.7
corresponding direction of the Maximum wind speed	E	E	E	E	E	E	E	E	E	E	E	E	E

(2) Wind direction

The most prevailing wind direction over the year is NE-ENE-E, and the most frequent direction is E. Clam wind frequency is 28%.

See Figure 4-1-1 for wind-rose diagram.

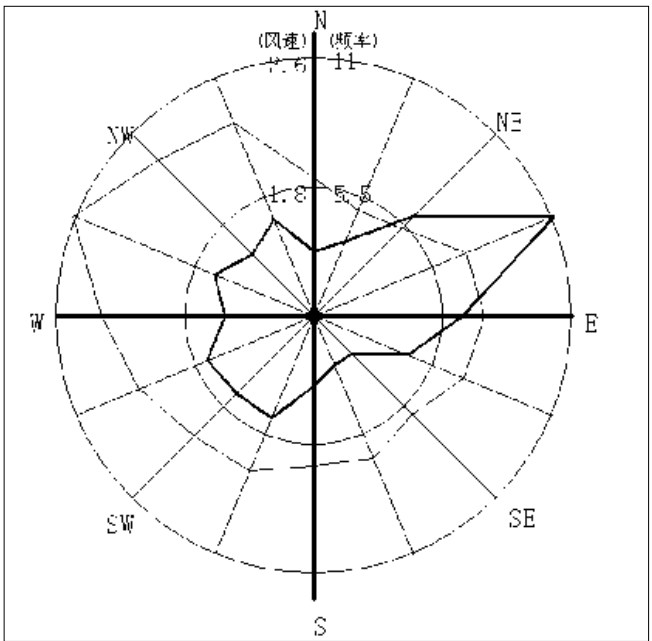


Figure 4-1-1 Annual wind-rose diagram C=28%

（2）Temperature

The monthly and annual temperatures are listed in table 4-1-2.

Table 4-1-2 Monthly and annual average temperatures over the past years (℃)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Year
Average temperature	-4.1	-4.0	-6.1	14.5	20.5	24.7	26.6	25.7	20.8	13.5	4.5	-1.8	11.2

In the past years, the extreme maximum temperature in Ji County is 41.7℃, the extreme minimum temperature is -20.3℃.

(3) Precipitation

See table 4-1-3 for precipitation in Ji County in recent 20 years.

Table 4-1-3 Annual precipitation (mm)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Precipitation	751.6	474.6	572.5	756.9	752	1001	372.9	753.9	344.2	454.5
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Precipitation	571.6	323.4	607.9	566	552.9	510.8	571.5	785.3	665.1	488.7

The precipitation in 1996 ranks the first with 1001 mm; precipitation in 2002 takes the lowest ranking with 323.4mm.

(4) Relative humidity

See table 4-1-4 for relative humidity in Ji County in recent 20 years.

Table 4-1-4 Relative humidity for each year (%)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Relative humidity	62.3	57.5	56.9	57.5	55.6	56.1	58.1	61.6	57.2	56.7
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Relative humidity	57.7	54.8	60.5	55.3	51.4	55.2	55.0	54.0	52.0	53.0

(5) Sunshine duration

See table 4-1-5 for sunshine amount of Ji County in last 20 years.

Table 4-1-5 Sunshine duration for each year (hour)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000

Sunshine hour	170.8	179.6	162	147.8	201	168.7	156.5	144.2	158.1	118.5
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sunshine hour	101.4	133.9	161.4	180.6	169.7	104.6	174.7	164.2	2459.2	2223.3

4.2 Discussion for pollutant emission compliance

4.2.1 Calculate the minimum outlet inner diameter of chimney

According to the provision given in national standard GB/T13201－91 “Technical Methods for Making Local Emission Standards of Air Pollutants”, flue gas flow rate at chimney outlet V_s should not be less than 1.5 times of wind speed U, that is Vs≥1.5U, among which U is calculated by the following formula.

$$U = \overline{U} \times (2.303)^{1/k} / \Gamma(1 + \frac{1}{K})$$

$$K = 0.74 + 0.19\overline{U}$$

In the formula, $\overline{U}$ －multi-year average of ambient wind speed at height of outlet of exhaust funnel, ， $m \cdot s^{-1}$;

K－Weber slope

$\Gamma(\lambda)$－Γfunction, λ＝1+1/k。

$\overline{U}$ is calculated as follows:

When $Z_2 \leq 200m$, $\overline{U} = U_1(Z_2/Z_1)^m$

In the above formula, U_1－average wind speed at the height close to weather station Z_1, m/s, default it as 1.7m/s；

Z_1－height of wind meter of the corresponding weather station, m, set as10m；

Z_2－Height of outlet exhaust funnel (take the same baseline with Z_1）,m, set as 80m;

m－wind speed profiler, set as 0.15。

It is calculated that: $\overline{U}$ ＝2.32m/s，k＝1.18，λ＝1.85，Γ(λ)＝0.95，U＝4.95。

Inner diameter of flue gas outlet is related to air volume, as shown in table 4-2-1.

Table 4-2-1 Relationship between inner diameter of flue gas outlet and air

volume

Name	Air output(m^3/s)	Required maximum inner diameter of outlet (m)	Designed inner diameter of outlet (m)	Remarks
chimney	17.8	1.75	1.7	Average wind speed 1.7m/s

According to the above calculation, the outlet velocity Vs of flue gas should be greater than 7.425 m/s, the outlet diameter of flue gas D should not be greater than 1.75m. This project adopts a combined chimney composed of chimneys of 1.7m outlet diameter, with the inner diameter in conformance with the plume rising requirement.

4.2.2 Discussion for pollutant emission compliance

(1) Discussion for soot emission compliance

This project adopts bag-type dust remover to remove soot in the flue gas. According to the environmental protection acceptance report for waste incineration power plant in Binhai New District, after adopting bag-type dust remover, the emission concentration of soot ranges between 1.40 and 4.13mg/m^3, with purification efficiency>99.9%. According to the monitoring data of Changzhou Environmental Monitoring Center on flue gas discharged from incinerator of Changzhou Dynagreen Environmental Protection and Thermal Electricity Co., Ltd., the emission concentration of flue gas ranges from 2.6 to 9.4mg/m^3, that is to say, the emission concentration of flue gas can reach the design objective (20mg/$m^{3)}$.

(2) Discussion for NOx emission compliance

This project controls emission concentration of NO_X by taking the method of low oxygen combustion+ SNCR denitrification system, and controlled the concentration of NO_x in flue gas around 350mg/Nm^3 by completely mixing the flue gas in incinerator and controlling parameters such as flue gas temperature and oxygen content. According to the environmental protection acceptance report for waste incineration power plant in Binhai New District, after adopting SNCR denitrification system, the purification efficiency of nitric oxide arrives at 60.0 %～71%. That is to say, the emission concentration of NO_X in this project can meet the requirement of design objective (200mg/Nm^3).

(3) Discussion for up-to-standard emission of SO_2 and HCl

The project adopts semidry treatment process, which is a relatively mature flue gas purification technology widely used in municipal solid waste incineration plants. Acid gas removal efficiency of semidry treatment process depends on many factors including residence time, temperature difference, and particle size of absorbent and atomizing effect.

According to the acceptance data for Shuanggang Waste Incineration Plant in Tianjin City, by adopting semidry technology, concentration of SO_2 and HCl in flue gas ranges between 20 and 35mg/m^3; According to the environmental protection acceptance report for waste incineration power plant in Binhai New District, after adopting semidry deacidification technology, emission concentration of SO_2 is between 2.03 and 12.5mg/m^3 while the emission concentration of HCl ranges between 2.03 and 24.5 mg/m^3; According to the monitoring data of Changzhou Environmental Monitoring Center on flue gas discharged from incinerator of Changzhou Dynagreen Environmental Protection and Thermal Electricity Co., Ltd., emission concentration of SO_2 is between 20 and 24mg/m^3, HCl is between 0.019 and 33.3mg/m^3, all of which can meet the design objective （$SO_2$80 mg/m^3，HCl 30 mg/m^3）.

(4) Discussion for up-to-standard emission of heavy metal and dioxin

The project adopts the technology combining activated carbon absorption with bag-type dust remover to remove heavy metal and dioxin. Some relevant data shows that, after taking measures of activated carbon injection and bag-type dust remover, emission concentration of dioxin comes to be 0.065ng/m^3, able to meet the design objective. According to the environmental protection acceptance report for waste incineration power plant in Binhai New District, after adopting purification measure, emission concentration of mercury becomes 0.0001～0.004mg/m^3, while the emission concentrations of lead, cadmium are respectively not detected ～ 0.05 mg/m^3 and 1.2×10^{-5} ～ 2.1×10^{-3} mg/m^3. Emission concentration of heavy metal and dioxin in this project can reach the design objective (dioxin 0.1ng/m^3, lead 1.6 mg/m^3, mercury 0.05 mg/m^3, cadmium 0.05 mg/m^3)

(5) Discussion for up-to-standard emission of dust

Dust may be produced in process of feeding the lime and cement storage silo and the dusty waste gas must be purified by the bag-type dust remover on the top of storage silos before emission. The emission height of lime storage silo and cement storage silo are representatively 18 m and 24m; emission concentration and rate of dust are respectively 20mg/m^3 and 0.0012kg/h, conforming to Integrated Emission Standard of Air Pollutants (Class II).

4.3 Air pollutant emission parameter and dispersion pattern

The project is a municipal solid waste incineration power generation project. According to Guidelines for Environmental Impact Assessment Atmospheric Environment, it is evaluated as grade 2 and AERMOD mode system, a further prediction mode recommended in the guideline, is adopted to predict dispersion concentration of all pollutants. AERMOD is a steady plume dispersion mode applicable to rural and urban area, no matter in simple or complex terrain, able to simulate the concentration dispersion of pollutants discharged from point source, surface point and body source in short term (hourly average, daily average), long term (seasonal average and annual average). AERMOD has taken into account the influence of building wake, that is plume downwash. It uses the continuously pretreated meteorological data in each hour to stimulate the concentration distribution in or above 1 hour. It includes two pretreat models: AERMET meteorological pretreat and AERMET topography pretreatment model.

4.3.1 Major calculation formulas

In the condition of convection, concentration of pollutants at downwind direction of chimney is mainly contributed by direct source, indirect source and transparent source, calculated as follows:

$$C_c\{x_r, y_r, z_r\} = C_d\{x_r, y_r, z_r\} + Cr\{x_r, y_r, z_r\} + C_p\{x_r, y_r, z_r\}$$

$$C_d\{x_r, y_r, z\} = \frac{Qf_p}{\sqrt{2\pi \bar{u}}} F_Y \sum_{j=1}^{2}\sum_{m=0}^{\infty} \frac{\lambda_j}{\sigma_{zj}} \left[\exp\left(-\frac{(z - \psi_{dj} - 2mz_i)}{2\sigma_{zj}^2} \right) + \exp\left(-\frac{(z + \psi_{dj} + 2mz_i)}{2\sigma_{zj}^2} \right) \right]$$

$$C_r\{x_r, y_r, z\} = \frac{Qf_p}{\sqrt{2\pi \bar{u}}} F_Y \sum_{j=1}^{2}\sum_{m=1}^{\infty} \frac{\lambda_j}{\sigma_{zj}} \left[\exp\left(-\frac{(z + \psi_{rj} - 2mz_i)}{2\sigma_{zj}^2} \right) + \exp\left(-\frac{(z - \psi_{rj} + 2mz_i)}{2\sigma_{zj}^2} \right) \right]$$

$$C_p\{x_r, y_r, z\} = \frac{Q(1-f_p)}{\sqrt{2\pi}\,\bar{u}} F_Y \sum_{j=1}^{2}\sum_{m=0}^{\infty}\frac{\lambda_j}{\sigma_{zj}}\left[\exp\left(-\frac{(z-h_{ep}+2mz_{ieff})}{2\sigma_{zo}^2}\right)+\exp\left(-\frac{(z+h_{ep}+2mz_{ieff})}{2\sigma_{zp}^2}\right)\right]$$

In steady condition, the pollutant dispersion in air follows Gaussian models, with formula as follow:

$$C_s\{x_r, y_r, z\} = \frac{Q}{\sqrt{2\pi}\,\bar{u}} F_Y \sum_{m=-\infty}^{\infty}\left[\exp\left(-\frac{(z-h_{es}+2mz_{ieff})}{2\sigma_{zs}^2}\right)+\exp\left(-\frac{(z+h_{es}+2mz_{ieff})}{2\sigma_{zs}^2}\right)\right]$$

4.3.2 Meteorological data

According to the requirements in guideline, the project needs to investigate the surface meteorological data and upper air meteorological data of at least one of the last three year.

(1) Surface meteorological data

Surface meteorological data is sourced from successive observations made by Weather Station of Ji County throughout 2012, including 24 observations on wind speed and direction every day and 3 observations on cloud cover every day. The cloud cover at the rest time can be calculated with interpolation method.

Level of weather station: general station

Location of weather station: 40.044N　117.415E

(2) Upper air meteorological data

Upper air meteorological data is provided by Environment & Engineering Appraisal Center under Ministry of Environmental Protection and formed by stimulating with mesoscale numerical model. The whole nation is divided into 149×149 networks to make calculation and the resolution is set as 27km×27km. The model also adopts some original data such as terrain height, land utilization, land-water mark and canopy structure. The data is sourced from USGS data in America and takes the reanalyzed data of NCEP (National Centers for Environmental Prediction) as the input field and boundary filed of model. The data is dated from January 1, 2012 to December 31, 2012.

Location of simulation point: 40.0128N， 117.514E

Distance between simulation point and project site: 4.7km

4.3.3 Model and calculation parameters

The evaluation process sets origin of the coordinate system at the middle point of chimney, X-axis at east direction and Y-axis at north direction.

Please see table 4-3-1 for all calculation parameters.

Table 4-3-1 list of calculation parameters

Name of point source	X coordinate	Y coordinate	Altitude of bottom of chimney m	Height of chimney m	Inner diameter of chimney m	Outlet velocity of chimney m/s	Outlet temperature of chimney K	Annual emission hours h	Emission mode
Chimney	0	0	53	80	2.4	7.876	423	8000	Continuous
Source intensity of assessment factors（g/s）									
HCl	SO_2	NO_X	Soot	CO	Dioxin（ng/s）				
1.068	2.849	7.12	0.712	3.561	3.56				

4.4 Air quality impact prediction and assessment

4.4.1 Hourly concentration impact prediction and assessment

According to one-hour (one-time) concentration limits specified in GB3095-1996 Ambient Air Quality Standards and TJ36-79 Hygienic Standards for Design of Industrial Enterprises, this report decides to calculate the concentration of HCl, SO_2, NO_2, CO pollutants. Please see table 4-4-1 for their assessment standards.

Table 4-4-1 Pollutants assessment standard

Serial number	Pollutant name	Standard for environment quality assessment	Remarks
1	HCl	0.05mg/m^3	TJ36-79
2	SO_2	0.50 mg/m^3	GB3095-2012
3	NO_x	0.25mg/m^3	
4	CO	10.00 mg/m^3	

(1) Prediction for environmental impact at sensitive areas

Figure out the maximum concentration at environmentally sensitive areas

as well as the area of maximum concentration and ground concentration within the assessment scope (within a radius of 2.5km from the chimney)according to the meteorological conditions each day and hour throughout the year; the result is listed in figure 4-4-2.

Table 4-4-2 Hourly maximum ground concentration at environmentally sensitive areas Unit: mg/m^3

Serial No.	Name	Coordinate	Prediction Results												
			HCl			SO_2			NO_x			CO			Occurrence date *
			Predicted value	Ratio%	Superimposition value	Impact value	Ratio%	Accumulated value	Impact value	Ratio%	Superimposition value	Predicted value	Ratio %	Accumulated value	
1.	VILLA DISTRICT	（111,2039）	0.00329	6.58	0.0063	0.0088	1.76	0.0888	0.0219	8.76	0.0294	0.0110	0.11	0.511	12/01/05/11
2.	Shiling Village	（1452,120）	0.00310	6.20	0.0061	0.0083	1.66	0.1483	0.0206	8.24	0.0281	0.0103	0.10	0.5103	12/12/26/12
3.	XIAOPANGGEZHUANG	（668,-898）	0.00226	4.52	0.0053	0.0060	1.20	0.166	0.0151	6.04	0.0226	0.0076	0.08	0.5076	12/08/11/07
4.	DAPANGGEZHUANG	（1373,-586）	0.00384	7.68	0.0068	0.0102	2.04	0.1702	0.0256	10.24	0.0331	0.0128	0.13	0.5128	12/12/19/12
5.	BAISHAN VILLAGE	（23,-2468）	0.00161	3.22	0.0046	0.0042	0.84	0.0902	0.0106	4.24	0.0181	0.0053	0.05	0.6053	12/03/20/08
6.	DONGJIUHU	（-108,-1322）	0.00169	3.38	0.0047	0.0045	0.90	0.0905	0.0113	4.52	0.0188	0.0057	0.06	0.6057	12/03/20/08
7.	XIJIUHU	（-994,-437）	0.00296	5.92	0.0060	0.0079	1.58	0.1079	0.0197	7.88	0.0272	0.0099	0.10	0.6099	12/11/07/09
8.	Nanchouzhuang	（-1237,-766）	0.00265	5.30	0.0057	0.0071	1.42	0.1071	0.0177	7.08	0.0252	0.0088	0.09	0.6088	12/08/16/07
9.	ZHOUZHUANGZI	（-1260,-923）	0.00265	5.30	0.0057	0.0071	1.42	0.1071	0.0177	7.08	0.0252	0.0088	0.09	0.6088	12/09/06/08
10.	DOUZHUANGZI	（-1143,-1150）	0.00257	5.14	0.0056	0.0069	1.38	0.1069	0.0171	6.84	0.0246	0.0086	0.09	0.6086	12/09/06/08
11.	DONGMAOZHUANG	（-1111,-1377）	0.002225	4.45	0.0052	0.0060	1.20	0.106	0.0150	6.00	0.0225	0.0075	0.08	0.6075	12/08/16/07
STANDARD VALUE			0.05			0.50			0.25			10.00			
Pollutant background value: undetected value should be calculated by the half of detected limits.															

*: Occurrence date should be in form of Y/ M / D / H .

Within the assessment scope, the hourly maximum ground concentration at the environmentally sensitive area is predicted to be present at Pingshan Villa district. As for the atmospheric sensitive targets, hourly accumulated value of SO2 is 0.0888～0.1702mg/m3, maximum occupation ratio of predicted value is 2.04%; hourly accumulated value of NOx is 0.0181～0.0331mg/m^3, maximum occupation ratio of predicted value is 10.24%; hourly accumulated value of CO is 0.5103～0.6099mg/m^3, maximum occupation ratio of predicted value is 0.13%. In conclusion, the concentration accumulated value of the above three pollutants meet requirements given in GB3095-2012 Ambient Air Quality Standards (Class II); hourly accumulated value of HCl is 0.0046～0.0068mg/m^3, maximum occupation ratio of predicted value is 7.68%, in conformance with the one-time concentration limits (0.05 mg/m^3) specified in TJ36-79 Hygienic Standards for Design of Industrial Enterprises.

(2) Prediction for maximum ground concentration within assessment scope

Please see table 4-4-3 for the hourly maximum ground concentrations of all air pollutants produced in the project, as well as their occurrence places and time.

Table 4-4-3 Maximum ground concentration of pollutants

Pollutant	Maximum ground concentration (mg/m^3)	Occurrence place	Occurrence time	Out-of-limit ratio (%)	Relative standard (mg/m^3)
HCl	0.079	（-500，1550）	12010305	58	0.05
NO_x	0.525	（-500，1550）	12010305	110	0.25
SO_2	0.210	（-500，1550）	12010305	0	0.5
CO	0.263	（-500，1550）	12010305	0	10

The maximum hourly concentration of pollutants within the assessment scope occurs at 5:00 on January 3, 2012, at 1630 m downwind, coordinate (-500, 1500).

Within the assessment scope, predicted maximum hourly concentration of SO_2 is 0.21mg/m^3, occupying 42% of the standard value and meeting the hourly concentration limit (0.5 mg/$m^{3)}$ specified in GB3095-1996 Ambient Air Quality Standards; and the predicted maximum hourly concentration of CO is

0.263mg/m^3, occupying 2.63% of the standard value and meeting the hourly concentration limit (10 mg/$m^{3)}$ specified in GB3095-1996 Ambient Air Quality Standards.

Elevation of the project site is 52m, and the maximum elevation at some north and southeast area is above 200m. Due to the complex terrain, the predicted maximum hourly concentrations of NO_x and HCl exceed the limit value. Predicted maximum hourly concentrations of NO_x is 0.525mg/m^3 , exceeding the hourly concentration limit (0.25mg/$m^{3)}$ specified in GB3095-2012 Ambient Air Quality Standards by 110% at maximum. Exceeding ratio of hourly concentration is 0.0197% probability, and the maximum lasting time is 3 hours, predicted maximum hourly concentration of HCl is 0.087mg/m^3, exceeding one-time concentration limits (0.05 mg/m^3) specified in Hygienic Standards for Design of Industrial Enterprises by 58% at maximum. The exceeding ratio of hourly concentration is 0.0044% and the maximum lasting time is 2 hours. The points of exceeding limit of predicted hourly concentration are distributed in northwest part of the project site.

4.4.2 Impact Prediction and Assessment of Pollutants' Daily Average Ground Level Concentration

According to the daily average concentration limit specified in GB3095-1996 Ambient Air Quality Standards and TJ36-79 Hygienic Standards for Design of Industrial Enterprises, the six pollutants of HCl, SO_2, NO_x, CO, smoke and dioxin are selected in this report.

Refer to Table 4-4-4 for the assessment criteria for various pollutants.

Table 4-4-4 Assessment Criteria for Various Pollutants

Serial No.	Name of Pollutant	Assessment Criteria for Environment Quality	Remark
1	HCl	0.015mg/m^3	TJ36-79
2	SO_2	0.15mg/m^3	GB3095-2012
3	NO_x	0.10 mg/m^3	
4	Soot	0.15 mg/m^3	
5	CO	4.0 mg/m^3	
6	Dioxin	0.6pg/m^3	Refer to Japan annual average

			values

4.4.2.1 Impact Prediction of Daily Average Concentration

(1) Impact Prediction of Daily Average Concentration in Environmentally Sensitive Areas

Based on the day-by-day wind speed, direction, stability and other meteorological observation data in Ji County, Tianjin in 2012, the atmospheric pollutants' annual day-by-day daily average concentration propagation in the environmentally sensitive areas and the maximum daily average concentration and settling spot within the assessment scope are calculated in this assessment report.

Refer to Table 4-4-5 for the calculation of the atmospheric pollutants' maximum daily average concentration in each environmentally sensitive area of this project based on the records of day-by-day concentration of the year.

Table 4-4-5 Maximum Daily Average Ground Level Concentration in Environmentally Sensitive Areas

Serial No.	Name	Coordinates	Ground Level Concentration (mg/m^3)																		Date of Occurrence
			HCl			SO2			NOx			Soot			CO			Dioxin(pg/m^3)			
			Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	
1	Villa District	（111,2039）	1.50×10-4	1.00	0.0032	4.00×10-4	0.27	0.0144	9.99×10-4	1.00	0.0040	1.00×10-4	0.07	0.3931	4.99×10-4	0.01	0.4005	4.99×10-4	0.08	5.29×10-4	12/01/05
2	Shiling Village	（1452,120）	1.96×10-4	1.31	0.0032	5.22×10-4	0.35	0.0155	1.30×10-3	1.30	0.0043	1.30×10-4	0.09	0.4231	6.52×10-4	0.02	0.4007	6.52×10-4	0.11	6.96×10-4	12/04/03
3	Small Pangge Village	（668,-898）	3.25×10-4	2.17	0.0033	8.66×10-4	0.58	0.0169	2.16×10-3	2.16	0.0052	2.16×10-4	0.14	0.4412	10.8×10-4	0.03	0.4011	10.8×10-4	0.18	11.25×10-4	12/09/12
4	Big Pangge Village	（1373,-586）	2.42×10-4	1.61	0.0032	6.47×10-4	0.43	0.0166	1.62×10-3	1.62	0.0047	1.62×10-4	0.11	0.4411	8.08×10-4	0.02	0.4001	8.08×10-4	0.081	8.53×10-4	12/03/07
5	Baishan Village	（23,-2468）	0.769×10-4	0.51	0.0031	2.02×10-4	0.13	0.0132	5.05×10-4	0.51	0.0035	0.51×10-4	0.03	0.3831	2.53×10-4	0.01	0.5003	2.53×10-4	0.04	2.94×10-4	12/03/20
6	East Jiuhu	（-108,-1322）	1.19×10-4	0.79	0.0031	3.19×10-4	0.21	0.0133	7.96×10-4	0.80	0.0038	0.80×10-4	0.05	0.3831	3.98×10-4	0.01	0.5004	3.98×10-4	0.07	4.39×10-4	12/05/30
7	West Jiuhu	（-994,-437）	2.80×10-4	1.87	0.0033	7.46×10-4	0.50	0.0147	1.86×10-3	1.86	0.0049	1.86×10-4	0.12	0.4202	9.32×10-4	0.02	0.5009	9.32×10-4	0.16	9.73×10-4	12/10/25
8	Nanchou Village	（-1237,-766）	1.95×10-4	1.30	0.0032	5.20×10-4	0.35	0.0145	1.30×10-3	13.00	0.0043	1.30×10-4	0.09	0.4201	6.50×10-4	0.02	0.5007	6.50×10-4	0.11	6.91×10-4	12/07/09
9	Zhouzhuangzi	（-1260,-923）	1.82×10-4	1.21	0.0032	4.86×10-4	0.32	0.0145	1.21×10-3	1.21	0.0042	1.21×10-4	0.08	0.4201	6.07×10-4	0.02	0.5006	6.07×10-4	0.10	6.48×10-4	12/04/21
10	Douzhuangzi	（-1143,-1150）	1.63×10-4	1.09	0.0032	4.34×10-4	0.29	0.0144	1.08×10-3	1.08	0.0041	1.09×10-4	0.07	0.4201	5.43×10-4	0.01	0.5005	5.42×10-4	0.09	5.83×10-4	12/09/06
11	Dongmao Village	（-1111,-1377）	1.26×10-4	0.84	0.0031	3.35×10-4	0.22	0.0143	8.38×10-4	0.84	0.0038	0.84×10-4	0.06	0.4201	4.19×10-4	0.01	0.5004	4.19×10-4	0.07	4.60×10-4	12/09/06
Standards			0.015			0.15			0.10			0.15			4.0			0.6			—

*: Format of date: year, month and date

It is seen from the table above that the atmospheric pollutants' maximum predicted value of ground level concentration in environmentally sensitive area appears in Pangge Village. The maximum predicted values of daily average concentration of HCl, SO_2, NO_x, soot and CO in the project's environmental protection spots meet the limits of daily average concentration specified in TJ36-79 Hygienic Standards for Design of Industrial Enterprises and GB3095-1996 Ambient Air Quality Standards. The predicted values of daily average concentration of dioxin in the environmentally sensitive area meets the reference to Japan annual average concentration standard (0.6 pg/m^3).

Each major atmospheric sensitive target's daily average accumulated concentration of SO_2 is 0.0132～0.0169mg/m^3 within the assessment scope, and the maximum predicted value accounts for 0.58%; the daily average accumulated concentration of NO_x is 0.0035～0.0052mg/m^3 and the maximum predicted value accounts for 2.16%; the daily average accumulated concentration of CO is 0.4005～5009mg/m^3 and the maximum predicted value accounts for 0.03%. The values of daily average accumulated concentration of SO_2, NO_x and CO meet the standard values specified in GB3095-2012 Ambient Air Quality Standards (Second Level).

Each major atmospheric sensitive target's daily average accumulated concentration of soot is 0.3831～0.4412mg/m^3 within the assessment scope, and the maximum predicted value accounts for 0.14%. The accumulated concentration value is 194% higher at maximum than the standard value specified in GB3095-2012 Ambient Air Quality Standards (Second Level) and the over-limit mainly results from the over-limit of status monitoring value.

Each major atmospheric sensitive target's daily average accumulated concentration of HCl is 0.0031～0.0033mg/m^3 within the assessment scope, and the maximum predicted value accounts for 2.17%, which meets the limit (0.015 mg/m^3) of daily average concentration specified in TJ36-79 Hygienic Standards for Design of Industrial Enterprises; the daily average accumulated concentration of dioxin is 2.94×10^{-4}～11.25×10^{-4}pg/m^3 and the maximum predicted value accounts for 0.18%, which meets the reference to Japan annual average concentration standard (0.6 pg/m^3).

Except the soot's over-limit of accumulated value, the accumulated values of all other atmospheric pollutants in the environmentally sensitive areas meet the relevant standards. Soot's over-limit of accumulated value mainly results from the over-limit of status monitoring value. The exceedings of the background level may depend on the certain monitoring point and monitoring time, the local pollution is also a reason for the high background level. The maximum predicted values of daily average concentration of various pollutants in environmentally sensitive areas account for a relatively lower percentage, so it is predicted that there is no obvious impact on the ambient air quality.

(2) Maximum Daily Average Ground Level Concentration Within the Assessment Scope

Refer to Table 4-4-6 for the daily average ground level concentration within the assessment scope of all atmospheric pollutants caused by the project and their corresponding location and dates.

Table 4-4-6 Various Pollutants' Maximum Daily Average Ground Level Concentration

Pollutant	Spot of Maximum Ground Level Concentration(mg/m^3)	Percentage of Impact Value (%)	Spot	Date	Accumulated Value (mg/m^3)	Relevant Standard (mg/m^3)
HCl	0.0097	64.67	(-2050，700)	121216	0.0127	0.015
SO_2	0.0257	17.13	(-2050，700)	121216	0.0357	0.15
NO_x	0.064	64.0	(-2050，700)	121216	0.067	0.10
Soot	0.0064	4.27	(-2050，700)	121216	0.361	0.15
CO	0.032	0.8	(-2050，700)	121216	0.413	4.0
Dioxin	0.032 pg/m^3	5.33	(-2050，700)	121216	0.398	0.6pg/m^3

Note: The background values are extracted from the average values of the current monitoring.

Within the valuation scope, the maximum predicted values of the daily average

concentration of HCl, SO_2, NO_x, soot and CO all meet the limits of daily average concentration specified in TJ36-79 Hygienic Standards for Design of Industrial Enterprises and GB3095-2012 Ambient Air Quality Standards. The maximum concentration appeared at the spot of 2,166 m at the coordinate (-2050, 700) downwind on December 16, 2012. There is no other over-limit on any date within the assessment scope.

Within the valuation scope, the maximum predicted value of the daily average concentration of HCl is 0.0097mg/m^3, accounting for 64.67% and the impact value after adding the current value is 0.0127mg/m^3, which meets limit (0.015 mg/m^3) of daily average concentration specified in TJ36-79 Hygienic Standards for Design of Industrial Enterprises.

The maximum predicted value of the daily average concentration of SO_2 is 0.0257mg/m^3, accounting for 17.13% and the impact value is 0.0357 mg/m^3, which meets limit (0.015 mg/m^3) of daily average concentration specified in GB3095-2012 Ambient Air Quality Standards.

The maximum predicted value of the daily average concentration of NO_x is 0.064mg/m^3, accounting for 64.0% and the impact value is 0.067mg/m^3, which meets limit (0.10mg/m^3) of daily average concentration specified in GB3095-2012 Ambient Air Quality Standards.

The maximum predicted value of the daily average concentration of soot is 0.0064mg/m^3, accounting for 4.27% and the impact value is 0.362mg/m^3, which is 141.3% higher than the limit (0.15mg/m^3) of daily average concentration specified in GB3095-2012 Ambient Air Quality Standards. The predicted value of soot accounts for a relatively lower percentage and the over-limit of impact value is mainly resulted from the high background value.

Within the assessment scope, the maximum predicted value of the daily average concentration of CO is 0.032mg/m^3, accounting for 0.8% and the impact value is 0.413mg/m^3, which meets limit (4.0mg/m^3) of daily average concentration specified in GB3095-2012 Ambient Air Quality Standards.

Within the assessment scope, the maximum predicted value of the daily average concentration of dioxin is 0.032pgmg/m^3, accounting for 5.33% and the impact value is 0.398 pg /m^3, which meets the reference to Japan annual average concentration standard (0.6 pg/m^3).

4.4.3 Long-term Impact Prediction and Assessment

4.4.3.1 Long-term Impact Prediction of the Project

The atmospheric pollutants' long-term impact on the regional ambient air quality caused by the project in this assessment report is calculated based on the whole annual meteorological observation data. Refer to Table 4-4-7 and Table 4-4-8 for the predicted results.

Table 4-4-7 Pollutant's (lead) Quarterlypropagation Concentration Unit: mg/m^3

Serial No.	Name	Coordinate	Ground Level Concentration (mg/m^3)											
			Winter			Spring			Summer			Autumn		
			Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value
1	Villa District	（111，2039）	1.06×10-6	1.06	4.26×10-6	1.19×10-6	1.19	4.39×10-6	1.37×10-6	1.37	4.57×10-6	0.98×10-6	0.98	4.18×10-6
2	Shiling Village	（1452，120）	1.67×10-6	1.67	4.87×10-6	2.64×10-6	2.64	5.84×10-6	1.50×10-6	1.5	4.7×10-6	2.47×10-6	2.47	5.67×10-6
3	Small Pangge Village	（668，-898）	0.72×10-6	0.72	3.92×10-6	1.66×10-6	1.66	4.86×10-6	1.05×10-6	1.05	4.25×10-6	1.43×10-6	1.43	4.63×10-6
4	Big Pangge Village	（1373,-586）	1.32×10-6	1.32	4.52×10-6	1.79×10-6	1.79	4.99×10-6	1.05×10-6	1.05	4.25×10-6	1.84×10-6	1.84	5.04×10-6
5	Baishan Village	（23，-2468）	0.12×10-6	0.12	3.32×10-6	0.26×10-6	0.26	3.46×10-6	0.29×10-6	0.29	3.49×10-6	0.27×10-6	0.27	3.47×10-6
6	East Jiuhu	（-108，-1322）	0.14×10-6	0.14	3.34×10-6	0.54×10-6	0.54	3.74×10-6	0.64×10-6	0.64	3.84×10-6	0.46×10-6	0.46	3.66×10-6
7	West Jiuhu	（-994，-437）	1.21×10-6	1.21	4.41×10-6	3.07×10-6	3.07	6.27×10-6	5.32×10-6	5.32	8.52×10-6	3.43×10-6	3.43	6.63×10-6
8	Nanchou Village	（-1237，-766）	0.72×10-6	0.72	3.92×10-6	1.68×10-6	1.68	4.88×10-6	2.95×10-6	2.95	6.15×10-6	2.10×10-6	2.1	5.3×10-6
9	Zhouzhuangzi	（-1260，-923）	0.52×10-6	0.52	3.72×10-6	1.29×10-6	1.29	4.49×10-6	2.31×10-6	2.31	5.51×10-6	1.59×10-6	1.59	4.79×10-6
10	Douzhuangzi	（-1143，-1150）	0.28×10-6	0.28	3.48×10-6	0.79×10-6	0.79	3.99×10-6	1.57×10-6	1.57	4.77×10-6	0.94×10-6	0.94	4.14×10-6
11	Dongmao Village	（-1111，-1377）	0.19×10-6	0.19	3.39×10-6	0.52×10-6	0.52	3.72×10-6	1.10×10-6	1.1	4.3×10-6	0.62×10-6	0.62	3.82×10-6
Standard			0.001											

Table 4-4-8 Pollutant's Long-term (Annual) propagation Concentration Unit: mg/m3

Serial No.	Name	Coordinate	Ground Level Concentration (mg/m^3)													
			SO_2			NO_x			Soot			Dioxin (pg/m^3)			Pb		
			Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value	Predicted Value	Percentage (%)	Accumulated Value
1	Villa District	（111，2039）	5.71×10^{-5}	0.10	0.04606	1.43×10^{-4}	0.10	0.0031	1.43×10^{-5}	0.02	0.11501	7.14×10^{-5}	0.0119	1.01×10^{-4}	1.14×10^{-6}	0.23	4.34×10^{-6}
2	Shiling Village	（1452，120）	1.03×10^{-4}	0.17	0.04610	2.58×10^{-4}	0.17	0.0033	2.58×10^{-5}	0.04	0.11503	12.9×10^{-5}	0.0215	1.73×10^{-4}	2.06×10^{-6}	0.41	5.26×10^{-6}
3	Samll Pangge Village	（668，-898）	5.97×10^{-5}	0.10	0.04606	1.49×10^{-4}	0.10	0.0031	1.49×10^{-5}	0.02	0.11501	7.47×10^{-5}	0.0125	1.20×10^{-4}	1.20×10^{-6}	0.24	4.4×10^{-6}
4	Big Pangge Village	（1373,-586）	7.75×10^{-5}	0.13	0.04608	1.94×10^{-4}	0.13	0.0031	1.94×10^{-5}	0.02	0.11501	9.68×10^{-5}	0.0161	1.42×10^{-4}	1.55×10^{-6}	0.31	4.75×10^{-6}
5	Baishan Village	（23，-2468）	1.13×10^{-5}	0.02	0.04601	2.82×10^{-5}	0.02	0.0030	0.28×10^{-5}	0.00	0.11500	1.41×10^{-5}	0.0024	0.55×10^{-4}	0.23×10^{-6}	0.05	3.43×10^{-6}
6	East Jiuhu	（-108，-1322）	2.19×10^{-5}	0.04	0.04602	5.47×10^{-5}	0.04	0.0031	0.55×10^{-5}	0.01	0.11501	2.73×10^{-5}	0.0046	0.68×10^{-4}	0.44×10^{-6}	0.09	3.64×10^{-6}
7	West Jiuhu	（-994，-437）	1.60×10^{-4}	2.67	0.04760	4.01×10^{-4}	0.27	0.0034	4.01×10^{-5}	0.06	0.11504	20.0×10^{-5}	0.0333	2.41×10^{-4}	3.21×10^{-6}	0.64	6.41×10^{-6}
8	Nanchou Village	（-1237，-766）	9.19×10^{-5}	0.15	0.04609	2.30×10^{-4}	0.15	0.0032	2.30×10^{-5}	0.03	0.11502	11.5×10^{-5}	0.0192	1.56×10^{-4}	1.84×10^{-6}	0.37	5.04×10^{-6}
9	Zhouzhuangzi	（-1260，-923）	7.07×10^{-5}	0.12	0.04607	1.77×10^{-4}	0.12	0.0032	1.77×10^{-5}	0.03	0.11502	8.83×10^{-5}	0.0147	1.29×10^{-4}	1.41×10^{-6}	0.28	4.61×10^{-6}
10	Douzhuangzi	（-1143，-1150）	4.45×10^{-5}	0.07	0.04604	1.11×10^{-4}	0.07	0.0031	1.11×10^{-5}	0.02	0.11501	55.6×10^{-5}	0.0927	5.97×10^{-4}	0.89×10^{-6}	0.18	4.09×10^{-6}
11	Dongmao Village	（-1111，-1377）	3.02×10^{-5}	0.05	0.04603	7.55×10^{-5}	0.05	0.0031	0.76×10^{-5}	0.01	0.11501	3.78×10^{-5}	0.0063	0.79×10^{-4}	0.60×10^{-6}	0.12	3.8×10^{-6}
Standard			0.06			0.15			0.07			0.6			0.0005		

Note: The background values of soot and sulfur dioxide come from Ji County's annual average data in 2012.

It is seen form the table above that the maximum predicted value of ground level concentration of atmospheric sensitive target Pb in winter appears in Shiling Village and the maximum predicted values of ground level concentration in spring, summer and autumn appear West Jiuhu. The maximum predicted value of Pbground level concentration at all environmentally sensitive areas in each season meets the limit of quarterly concentration specified in GB3095-2012 Ambient Air Quality Standards.

The accumulated value of quarterly average concentration of atmospheric sensitive target Pb in winter is 3.32×10^{-6}～4.87×10^{-6}mg/m^3 and the predicted value accounts for 1.67% at maximum; the accumulated value of quarterly average concentration of atmospheric sensitive target Pb in spring is 3.46×10^{-6}～6.27×10^{-6}mg/m^3 and the predicted value accounts for 3.07% at maximum; the accumulated value of quarterly average concentration of atmospheric sensitive target Pb in summer is 3.49×10^{-6}～8.52×10^{-6}mg/m^3 and the predicted value accounts for 5.32% at maximum; the accumulated value of quarterly average concentration of atmospheric sensitive target Pb in autumn is 3.47×10^{-6}～6.33×10^{-6}mg/m^3 and the predicted value accounts for 3.43% at maximum. The maximum accumulated value of Pb concentration at all environmentally sensitive areas in each season meets the limit of quarterly average concentration specified in GB3095-2012 Ambient Air Quality Standards.

Within the assessment scope, the maximum predicted value of pollutant's long-term ground level concentration of each atmospheric sensitive target appears in West Jiuhu. The maximum predicted values of long-term ground level concentration of SO_2, NO_x, soot, Pb and other pollutant in the project's environmental protection spots meet the limits of annual average concentration specified in GB3095-2012 Ambient Air Quality Standards. The predicted value of dioxin annual average concentration in environmentally sensitive areas meets the reference to Japan annual average concentration standard (0.6 pg/m^3).

Within each atmospheric sensitive target's assessment scope, the accumulated value of annual average concentration of SO_2 is 0.04610～0.04760mg/m^3 and and the predicted value accounts for 2.67% at maximum;

the accumulated value of annual average concentration of NO_x is 0.0030～0.0034mg/m^3 and and the predicted value accounts for 0.27% at maximum; the accumulated value of annual average concentration of Pb is 3.43×10^{-6}～6.41×10^{-6}mg/m^3 and and the predicted value accounts for 0.64% at maximum. The long-term concentration accumulated values of SO_2, NO_x and Pb meet the annual average standards specified in GB3095-2012 Ambient Air Quality Standards (Second Level).

Within each atmospheric sensitive target's assessment scope, the accumulated value of annual average concentration of soot is 0.11500～0.11504mg/m^3 and and the predicted value accounts for 0.06% at maximum, and the accumulated value exceed 64.3% at maximum than that the standard specified in GB3095-2012 Ambient Air Quality Standards (Second Level). The over-limit of accumulated value mainly resultes from the over-limit of background value.

Within each atmospheric sensitive target's assessment scope, the accumulated value of daily average concentration of dioxin is 0.79×10^{-4}～5.97×10^{-4}pg/m^3 and and the predicted value accounts for 0.03% at maximum, so the values meet the reference to Japan annual average concentration standard (0.6 pg/m^3).

Except the soot's over-limit of accumulated value, the accumulated values of all other atmospheric pollutants in the environmentally sensitive areas meet the relevant standards. Soot's over-limit of accumulated value mainly results from the over-limit of background value. The maximum predicted values of long-term concentration of various pollutants in environmentally sensitive areas account for a relatively lower percentage, so it is predicted that there is no obvious impact on the ambient air quality.

4.4.3.2 Long-term Comprehensive Impact on Regional Ambient Air Quality

Based on the addition of the annual average value of soot and SO_2 in Ji County in 2012 and the project's maximum predicted value of long-term impact, this assessment report takes the average value of the monitoring values of NO_x and Pb in the current ambient air quality monitoring as the background value to predict the long-term impact on the regional ambient air quality after

completion of the project.

Table 4-4-10 Long-term Comprehensive Impact on Regional Ambient Air Quality Unit: mg/m^3; Dioxin: pg/m^3

Pollutant	Predicted Value	Spot of Occurrence	Percentage (%)	Accumulated Value	Standard Value	Remark
Soot	5.71×10^{-4}	（-1250,1500）	0.571	0.1158	0.10	GB3095-2012
SO_2	2.28×10^{-3}		0.038	0.048	0.06	
NO_x	5.71×10^{-3}		0.114	0.0087	0.05	
Pb (Winter)	9.92×10^{-5}	（-2100,700）	9.92	10.2×10^{-5}	0.001	
Pb (Spring)	4.15×10^{-5}	（-1250,1500）	4.15	4.47×10^{-5}		
Pb (Summer)	4.61×10^{-5}	（-1250,1500）	4.61	4.93×10^{-5}		
Pb (Autumn)	5.21×10^{-5}	（-2100,700）	5.21	5.53×10^{-5}		
Pb*	4.66×10^{-5}	（-1250,1500）	9.32	4.98×10^{-5}	0.0005	
Dioxin	2.85×10^{-3}		0.475	0.369	0.6	Refer to Japan annual standards

It is seen from the table above that, after completion of the project, the various atmospheric pollutants' maximum annual average ground level concentration appeared at the spot of 1,950 m at the coordinate (-1250,1500) downwind. The maximum quarterly average ground level concentration of plumbum in autumn and winter appeared at the spot of 2,210 m at the coordinate (-2100,700) downwind, and the maximum quarterly average ground level concentration in spring and summer appeared at the spot of 1,950 m at the coordinate (-1250,1500) downwind. The long-term impact value of moke dust, SO_2, NO_x, Pb and dioxin merely accounts for 0.038%～9.92%, which indicates a very minor long-term impact on the regional ambient air quality, so it is predicted that there won't be obvious impact on ambient air quality. The ambient air quality can maintain its current status after completion of the project.

Within the project's assessment scope, the accumulated values of the maximum annual average ground level concentration of SO_2 and NO_x meets the relevant annual average concentration standards specified in GB3095-2012 Ambient Air Quality Standards (Second Level); the quarterly average value and annul average accumulated concentration of Pb meet the limits specified in GB3095-2012 Ambient Air Quality Standards (Second Level); the accumulated value of the maximum annual average ground level concentration of dioxin meets the reference to Japan annual average

concentration standard.

The predicted value of maximum annual average ground level concentration of soot accounts for 0.571%, which exceeds the limiting standard specified in GB3095-2012 Ambient Air Quality Standards (Second Level) after adding the current value. The over-limit of predicted value is mainly resulted from the over-limit of current status value.

Therefore, each atmospheric pollutant has a very minor long-term impact on the regional ambient air quality for its relatively low percentage.

4.5 Discussion of Chimney Height

According to the requirements specified in GB18485-2001 Standard for the Control of Pollutants from the Burning of Municipal Solid Waste, when the incineration scale is larger than 300t/d, the chimney height should be decided according to the environmental impact assessment report but shall not be lower than 60 m. The current and long-term incineration scales of the project's garbages respectively are 700t/d and 1,050t/d, so the chimney height is 80 m, which meets the requirement specified in the document. As for the calculation of pollutants propagation, all atmospheric pollutants will be emitted from the 80m-height chimney, except that the nitric oxide and Hydrogen sulfide maximum hourly concentration exceeds the specified standard due to the influence of complicated geographic conditions, all other pollutants' maximum ground level concentration all meets the environmental standards. It is predicted that the minor over-limit of nitric oxide and sulfuretted hydrogen's maximum hourly concentration won't have an obvious impact on ambient air quality. Therefore, it is feasible for the project to have the 80m-height chimney.

4.6 Control Measures for Odorous Pollutants

The regulating tank, UASB and sludge concentration tank in the leachate treatment station are the major processes that produce the odors, and the major assessment factors of odors are NH_3, H_2S and odor concentration.

According to the requirements in HF (2008) No. 82 Document , the structures of garbage leachate treatment must be sealed to avoid the odors' obvious impact ton ambient air quality. Except the sealing measures, the odors also must be purified. In order to reduce the impact on environment, the regulating tank is built in reinforced concrete structure, and the roof on upper part will

control the overflow of waste gases. Waste gases produced by the regulating tank and other units will be pumped into the garbage storage pit. Corrosion prevention and anti-seepage measures are taken for the regulating tank to avoid pollution to external environment caused by any seepage of liquids from the tank.

4.7 Discussion of Environment Protection Zone for Unorganized Emissions

It is known from the engineering analysis that the project's pollutants are in organized emissions. Unorganized emissions may only happen when there is an accident and the waste incineration plant becomes the dumping site, on which the odors will emit through the workshop doors and windows. When there is incinerator repair, the special designed air flue will dump the odors in the waste pit through the deodorization pit draught fan, and the odors will emit into the air after activated carbon adsorption process. This method minimizes the unorganized emissions of waste gases from the waste pit. Since the project has the waste pit and sewage treatment station to seal and dump the odors into the incinerator for burning, there is no unorganized emission source under normal conditions. When there is a malfunction of the incinerator, the waste gases in the garbage pit will emit after qualified purification by the activated carbon adsorption device to avoid odorous pollutants. Therefore, the environment protection zone will be decided in this report based on best management practices.

According to the survey results of odors in the waste incineration plants in Shenzhen and Macau, with good management and normal operation of environmental protection facilities, the waste incineration plant's ambient odor severity wont't exceed the level-1 odor severity even in the hot summer, namely, NH_3 and H_2S respectively wont't exceed 0.076mg/m^3 and 0.00076mg/m^3 and both meet the limits of odorous pollutants in Emission Standards for Odorous Pollutants DB12/-059-95. The environmental protection inspection reports of Tianjin's two operated waste incineration power plants show that the ambient odor severity under waste incineration plant's normal operation is lower than 20, which meets the limits specified in Emission Standards for Odorous Pollutants.

Analysis above indicates that the project's unorganized emission will generally

be controlled within the project area. According to the requirement of “environment protection zone of new and reconstruction projects shall not be shorter than 300 m” specified in HF (2008) No. 82 Document Notice on Enhancing Environment Impact Assessment of Biomass-to Energy Projects, the project has to set a 300-m environment protection zone to make sure that there is no current and planned environment-sensitive targets within 300-m ambient areas.

4.8 Standardization and On-line Monitoring Requirements for Pollutant Emission

According to the requirements specified in HF (2008) No. 82 Document and Tianjin Environmental Protection Bureau’s JHBJL [2007] No. 71 Notice on Enhancing Tianjin Standardized Pollutant Emission and JHBJC [2007] No. 57 Notice on Release of Tianjin Technical Requirements for Standardizing Pollution Source Emission, the project should have standardized management on the category, quantity, concentration and emission of all waste gas pollutants for the convenience of easy sampling, automatic monitoring and daily supervision and inspection. The specific requirements are as follows:

(1) Standardize the design, construction and management of the discharge outlet of waste gases as required;

(2) Set a sampling port in the flue and the sampling port can be set under the guidance of local environment protection bureau;

a) Sample or real-timely monitoring the particles, gaseous pollutants’ emission concentration and locations of the emissions (flue gas emission real-time monitoring system). The system should be set in the stable airflow section in the pipeline and the vertical pipeline and negative-pressure area of the flue should be firstly taken into consideration.

b) In principle, the location of sampling port should keep away from the elbow and changing sections of the flue. The sampling or real-time monitoring of particles should be conducted at the positions in the downstream direction from at least four times of the diameters of the elbow, valve and reducer and upstream direction from at least two times of the diameters of foresaid components. The sampling or real-time monitoring of gaseous pollutants

should be conducted at the positions in the downstream direction from at least two times of the diameters of the elbow, valve and reducer and upstream direction from at least 0.5 time of the diameters of foresaid components. Equivalent diameter of rectangle flue is: D=2AB/(A+B), among which, A and B refer to side length.

c) In principle, two orthogonal sampling ports should be set in the circular flue. Rectangle flue should be divided according to the sectional area, generally, there must be a gauging point in each block 0.6 m^2 and the number of sampling ports is dependent on the gauging points.

d) The caliber of the sampling port is generally not less than 75 mm. When sampling poisonous or temperature-variable gases and the flue is in the positive-pressure state, the blowout preventer should be added. The caliber of the sampling port of flue gas emission real-time monitoring system should be confirmed according to the product specification.

e) Location 0.5 m downstream the monitoring section should be reserved for the reference method sampling aperture of the flue gas emission real-time monitoring system for the sake of calibration of reference method. The position of reference method sampling aperture shall not be in overlap with the position of real-time monitoring system, but the two positions should be as close as possible on the condition of no mutual influence on the measurement. If the section height of the rectangle flue is higher than 4 m, then it is not appropriate to set the reference method sampling aperture at the top flue; if the section width of the flue is wider than 4 m, then reference method sampling apertures should be set at both sides of the flue and a multi-layer sampling platform should be additionally set.

f) When the position of sampling port fails to meet the above requirements, its gauging point should be set at the stable airflow section as far as possible, but the length of front straight pipe at the gauging point must be longer than that of the rear straight pipe.

(3) Install the flue gas automatic real-time monitoring device to conduct on-line monitoring to soot, SO_2 and other pollutants that can be monitored real-time; meanwhile, keep networking with district and municipal environmental protection bureau;

(4) Install the flue gas on-line monitoring system to monitor the temperature,

pressure, humidity, oxygen concentration, soot, HCl, SO_2, NO_X, CO and other pollutants; meanwhile, keep networking with district environmental protection bureau

(5) Measure and monitor the application amount of activated carbon and the jetting status;

(6) The environmental protection escutcheon of waste gas discharge outlet should be set on a conspicuous position on the floor near the exhaust funnel.

4.9 Discussion of Permissible Emission of Canteen fume

The canteen of the project is a medium-scale canteen and the fume caused will emit through the fume channel with a draught fan. The fume concentration of this project is about 6～10mg/m^3, which exceeds the maximum permissible emission concentration 2mg/m^3 specified in GB18483-2001 Emission Standards of Cooking Fume (Trial Implementation). In order to reduce serious impact of cooking fume on ambient air quality, the construction unit has taken the following handling measures into consideration and the specific flow of processes are as follows:

Fume→ Gas-collecting Hood → Air Duct→ Draught Fan → Fume→ Purification Device Organized Emission

In order to make sure that there is no serious impact of cooking fume on ambient air quality, the fume discharge system must:

a) Be equipped with qualified fume purification facilities recognized by relevant departments to guarantee a fume purification rate of 75% and fume emission concentration lower than 2.0mg/m^3;

b) The fume must be collectively emitted through a special exhaust funnel, which must have the outlet section with a straight pipe of minimum length of 4.5 times of diameter (or equivalent diameter);

c) The fume discharge system must be well sealed and random dilution of pollutant concentration in the exhaust funnel is forbidden;

b. d. After qualified purification by the purification device, the project's fume will emit through a special funnel roof, so it is predicted that there won't be

obvious adverse impact on ambient air quality.

5. Water Environmental Impact Assessment

5.1 Feasibility of Wastewater Zero Discharge

5.1.1 Feasibility Analysis of Water Balance and Wastewater Zero Discharge

According to the engineering analysis, the project's wastewater during the construction period is mainly the workers' domestic wastewater, landfill leachate in the garbage storage pit and the washing wastewater caused by waste unloading hall, ash area and boiler room, . The wastewater will be recycled after being treated through the sewage treatment system and will not be discharged outside.

The wastewater treated by the sewage treatment system is used to wash the production workshop, purify the fume and water the greening, . The inadequacy of water will be supplemented by the circulation cooling water. Since there will be no wastewater discharge outside after the construction, so wastewater zero discharge can be realized.

5.1.2 Feasibility Analysis of Wastewater Treatment Process

5.1.1.1 Wastewater Quantity and Quality

The wastewater treated by the project's sewage treatment system is divided into three kinds: domestic wastewater, production wastewater and percolate, which total a wastewater quantity of 139m^3/d. Among which, the landfill leachate has relatively higher pollutant concentration, complex constituent and high ammonia nitrogen content, which make the leachate high concentrated organic wastewater, and its major pollutant representation values are CODcr, NH_3-N and SS, . The addition of washing wastewater basically has no impact on the leachate wastewater quality. According to the design data, the raw water quality of waste water treatment system design is shown in Table 5-1-1.

Table 5-1-1 Raw Water Quality in Sewage Treatment System Design

Unit: mg/L except pH

Sewage Quality Index	pH	$CODc_r$	BOD_5	SS	NH_3-N
Inflow Water Quality	6～9	80000	40000	4000	2500

5.1.1.2 Wastewater Quality Characteristic Analysis

Characteristics of leachate are as follows:

a) The water quality and quantity of leachate has obvious seasonal changes, so it is a must to have enough regulating tanks and good handling facilities.
b) When the specific value (B/C value) of BOD and COD in leachate is higher than 0.4, there will be relatively better biodegradability.
c) Due to its high concentration, heavy load and relatively deeper color and odor, the leachate requires necessary pre-treatment to guarantee biodegradability and conformance.

There are physical-chemical process and bioanalysis to treat the landfill leachate. According to domestic and international relevant data, high-concentration landfill leachate of CODcr concentration higher than 50,000 mg/L is suggested to be treated by anaerobic + aerobiotic method; landfill leachate of CODcr concentration lower than 50,000mg/L is suggested to be treated by aerobic biological treatment; landfill leachate of CODcr concentration between 5,000～50,000 mg/L can be treated by both aerobiotic and anaerobic methods. As for the project, the CODcr concentration in the designed inflow indicator is 65, 000 mg/L, it is planned to adopt the method of anaerobic + MBR + nanofiltration process.

5.1.1.3 Wastewater Treatment Process

Technological Process Flow of Garbage Leachate Treatment System is shown in Figure 5-1-2.

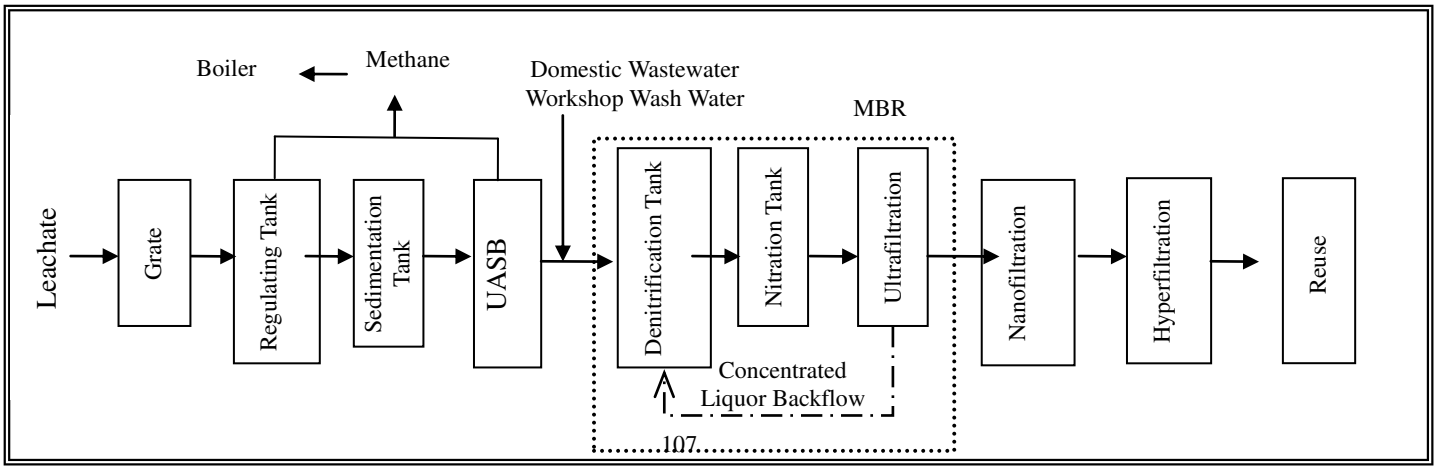


Figure 5-1-2 Block Diagram of Technological Process of Leachate Treatment

(1) Selection of Pre-treatment Process

Municipal solid waste's landfill leachate and waste unloading hall's wash wastewater have relatively high-concentration suspended matter and the suspended particles contain large amount of organics. The suspended matters in follow-up treatment period will act on the treatment to effectively eliminate the suspended matters in the wastewater, and this is the major procedure of pretreatment process.

The pretreatment process of the project includes grilling, regulating tank and sedimentation tank. The leachate will be lifted to the automatic grilling, and the space between grilling is 3 mm, which may eliminate the large matters in the leachate to provide good conditions for the follow-up process. The addition of lime and sodium carbonate into the regulating tank's water can eliminate partial hardness and basicity, meanwhile, the addition of PAC coagulant and PAM (Polyacrylamide)coagulant aids may precipitate some suspended matters, reduce COD, hardness and basicity as well as reduce the contamination to the membrane.

(2) Selection of Anaerobic Process

The project adopts the up-flow anaerobic sludge blanket (UASB) process. UASB bioreactor was developed by Lettinga and other persons of Wageningen University in Holland during 1973 to 1977. The investigation of global anaerobic treatment techniques in 1999 showed that, among the 1,303 applied anaerobic reactors of different types, nearly 800 reactors were UASB bioreactors, which accounted 59% of all reactors applied. As for treatment of urban landfill leachate, New Zealand, USA, Australia and other countries adopted the UASB techniques and achieved good efficiency. There were living examples in China, Beijing, Hangzhou, Fuzhou, Wuhan, Kunshan and other cities also adopted UASB techniques to treat the landfill leachate. UASB bioreactor belongs to the second generation of anaerobic reactor and its use greatly enhances anaerobic reactor's load and treatment efficiency and makes

it possible to shrink the reactor volume, and the development of three-phase separation techniques obviously improves the gas-liquid separation efficiency. The prolonged stay and higher concentration of sludge make the anaerobic system more stable and then effectively improve its applicability to harmful toxic substances.

The sewage will be lifted into the bottom of the reactor by a pump and then flows from bottom to top at a certain flow rate. The large amount of methane produced during the anaerobic process will stir the sewage to fully mix with the sludge and then the organic matters will be adsorbed and decomposed. The methane produced will be emitted from the three-phase separator's plenum chamber on the anaerobic reactors, then the sewage with floating sludge will flow into the three-phase separator's sedimentation area. Sludge of good sedimentation performance will be returned to the main part of reactors through the sedimentation surface and then the sewage containing light sludge will be discharged from the reactors.

The anaerobic reactor's most prominent characteristic is that it can granulate the sludge in the reactor and it has good sedimentation performance and high production of methane, thus the sludge in the reactor will have higher concentration and older sludge age, which greatly improve the COD volumetric loading and realize the good contact with sludge and water. The adoption of high COD load produces large quantity of methane and makes the sludge in an expansion and fluidization state, which strengthen the mass transfer effect and good contact with sludge and water.

The outflow water treated by the anaerobic reactor flows into the MBR system for further treatment, and then be drawn into the negative pressure zone of the garbage pit through the pipeline by a methane draught fan.

(3) Membrane Bioreactors (MBR)

In recent years, MBR techniques are successfully applied into the leachate treatment, and the external MBR has been successfully applied into the landfill leachate treatment. MBR is a high-efficiency waste water treatment system combined the biochemical reactor and membrane separation, and the secondary sedimentation tank of conventional biological process is replaced with a membrane separation (normally is the ultrafiltration). Compared with the conventional activated sludge process, MBR has much higher removal rate,

because in the conventional activated sludge process, the biological treatment is hard to continue to improve the system's removal rate when it reaches a certain level due to the influence of secondary sedimentation tank's requirements for sludge sedimentation performance, and a prolonged stay of water only can achieve a slightly higher removal rate; while in the MBR, with the great increase of separation efficiency, the microorganism concentration in the biochemical reactor can be improved to 15～30g/L from its normal concentration of 3～5g/L, thus the biochemical reactor volume is decreased and the biochemical reaction efficiency is improved, and there is no thalli or suspended matters in the outflow water, so MBR has obvious advantages in improving the system's treatment capacity and outflow water quality. The MBR applied in the project is an external MBR, which includes two units: biochemical reaction tank and ultrafiltration (UF).

Biochemical Reaction Tank: After treatment from the anaerobic reactor, the leachate flows into the nitration reactor after the mixture with the backflow of nitration tank, and then fully mixes with the denitrification sludge by the burried stirrer. The high-activity aerobic microorganism's nitration changes the ammonia nitrogen, organic nitrogen and oxygen into nitrate and nitrite, which will be reverted to nitrogen in the poor-oxygen denitrification reactor with the effect of denitrification sludge, this is a denitrification process. Outflow water of the denitrification tank will directly flow into the nitration tank to fully mix with the sewage, air and activated sludge. After circulatory movement in the reaction tank and the high-activity aerobic microorganism's nitration, the organic matters that contain carbon, nitrogen, phosphorus and other elements in the sewage will be effectively eliminated and the ammonia nitrogen, organic nitrogen and oxygen will be changed into nitrate and nitrite. The necessity of nitrate and nitrite's flow into the carbon source's postpositional denitrification tank is flexibly dependent on the ammonia nitrogen content in raw water and the effect of aforementioned treatment. If total nitrogen of the aforementioned treatment is qualified, then the carbon source is not required; if the total nitrogen is unqualified, then the carbon source is required to be added to change the nitrate and nitrite into nitrogen for denitrification effect. The outflow water of denitrification tank flows into the ultrafiltration system through the

ultrafiltration deliver pump, and with the effect of ultrafiltration circulating pump, the activated sludge brings the sewage into the nitration reactor and then return to the postpositional denitrification reactor, and the residual sludge will be discharged into the sludge thickener. The domestic wastewater and the floor washing water can be directly flowed into the denitrification tank for treatment through the grilling for their low water quality concentration.

Ultrafiltration: After nitration and denitrification, the landfill leachate will be filtrated through the ultrafiltration device. The secondary sedimentation tank of conventional biological process is replaced with an ultrafiltration device, which promptly and fully retains the microorganism into the biochemical reactor, keeps a high biological concentration for the biochemical reactor and effectively controls the sludge age, and then avoid the sludge loss, guarantee the nitration effect and improve the outflow water quality. Ultrafiltration is a membrane separation process to separate macroparticle solute from the solution. The separation mechanism is the machinery screening principle, and the ultrafiltration membrane has the characteristic of selective separation.

Ultrafiltration Process: Under the pressure, the solvents and various minor solutes contained in the feed liquid will flow onto the low pressure side from the high pressure side through the ultrafiltration membrane to form permeate, and the solute molecule in larger size than the membrane hole will be retained to form the concentrated solution.

(4) Nanofiltration (NF)

Since the MBR outflow water cannot stably meet the standards for nanofiltration pipe, so a nanofiltration system is required to be added post the MBR. Nanofiltration aims at retaining the COD that is hard to be biochemical and most divalent salt to reduce RO inflow salinity and the quantity of concentrated water. The recycle rate of nanofiltration purified water is 85%, and the nanofiltration concentrated solution will be returned to the regulating tank after treatment.

(5) Reverse Osmosis (RO)

NF outflow saline requires RO to further retain the salinity to make sure that the outflow saline is qualified to be recycled.

5.1.1.4 Outflow Quality Prediction(online test, use the special test machine)

The operation steps of sewage treatment system and the pollutant removal rate and treatment effect are shown in Table 5-1-2.

Table 5-1-2 Pollutant Removal Rate and Treatment Effect

Unit		Item	CODcr (mg/L)	BOD_5 (mg/L)	NH_4-N (mg/L)
Sewage Treatment System	Anaerobic Reactor	Inflow	80000	40000	2500
		Outflow	24000	12000	--
		Removal Rate	70%	70%	--
	MBR	Inflow	24000	12000	2500
		Outflow	720	192	12.5
		Removal Rate	97%	98.40%	99.5%
	NF	Inflow	840	192	12.5
		Outflow	84	19.2	8.75
		Removal Rate	90%	90%	30%
	RO	Inflow	84	19.2	8.75
		Outflow	16.8	3.84	5.25
		Removal Rate	80%	80%	40%

It can be seen from the analysis above that, after regulation + anaerobism + Membrane Bioreactors (MBR) + nanofiltration process treatment, the project's landfill leachate may meet the requirements in GB/T 18920-2002 Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Water Consumption. Such kind of wastewater will be fully recycled without any emission outside after treatment.

5.2 Groundwater Environment Impact Analysis

5.2.1 Groundwater Pollution Way

The major pollution to groundwater comes from the sewage's direct outflow to the ground, and the unloading workshop and sewage treatment station are sewage concentrated places. If there are no appropriate ground anti-seepage measures, the pollutants may permeate with the sewage into the ground and impact the groundwater quality.

5.2.2 Hydrogeological Condition Survey of Construction Area

Ji County is located at north Tianjin City with an area of 1,470km^2, and it is in a

semiarid and subhumid climatic zone with the average annual precipitation of 672. 2mm. North Ji County is in mountainous region with an area of 727 km^2 and south Ji County is in alluvial-proluvial plain with an area of 743 km^2. Yuqiao Reservoir is the regulating reservoir for Water Diversion Project from Luanhe River to Tianjin City.

5.2.3 Groundwater Environment Impact and Measures Analysis

The groundwater level of the project's construction area is 22.0～25.9m. Appropriate anti-seepage measures are taken in the whole plant areas. Generally, the production workshop and floors have cement foundation, which covered by an impermeable membrane and then the anti-seepage concrete. After anti-seepage treatment, the permeability coefficient is lower than 10^{-7}cm/s. The anti-seepage treatment in garbage storage pit, sewage treatment station and hazardous waste storage room is required to be strengthened: it is a must to have cement foundation, cover 2 mm HDDP(High-density polyethylene impermeable membrane) on the cement and finally lay the anti-seepage concrete. After anti-seepage treatment, the permeability coefficient is less than 10^{-10}cm/s. After taking the above measures, the computational formula of project's soil and underground pollution rate are as follows:

T=h/K

T: Duration of pollution to the soil;

h: Foundation and thickness of impermeable membrane, the thickness of cement takes 40 cm, the thickness of concrete takes 10 cm, and the thickness of impermeable membrane of high density polyethylene takes 2 mm.

K: Permeability coefficient, HDDP takes 10^{-10}cm/s and other coefficients take 10^{-7}cm/s;

After calculation, it takes 79 years for the sewage to penetrate the foundation and anti-seepage membrane and then pollute the soil, namely, on the condition of guaranteeing the anti-seepage effectiveness of foundation and anti-seepage membrane, the wastewater will not penetrate and pollute the soil.

5.2.4 Pollution Prevention Measures

(1) Select qualified design organizations to design the plant area.

(2) Select qualified construction units to conduct construction strictly according to the design to guarantee the construction quality and make

sure that all construction indicators meet the design requirements. Cheating on workmanship and materials is strictly prohibited.

(3) The waste disposal site and main construction must be simultaneously constructed and put into use with other supporting facilities.

(4) Formulate a series of strict management and operation procedures and the workers must be strictly trained before starting working.

(5) Conduct strict management and regular inspection to make sure that the sewage treatment facilities operate normally.

(6) Build ground water quality monitoring and warning systems to timely find problems, immediately stop the operation when there is any fault or accident and promptly report the problems to relevant department for timely handling to minimize the pollution.

To sum up, the project won't pollute the ambient groundwater under normal operation. In the viewpoint protecting the groundwater, the project is feasible if the measures above are strictly taken for pollution prevention.

5.3 Rationality and Feasibility of Groundwater Use

There is no municipal water supply system in the project's construction area, and the project's domestic and production water is extracted from groundwater. Tianjin Runye Water Resources Development Technology Consulting Co., Ltd. is entrusted by the construction unit to prepare the Demonstration Report of Water Resources of Tianjin Ji County's Municipal Solid Waste to Energy Project. In November 2013, Tianjin Ji County's Water Supplies Bureau organized an expert review meeting for the demonstration report and the report pass the review and on November 15, 2013, Ji County approves the demonstration report. The rationality and feasibility analysis of groundwater use in this assessment report cites the content of Demonstration Report of Water Resources of Tianjin Ji County's Municipal Solid Waste to Energy Project.

5.3.1 Occurrence Conditions of Groundwater

Ji County is Tianjin's richest area in groundwater, and the mountains in Ji County are mainly of carbonatite karst fissure water. Except the quaternary

pore water in the plain areas, there is plenty of shallow buried hidden karstic water, which has great water supply significance and is the main water source for the current industrial and agricultural water supply.

As for the geologic structure, Ji County is located at north of Jibao upwarping folded zone with the quaternary thickness of 100-300m, which directly covers the prepaleozoic era's bed rock.

(I) Quaternary Pore Water $Q_{4+3}^{al-pl} + Q_2^{al-pl}$

The quaternary pore water is fresh water from the flood diluvium and alluvium, and it is mainly distributed in plains and intermountain basin. Comparatively speaking, the shallow groundwater is more developed than the deep groundwater. Shallow groundwater is mainly hidden and confined groundwater, and its major aquifer floor is deeply buried 70 to 100 m underground. Contained by the sub-mountain alluvial-proluvial fan and river alluvial fan, the aquifer generally follows the flow directions from north to south and from north-east to south-west, the aquifer rocks change from coarse to fine and the water flow change from large to small. But there are no large rivers in Ji County's sub-mountain regions, there are plenty of thick proluvial claypan in the piedmont belt, so the aquifer in sub-mountain plain near the piedmont belt are getting thinner and the water flow is getting smaller. The zones of large water flow are usually located at the central alluvial fan, so the water flows from north-east to south-west and the water inflow is 500-1000→1000-3000→>3000→1000-3000→500-1000→1000-3000m^3/d. In the mountains, the ground is mainly shaped by rivers and basal structure, so the shallow groundwater and deep groundwater are both well developed in the east of Longmenkou-Yanshankou breakage and upstream areas of sand and river alluvial fan. There are coarse and thick particles in the aquifer, especially the second aquifer, in which the confined groundwater is widely distributed and large amount of water is contained.

The highly water-rich zones are mainly distributed in middle-upper sub-mountain plains, sides of Zhou River and the upstream areas of sand and river alluvial fan in the intermountain basin. The aquifer contains gravel and medium-coarse sand generally with the thickness of 30-50 m, water inflow of 3,000m^3/d and the transmissivity coefficient of 400 – 600 m^2/d. The aquifer in upstream sand and river alluvial fan is of the thickness of 30-60 m and the

transmissivity coefficient of 500 – 1,000 m^2/d, which is partially larger than l,000 m^2 / d.

The relatively water-rich zones are mainly distributed in east and center of sub-mountain plains and the center of sand and river alluvial fan. The aquifer contains gravel and medium-fine sand, the water inflow is 1,000-3,000 rn3/d, transmissivity coefficient is 300-500 m^2/d and the transmissivity coefficient of sand and river alluvial fan is 500 – l,000 m^2/d.

The moderately water-rich zones are mainly distributed in Ji County's piedmont belt and the region between west Zhou River and Xun River. These zones have relatively thick clayey soils and the aquifer is getting thinner, so the water inflow is 500-1000m^3/d and the transmissivity coefficient is 100 - 300m^2/d. The aquifer in Yuqiao Reservoir's surroundings has relatively fine particles and smaller water yield, which is generally smaller than 500m^3/d.

(II) Carbonatite Karst Fissure Water

1. Bare Karstic Water in Mountains

Bare karstic water is mainly distributed in northern mountains, and its water-bearing media is the carbonatite of dolomite of Gaoyuzhuang Fm and Wumishan Fm and hidden water. Because of the bare bed rock, steep topographic slope and quick water exchange, the karst ground water is developed and the water inflow is usually 1000 – 3000m^3/d and partially more than 3000nm^3/d. The karstic water, from east to west, has formed four water storage structures: Chanfangyu, Mopanyu, Zhaojiayu and Zhuangguoyu.

The area of Chuanfangyu Township's water storage structure is 55km^2 and its aquifer is mainly the dolomite in Gaoyuzhuang Fm. Opposite confining boundaries have been formed by the pelite of Dahongyu Fm in northeast part and Yangzhuang Fm in southwest part and the groundwater is mainly discharged from north-west to east-south.

Mopanyu water storage structure is distributed Fujun Mountain's syncline wings with an area of about 11km^2 and the aquifer consists of dolomite of Wumishan Fm. The opposite confining boundaries of Yangzhuang Fm are in the east, confining boundary of diabase dykes in banding distribution is the west, the recharge boundary of Nihe Town is in the north and the Ji County's

sub-mountain breakage boundary is the in south. Except the watertightness in one syncline wing of Fujun Mountain, the east part is water diversion breakage and the karstic water will recharge the sub-mountain plain groundwater.

Zhaojiayu water storage structure is located in the anticline east wing of Pan Mountain with an area of 35km^2 and the aquifer mainly consists of dolomite of Wumishan Fm. East and west parts have the confining boundaries respectively of diabase dykes and granite, and the breakage boundary in Ji County's sub-mountain is the water diversion and discharge boundary.

Zhuangguoyu water storage structure is a syncline structure and the aquifer of syncline wings mainly consist of Wumishan Fm. Granite boundary is in the east and the west part extends to Pinggu County.

2. Plain Covered Invisible Karstic Water

Plain covered invisible karstic water includes karstic water of Xilonghuyu water storage structure, Ji County's Chengguan water storage structure, Dakangzhuang water storage structure and Xiacang water storage structure. The plain is covered by quaternary water, which is the high-water-head confined groundwater.

Xilonghuyu water storage structure is located in the intermountain basin of Yuqiao Reservoir with an area of 250km^2, and its aquifer mainly consists of Gaoyuzhunag Fm and Wumishan Fm. The structure is covered by 50-250m quaternary loose illuvial horizon, the east and northwest part is the recharge boundary and the north part is the acquitted boundary of Dahongyu Fm. Tanmalanyu arcuate structure is the frontal breakage cluster, which forms the channel of recharge basin, and the south part is the watershed boundary. This water storage structure is a multilayered structure leakage system. There is close hydraulic connection between karstic water and upper pore water and the northern piedmont belt has a "skylight", which is the major channel of leakage recharge. The water-rich zones are in the Xishijiazhuang area, the water inflow usually is 5000 -10000m^3/d and partially more than l0000m^3/d.

Ji County's Chengguan water storage structure is located in the sub-mountain plain northward Qiuliu with an area of 60km^2, and its aquifer mainly consists of Miwushan Fm that belongs to fault-block structure, which mainly accepts lateral runoff recharge from north and east parts. The bed rock roof is deeply

buried under 50～150m and the water inflow usually is 3000～5000m^3/d.

Dakangzhuang water storage structure is located in the sub-mountain plain eastward Zhou River with an area of 127km^2, and the Shangcang breakage westward in upper part is the acquitted boundary, the Hongshuizhuang pelite in the south is the confining boundary and the north and east parts are the recharge boundaries. The water-rich zones are in the Dashen'an area and covered by a quaternary covering layer of the thickness of 150～300m and the water inflow is 3000～5000m^3/d.

Baodi-Xiacang water storage structure is located at Xiacang's syncline wings. The west and north parts are confining boundaries of Cambrian system pelite and the aquifer mainly consists of Ordovician limestone. The bed rock is deeply buried 100～250m underground and the underground runoff accepts the leakage recharge from external cross-flow upstream pore water. The water-rich zones are located in Big Yangge Village and North Xiaohu area and extend southward to Baodi with the water inflow of l0000m^3/d.

5.3.2 Groundwater Flow Law and Hydrochemical Characteristics

Sub-mountain plain pore water is mainly the recharge of rainfall, river, canals leakage, and water for irrigation. The pore water in sub-mountain valley belt also has the lateral river feeding from mountains and it is mainly dependent on evaporation, exploitation and discharge.

Sub-mountain plain aquifer has relatively coarse particles and good underground water runoff conditions. The general flow direction of groundwater is from north to east and south to south-east and the flow direction in Bieshan sub-mountain is from north-east to south-west, the hydraulic slope in piedmont belt is steep, so the groundwater flows from south and gets slow, generally about 0. 3‰-0.8‰. Zhou River has most discharge of groundwater, which gets shallow from north to south with the change of 5-15m to 2-4m. Controlled by rainfall and exploitation, the groundwater level is low in early June; the high water level and rainfall peak basically are consistent or slightly lagged behind and the annual water level fluctuation is 1-2.5m, showing the dynamic characteristic of permeation - runoff - exploitation.

Karstic water has good continuity and uniform flow distribution. The bare karst

water storage structure in north part has a steep hydraulic slope and its general flow direction is from north to south to recharge the plain groundwater. The basin hidden karst water's general flow direction is from north-east to south-west, and the karst water converges in the Yuqiao Reservoir and discharges southward through the runoff in Yanshankou. The basin's karstic water has hydraulic connection with the upper pore water, and during the exploitation, the lower pore water will recharge the karstic water. The plain's hidden karstic water generally flows from north to south, and the west part of Bangjun-Qiuliu breakage in east-west distribution has the watertightness.

All the sub-mountain plain pore water is fresh water, whose mineralization is getting higher from less than 0.5g/L to 1-1.5g/L from north to south with the aquifer particle becoming smaller. Its hydrochemical type is HCO_3-Ca·Mg→HCO_3-Ca·Na, which partially has higher F content.

Karstic water merely consists of HCO_3-Ca·Mg water, whose mineralization is smaller than 0.3g/L, among which, HCO_3^-, Ca^{2+} and Mg^{2+} contents are relatively higher.

5.3.3 Overview of Groundwater Resources

Ji County's total groundwater recharge amount is 295,997,000 m^3/a, among which, mountain karst pore water is 54,237,000 m^3/a, plain fissure karst water is 157,690,000 m^3/a, intermountain basin pore water and karstic water is 84,070,000 m^3/a. The allowable exploitation of groundwater is 269,465,000 m^3 / a, among which, mountain fissure karst water is 22,181,000 m^3/a, plain and basin pore water is 197,958,000 m^3/a, sub-mountain pore water is 131,920,000 m^3/a, intermountain basin pore water is 6,603.8 m^3/a, shallow buried hidden karstic water is 49,327,000 m^3/a. Chengguasn water storage structure is 15,093,000 m^3 / a (14,100 m^3/d), Dakangzhuang water storage structure is 12,381,000 m^3/a (33, 900 rn3/d), and Xilonghuyu water storage structure is 21,853,000 m^3/a (59, 900 m^3/d). During exploitation, the pore water leakage recharge is increasing, and partial pore water exploitation can be transferred into karstic water exploitation.

5.3.4 Groundwater Resources Amount

Ji County is located in north Tianjin City and all its groundwater is fresh water. Ji County's has relatively rich groundwater that is available for exploitation. The total reservation amount (natural recharge amount) of groundwater resources in the whole county is 285 million m^3 / per year, among which, mountain karst pore water is 54 million m^3 / per year, intermountain basin pore water is 61 million m^3 / per year, plain pore water is 158 million m^3 / per year and shallow buried karstic water is 12 million m^3 / per year. The allowable exploitation quantity of groundwater (refers to the allowable exploitation quantity of groundwater on the condition of reasonable economy, feasible technology, no continuous declination of underground water level or deterioration of water quality or ground subsidence or other environmental and geological problems after exploitation) is 228 million m^3 / per year.

(I) Development and Utilization of Regional Water Resources

In 2012, Ji County's total water supply of water conservancy project is 139,180,000 m^3, among which groundwater accounts for 93.45% with the amount of 130,063,000 m^3, surface water only accounts for 6.55% with the amount of 9,117,000 m^3. The water composition is mainly of irrigation water, among which, irrigation water is about 105,733,000 m^3, rural domestic water is about 22,222,000 m^3, urban domestic water is about 4,615,000 m^3, agricultural water is about 4,220,000 m^3, industrial and mining water is about 1,790,000 m^3, ecological water utilization is about 600,000 m^3. All surface water is used for irrigation.

(II) Current Water Supply

Ji County currently has 10 water works and the designed water supply capacity is 119,000 m^3/d, and all the water works are groundwater works with the actual current water supply of 40,600 m^3/d.

5.3.5 Feasibility of Groundwater Use

In 500 m depth of the project's construction area, the aquifer is divided into shallow groundwater and hidden bed rock groundwater. The project is planned to exploit the hidden bed rock groundwater. The project is located at northeast part of West Jiuhu Village, Bieshan Town (the address of former No.1 Cement Factory). According to the geological data, the aquifer of the project's construction area is mainly the chert banding dolomite of Wumishan Fm. The

karst fissures are well developed and mainly consist of solution caves and pores, which have relatively good groundwater occurrence conditions and aquifer. The aquifer's water abundance is mainly controlled by lithology and structure, thus it has large amount of water. According to the drilling history data, the single well has large quantity of water yield, which generally is more than 1200m^3/d.

The project area belongs to Wumishan Fm stratum carbonatite fissure - karst confined groundwater area. In the viewpoint of lithology and geological conditions, Wumishan Fm stratum is the water-bearing strata, which has aquiferous conditions. Wumishan Fm stratum has four segments:

Jxw1: Mainly consists of hoary lamellar intraclast dolomite with the aleurite, ash black chert banding crystal powder dolomite, brown grey and dark grey thick-layer and block-layer fine-crystalline dolomite. The upper layer has developed black thick-layer and block-layer algal dolomite and black flint with the thickness of 879 m.

Jxw2: Mainly consists of hoary lamellar intraclast dolomite with sand, light grey thick-layer dolomite with silicon & magnesium concretion and stripe crystal powder, taupe block-layer algal dolomite, ash black thick-layer chert banding fine-crystalline dolomite and chert. The bottom layer is mixed up with hoary lamellar dolarenite with aleurite and the middle layer has developed large-scale taper stromatolite with the thickness of 605 m.

Jxw3: Mainly consists of hoary lamellar dolarenite with aleurite and black chert banding lamellar algae crystal powder dolomite and mixed up with ash black block-layer algal dolomite. The bottom layer is mixed up with amaranth muddy dolomite with aleurite and oolith silicalite and the top layer generally has developed large-scale taper stromatolite with the thickness of 809～831 m.

Jxw4: Mainly consists of hoary, light grey lamellar crystal powder dolomite and medium-thick-layer crystal powder dolomite and mixed up with grey and brown grey medium-thick-layer dolomite, grey thick-layer clastic dolomite, brown grey medium-thick-layer chert banding dolomite and ash black block-layer fine-crystalline dolomite. The top layer has developed stromatolite reefs with the thickness of 878～1,072 m.

There are three sources and channels of the recharge for the karst groundwater:

(1) The hidden area has the overlying quaternary vertical recharge of pore water.
(2) Northwestern bed rock hidden groundwater's underflow recharge through fissure and roch layer interface.
(3) North Yuqiao reservoir's lateral recharge.

In natural state, the general direction of bed rock's runoff is west-north to east-south. The discharge channel of bed rock groundwater is artificial exploitation and downstream lateral runoff discharge.

Combine the analysis of geological and hydrogeological conditions above, the groundwater in the area has relatively good recharge conditions and most of the water storage rock is the dolomite limestone with good brittleness and solubility. The dolomite limestone has the forming foundation of fissure karst water and good bed attitude, which provide conditions for the migration of groundwater. The karst groundwater within area is abundant for exploitation.

The project is planning to excavate 3 groundwater wells, two for daily operation and one for standby. The water yield of single well is 55 m^3/h and the exploitation quantity of groundwater is 7,743,000 m^3/a, and the project's water is mainly used for domestic water, production water and fire protection water. According to the analysis of geological and hydrogeological conditions, most of the water storage rock in the project area is the dolomite limestone with good brittleness and solubility. The dolomite limestone has the forming foundation of fissure karst water and good bed condition, which provide conditions for the movement of groundwater. Affected by the runoff recharge of northwestern groundwater, lateral recharge of Yuqiao Reservoir, rainfall infiltration recharge conditions and other factors, there is remaining groundwater to be exploited. Therefore, it is safe to say that the project may increase fissure karst water exploitation by 774,300 m^3/a.

5.3.6 Environmental Impact of Groundwater Use

The project's groundwater exploitation can take the quaternary aquifer's top

recharge and partial lateral outflow yield, after exploitation, it can also be guaranteed that the area's total consumption is less than the total recharge. Therefore, the project's groundwater exploitation basically won't affect the regional situation of water resources.

West Jiuhu, Nanchou Village, Zhouzhuangzi, Dongmao Village, Douzhuangzi and other villages near the project are the area of groundwater exploitation, therefore, the project's water use basically won't affect other water users.

The project's water source well is the bed rock well and the water taking position is the Wumishan Fm stratum carbonatite fissure - karst confined groundwater. Meanwhile, the remaining groundwater to be exploited is enough for the project's water demand. Therefore, the project's water use won't lead to ground subsidence.

6. Sound Environment Impact Assessment

6.1 Noise Source Category and Intensity

It can be seen from the engineering analysis that the project's major noise sources are forced draught blower, draught fan, exciter, electric generator, cooling tower and other equipments. Meanwhile, the boiler's atmospheric relief valve also has serious noise. In the engineering design, noise elimination, noise insulation and other handling measures are taken according to the various noise sources and their site conditions to reduce the project's noise impact on external environment.

The plant's noise source distribution and intensity is shown in Table 6-1-1.

Table 6-1-1 Summary of Noise Pollution Sources

Serial No.	Noise Source	Intensity [dB(A)]	Noise Control Measures	External Noise Value [dB(A)]	Noise Emission	Location	Closest Distance to Boundary (m)	Height of Noise Source (m)
1	Boiler's atmospheric relief valve	110	Installation of silencer	70	Intermittent	Outside the workshop	28	15
2	Turbine	95	Building sound insulation	80	Continuous	Steam turbine workshop	32	8
3	Electric generator	95	Building sound insulation	80		Steam turbine workshop	32	8
4	Exciter	93	Building sound insulation	78		Steam turbine workshop	32	1
5	Feed water pump	85	Building sound insulation	70		Inside the equipment workshop	28	1
6	Draught fan	95	Building sound insulation	80		Inside the flue gas purification workshop	48	1
7	Primary air fan	95	Building sound insulation	80		Inside the incineration power generation workshop	57	1
8	Cooling Tower	85	—	85		Outside	13	4

6.2 Sound Environment Impact Prediction and Assessment

6.2.1 Calculation Mode

Computer Aided Noise Abatement (Cadna/A), certified by State Environmental Protection Administration-Environmental Engineering Assessment Center, is adopted for noise impact prediction.

Cadna/A software is a set of noise simulation and control software based on ISO9613 standard method and taking WINDOWS as the operating platform. In the State Environmental Protection Administration's environment engineering assessment documents - Expert Opinions on Germany Cadna/A Environmental Noise Simulation Software System (State Environmental Assessment Center [2001]7), the expert opinions on the software is: "The calculation principle of Cadna/A software is derived from ISO9613-2:1996 Calculation Methods of the Reduction of Outdoor Acoustic Propagation stipulated by International Organization for Standardization. In the software, the description of noise's physical principles, definition of sound source conditions, influence factors and noise calculation mode required to be taken into consideration for the noise propagation process and other information are in full compliance with the relevant requirements stipulated by International Organization for Standardization. GB/T17247.2-1998 Reduction of Outdoor Acoustic Propagation II: General Calculation Methods issued by the state has equivalently referred to the ISO9613-2:1996 standards stipulated by International Organization for Standardization. Therefore, the calculation methods of Cadna/A software are in principle consistent with the state's calculation methods of acoustic propagation reduction. The theoretical basis of the software is in compliance with the requirements specified in GB/T17247.2-1998 Environmental Impact Assessment Guideline-Acoustic Environment. The software has strong functions and friendly interface, and it is easy for operation. Since the software's predicted results are visualized and reliable, the software can be worked as the tool software for national sound environment impact assessment and applied into the prediction, assessment and the design of control scheme of urban or regional ambient noise. The application of software will enhance the efficiency of sound environment impact assessment, standardize the assessment technique and improve the

assessment level…”

Basic calculation model is as follows:

(1) Calculation Model of Noise Attenuation

$L_A(r)=L_A(r0)-(A_{div}+A_{bar}+A_{atm}+A_{exc})$

Among which:

$L_A(r)$: Sound level A from the noise source r;

$L_A(r0)$: Sound level A from the noise source r0;

A_{div}: Geometric emanative attenuation ;

A_{bar}: Attenuation caused by obstructions;

A_{atm}: Attenuation caused by air absorption;

A_{exc}: Additional attenuation.

Only A_{div} and A_{atm} attenuation is taken into the calculation above.

Calculation formula of geometric attenuation is:

$Adiv=20lg(r/r0)+A$

When the noise source is higher than 4m, take 11 for A according to free space handling; when the noise source is lower than 4m, take 8 for A according to semi-free space handling.

Calculation formula of attenuation caused by air absorption is:

$A_{atm}=ad/1000$

ad: Atmospheric attenuation coefficient.

(2) Calculation Model of Noise Superposition

$L=L_1+10lg[1+10^{-(L1-L2)/10}]$ $(L_1>L_2)$

Among which:

L: Total sound level at the noise source, dB(A);

L_1: Noise impact value of A noise source to the noise source, dB(A);

L_2: Background value of environmental noise, dB(A).

6.2.2 Analysis of Computation Results

The boundary’s noise impact value is calculated based on the software above

and relevant design parameters. The equal-loudness contour is shown in Figure 6-2-1 and the conformance of the boundary's noise value is shown in Table 6-2-1.

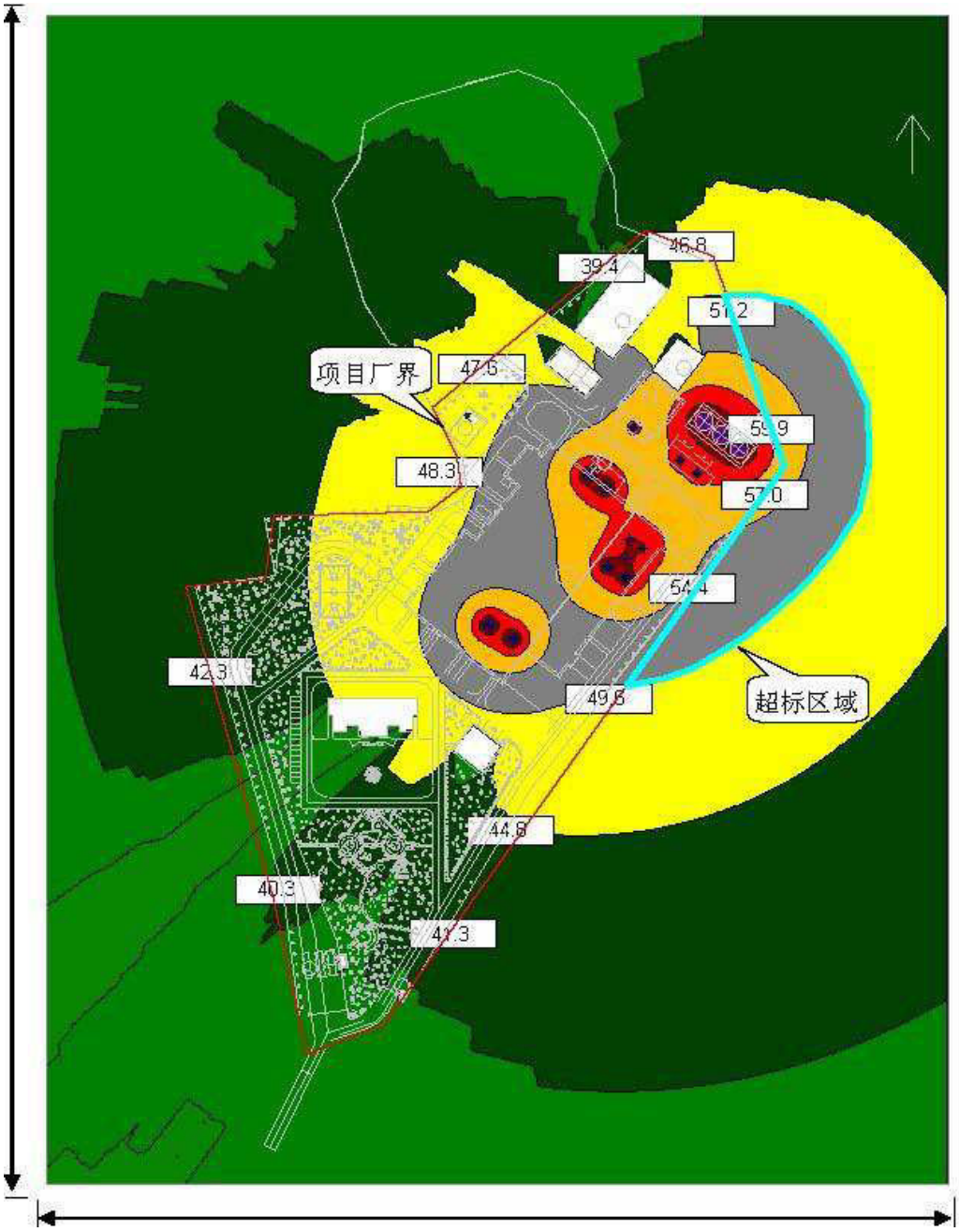


Figure 6-2-1

Table 6-2-1 Boundary Noise Computed Results dB(A)

Serial No.	Location of Gauging Point	Maximum Impact Value	Standard Value		Status of Conformance	
			Day	Night	Day	Night
1	East Boundary	57.0	60	50	Meet Standard	Exceed Standard

2	South Boundary	42.3	70	55	Meet Standard	Meet Standard
3	West Boundary	48.3	60	50	Meet Standard	Meet Standard
4	North Boundary	59.9	60	50	Meet Standard	Exceed Standard

It can be known from the equal-loudness contour and Table 6-2-1 that, after operation of the project, the equipments' noise source intensity doesn't exceed the data in Table 6-1-1 and it is guaranteed that the governance effect of noise control won't be lower than the data in the table, then:

(1) During the operation period, the noise in day(daytime 6am to 6pm, nighttime 6pm to 6am) at the east, west and north boundaries meets the standards in Emisson Standard for Industrial Enterprises Noise at Boundary (Class 2) and the noise in day in the south boundary meets the Class 4 standards. The noise at night at the east and north boundaries exceed standards, because the project's cooling tower, sewage pump house, clarified water pump house and other facilities are near to the boundaries, therefore, the noise at the east and north boundaries has obvious impact. During the operation period, the noise at night at the east boundary has an over-limit of 7.0dB(A) and the noise at night at the north boundary has an over-limit of 9.9dB(A).

(2) When there are no noise control measures, the intermittent noise produced by the boilers has obvious impact on ambient acoustic environment quality and only the noise in the area 800 m away can meet the limits in GB3096-2008 Acoustic Environment Quality Standard (Class 2). After installation of silencer and taking the noise reduction of 40 dB(A), the boundary external impact value can be lower than 50 dB(A).

(3) East side and north side of the project are forest lands, so there are no ambient acoustic environment sensitive targets. The nearest environmentally sensitive area in the east is Shiling Village about 1.4 km far away and the nearest environmentally sensitive area in the north is Villa District about 2.1 km far away. Therefore, before taking necessary control

measures, the noise during the operation period won't disturb the nearby residents.

6.2.3 Measures and Suggestions

It can be known from the equal-loudness contour during the operation period that noise sources resulting in the boundary over-limit of noise at night are the outdoor cooling tower, sewage pump house and other public facilities that are near the boundary. The areas of excessive noise impact are concentrated in the north boundary and east boundary. To guarantee standard noise impact, the construction unit may take the following specific control measures for the indoor and outdoor noise sources mentioned above:

(1) Strengthen the greening of relevant boundaries near the noise source and take the measures of vertical planting of trees, shrubs and grass, and the close planting of trees and grass will guarantee a certain sound insulation effect.

(2) The sound insulation effect of construction should be taken into consideration in the engineering design, for example, use the wall materials of good sound insulation effect. The windows of the clarified water pump house, sewage pump house and other supporting facility houses near the north and east boundaries cannot be opened towards the boundary. Setting a soundproof door, pasting sound absorption materials on the construction' internal ceiling and other measures may guarantee that the construction' sound insulation is not less than 15dB(A).

(3) Select appropriate vibration reduction equipment and select low-noise draught fan, cooling tower and other equipments on the condition of meeting the technologically technical indexes.

(4) Additionally install a vibration reduction pedestal when installing the equipments and set a flexible joint or flexible coupling at the tube coupling to further reduce the equipments' noise source intensity.

(5) A silencer must be installed at the exhaust port to reduce the noise produced by boiler's atmospheric relief valve to make sure that the sound insulation effect is higher than 40 dB(A).

(6) Since the east and north boundaries are forest lands, it is suggested that to

reserve the installation conditions and capitals at the east and north boundaries. If in the future, the noise of acoustic environment sensitive buildings near the east and north boundaries exceeds the standards, then it is required to take sound insulation measures to make sure that the boundary noise meet the standards. The project has reserved a 270m sound barrier and RMB 540,000 for the installation of sound insulation equipments. The noise impact values at the east and north boundaries after installation of sound barrier are shown in Table 6-2-2 and the equal-loudness contour is shown in Figure 6-2-2.

Table 6-2-2 Boundary Noise Computed Results After Installation of Sound Barrier dB(A)

Serial No.	Location of Gauging Point	Maximum Impact Value	Standard Value		Status of Conformance	
			Day	Night	Day	Night
1	East Boundary	44.9	60	50	Meet Standard	Meet Standard
6	North Boundary	47.7	60	50	Meet Standard	Meet Standard

(7) The construction unit should announce the boiler and blowpipe acoustic environment impact of trial production to neighboring residents before the trial production to explain the reasons, time and period of the noise impact to win over the residents' understanding.

After taking the noise control measures above, the boundary noise during the operation period won’t disturb the residents.

7. Environment Impact Assessment of Solid Wastes

7.1 Category of Wastes

The solid wastes of the incineration project mainly include:

(1) Waste Incinerator Slag: The amount of waste incinerator slag is 49,600 tons / per year;

(2) Fly Ash of Waste Incineration: The fly ash of waste incineration includes solid matters collected by bag-type dust remover and semi-dry reaction tower and the amount of fly ash is 10,700 tons / per year;

(3) Recycled Metals: The maximum amount of the project's recycled metals is about 202 tons / per year and all the recycled metals will be sold;

(4) The amount of sludge produced by the leachate treatment system and domestic sewage treatment system is about 3194t / a (the moisture content is 80%).

(5) Waste Packaging Materials and Municipal Solid Waste: The amount of waste packaging materials is 1.3t / a and the amount of municipal solid waste is 1.2 t / a.

(6) Waste Activated Carbon: The waste activated carbon is produced by the adsorption equipment for garbage pit waste gases. The amount of waste gases is related to the waste gas concentration, utilization frequency, the adsorption characteristics of activated carbon and many other factors. The amount of the project's waste activated carbon is relatively small. (120 tons of activated carbon per annum)

7.2 Analysis of Disposal Measures of Solid Wastes

7.2.1 Analysis of Disposal Measures of Slag

(1) Manufacturing of lightweight aggregate with Incineration Ash and Slag

The USA Franklin Institute (Philadelphia) Experimental Plant takes the incineration ash and slag as the aggregate of Portland cement concrete and bituminous concrete, which are used for the bituminous pavement of experimental highway, and the concretes have good effectiveness. Meanwhile, The Tokyo Industrial Experimental Institute has achieved

successful research of the lightweight aggregate from urban waste incineration and the products show good performance.

(2) Manufacturing of Wall Brick and Floor Tile with Incineration Ash and Slag

Wall brick and floor tile are generally made from silica, feldspar, alabaster, chinastone and clay. The replacement of these raw materials with waste incineration ash and slag may greatly lower the cost though there is reduction of the quality. The Tokyo Industrial Experimental Institute has conducted massive researches on the wall brick and floor tile made from waste incineration ash and slag, and the results show that the performance of wall brick and floor tile fully meets Japan's national requirements. Some plants in Guiyang, Xi'an and other cities manufacture silicic acid steam-cured waste bricks that meet the national standards with the mixture of 80% ~85% waste incineration ash and slag and other raw materials. The silicic acid steam-cured bricks only have one more screening process of wastes than the ordinary waste bricks.

The survey data show that the waste incineration ash and slag may be used in the manufacturing of building materials, which are able to be sold. According to the disposal of waste incineration ash and slag of Tianjin's already operated waste incineration plants, all the incineration ash and slag can be used in the manufacturing of building materials to be sold.

(3) Delivery of Slag to Landfill

According to Standard for the Control of Pollutants from the Burning of Municipal Solid Waste, incineration ash and slag can be disposed as ordinary solid wastes. When the incineration ash and slag cannot be manufactured into building materials for sale, it will be transported to landfill for landfilling, so the waste won't cause odors, leachate and other pollutants, i.e. the landfilling of wastes is feasible.

The project is planning to make the incineration ash and slag into building materials for sale and the building materials will be transported to Tianjin Ji County's Huanmei Waste Disposal Plant for landfilling if they cannot be sold.

7.2.2 Analysis of Disposal Measures of Fly Ash

According to National Catalogue of Hazardous Wastes, the fly ash is a hazardous waste and the incineration ash of municipal solid waste specified in HW18 “incineration slag disposal” with the code of 802-002-18. This kind of waste has toxicity (T) and should be disposed as a hazardous waste. Some foreign incineration plants’ actual testing data show that the leaching testing data of fly ash fail to meet the Identification Standards for Hazardous Wastes-Identification for Extraction Toxicity and it will be harmful to the soil and groundwater if be directly buried, so the ahs should be disposed a safe way. The common disposals are solidification and landfilling. The project is planning to firstly solidify the ash with cement and chelating agent then bury it.

Cement has a history of nearly a century to be used as a structural material, and it is an inorganic cementing material that can form hard cement stones after the hydration reaction and being solidly cemented with the sand, stones and other additives. The cement solidification for reducing the hazardous solid wastes is based on such a peculiarity. The fundamental principle of cement solidification is to reduce the surface area of hazardous solid wastes and permeability through solidification inclusiveness for the purpose of stabilization and harmlessness.

During the cement solidification process, there will be nonuniform mixing, early or late solidification, high leaching rate, weak intensity of solidification and other problems due to the particularity of waste composition. To better the solidification conditions and improve the solidified matters’ quality, appropriate amount of chelating agent is required to be added.

The the performance of solidified matters can be controlled according to the final disposal or use requirements in the ratio of regulation of wastes - cement - chelating agent - water. Cement solidification is a relatively mature disposal of hazardous wastes and be adopted in many countries for its simple process equipments, easy operation, massive sources of materials, low cost and strong solidification intensity and other advantages. But its disadvantages are extended volume and expansion ratio.

Practice has proven that the cement solidification is very effective for the disposal of wastes of heavy metals. During the solidification process, the cement makes heavy metal ions to generate hydroxide or carbonate and other

substances that are water insoluble under the alkaline conditions for its higher pH value, and some heavy metal ions can also be solidified in the cement lattice and thus effectively prevent the dissolution of heavy metals. The disposal of solidification of cement and chelating agent planned by the project is feasible. According to GB16889-2008 Pollution Control Standards for Municipal Solid Waste Landfill, the fly ash of municipal solid waste incineration can be transported to the landfill for landfillif meeting the following requirements:

(1) Moisture content is less than 30%;

(2) Content of dioxin is less than 3μg/kg;

(3) According to HJ/T300 Solid Wastes-Toxicity Characteristic Leaching Methods-Acetic Acid Buffer-solution Methods, the preparative hazardous ingredient concentration of leaching agents is lower than the limit specified in Table 7-2-1.

Table 7-2-1 leachatePollutants' Concentration Limit

Serial No.	Pollutant	Concentration Limit (mg/L)
1	Mercury	0.05
2	Copper	40
3	Zinc	100
4	Plumbum	0.25
5	Cadmium	0.15
6	Beryllium	0.02
7	Barium	25
8	Nickel	0.5
9	Arsenic	0.3
10	Total Chromium	4.5
11	Hexavalent Chromium	1.5
12	Selenium	0.1

After solidification of the fly ash, the construction unit must entrust a qualified

unit to conduct detection and leaching test to the fly ash's solidified matters as soon as possible. When meeting three requirements above, the fly ash can be transported to Tianjin Ji County's Huanmei Waste Disposal Plant for landfilling. According to the fly ash characteristics and material balancing calculation, under normal conditions, the moisture content of fly ash won't exceed 30% and the dioxin content is less than 1μg/kg. If the testing results show that the fly ash's solidified matters exceed the standards, the reasons of over-limit are required to be analyzed according to the over-limit indexes:

a) The over-limit of moisture content in the fly ash may be caused by the moisture permeation in the fly ash transport and storage process, so it is a must to inspect the transport and storage equipments.
b) The over-limit of dioxin content in the fly ash may be related to the garbage composition and the control of technological parameters of the incineration process. Analyze and find out the reasons of the increase of dioxin content to targetedly take control measures;
c) The over-limit of leaching test data may be related to the fly ash solidification process, solidification procedure and the control of technological parameters, . It is a must to analyze the solidification process to achieve up-to-standard fly ash's solidified matters through the adjustment of operation process conditions and methods.

After timely finding out the problems and taking appropriate adjustment measures, the construction unit should test the fly ash's solidified matters again and qualified matters will be transported to Tianjin Ji County's Huanmei Waste Disposal Plant for landfilling. Otherwise, adjustment measures are required to be continuously taken to find out the problems.

For unqualified fly ash's solidified matters, the construction unit should entrust a qualified unit to dispose them. They will be transferred to the local hazard waste disposal agency.

Since fly ash belongs to the hazardous waste, the storage of fly ash should meet the following requirements specified in Pollution Control Standards for Storage of Hazardous Wastes (GB18597-2001):

(1) The bottom of the facilities must be higher than the maximum groundwater

level;

(2) The ground and hemline for storage facilities should be built with solid and impermeable materials and the building materials must be compatible with the fly ash;

(3) There must be anti-seepage treatment for the storage facilities, the anti-seepage layer should have a thick soil layer with minimum thickness of 1 m (permeability coefficient: $\leq 10^{-7}$cm/s) or high density polyethylene with the thickness of 2 mm or other artificial material with minimum thickness of 2 mm (permeability coefficient: $\leq 10^{-10}$cm/s).

(4) The storage facilities should meet the requirements for wind protection, rain protection and sun protection;

(5) The design, building and management of storage facilities should also meet other requirements specified in Pollution Control Standards for Storage of Hazardous Wastes.

7.2.3 Analysis of Disposal Measures of Sludge

The project's sewage treatment station produces sludge, which mainly contains large amount of organic matters. According to the requirements of "the sludge and concentrated solution produced should be incinerated in the plant and is forbidden to be delivered out" in the HF (2008) Notice on Management Strengthening of Environmental Impact Assessment of Biomass-to-Energy Project, all sludge will be fed into the incinerator for incineration, so the disposal measure is feasible.

7.2.4 Analysis of Disposal Measures of Other Solid Wastes

Other solid wastes also include the metals, waste packaging materials, municipal solid waste and waste activated carbon collected in the slag cabin, among which, all metals and waste packaging materials can be sold and all waste activated carbon produced by municipal solid waste and odor adsorption equipment can be fed into the incinerator for incineration. Such disposal measures are feasible and there won't be any secondary pollution.

8. Environment Risk Analysis

8.1 Atmospheric Environment Risk Analysis

8.1.1 Accident Pattern of Atmospheric Environment Risk

The project's atmospheric environment risk factors mainly include the following aspects:

Scenario 1: Fault of activated carbon injection device results in emission of dioxin and heavy metal without filtration;

Scenario 2: Fault of deacidification reaction tower results in lower purification efficiency of acid gases;

Scenario 3: Fault of bag-type dust remover results in direct emission of soot, dioxin and heavy metal in the flue gas;

Scenario 4: Fault of SNCR system results in direct emission of nitrogen oxide without treatment.

The pollutant emission under the four circumstances above is shown in Table 8-1-1.

Table 8-1-1 Pollutant Emission Under Accident Conditions

Serial No. of Scenarios	Accident Cause	Major Pollutants' Emission Concentration and Rate	Duration Period of Abnormal Emission	Remark
Scenario 1	Fault of activated carbon injection device	Dioxin 2.5ngTEQ/m3, 0.167mgTEQ/h	30min	There are two draught fans installed for the activated carbon injection device, one is for application and the other one is for standby application. The draught fans will be automatically switched if there is a fault. When there is a fault of other equipment, the boiler needs not to be stopped if the fault can be removed within 30 minutes; otherwise, the boiler should be stopped for repair. The adsorption of heavy metal and dioxin happened in the jet pipe is mainly completed on the surface of the filter bag. 50% purification should be taken into consideration of each pollutant in this report.
Scenario 2	Fault of deacidification reaction tower	HCl:550mg/m^3,10.33g/s SO_2:500mg/m^3,10.33g/s	30min	There are two draught fans installed for the lime injection device, one is for application and the other one is for standby application. The draught fans will be automatically switched if there is a fault. When there is a fault of other equipment, the boiler needs not to be stopped if the fault can be removed within 30 minutes; otherwise, the boiler should be stopped for repair. The desorption of acid gases happens both in the semi-dry reaction tower and the bag-type dust remover. 50% purification should be taken into consideration for the semi-dry reaction tower in this report.
Scenario 3	Fault of bag-type dust remover	Soot: 1800mg/m3，32.41g/s Dioxin: 1ngTEQ/m3, 0.071mgTEQ/h	30min	There are many filter bags in the bag-type dust remover, so there won't be a situation that all filter bags are broken. The breakage of some filter bags will lower the purification efficiency of dusty gases. 80% is taken for the governance efficiency of soot, heavy metal and dioxin.
Scenario 4	Fault of SNCR system	NO_2:231.75mg/m^3，8.25g/s	30min	When there is a fault of SNCR system, the nitrogen oxide will direct access to the dust remover without treatment to react with the ammonia water in the bag-type dust remover. 10% is taken for the removal rate.

Note: The calculation above is only for the fault of 1 set of treatment equipment; 0.9 is taken for NO_2/NO_x

8.1.2 Assessment Standards for Atmospheric Pollutants Under Abnormal Situations

Under normal emission, take the exiting limit values in GBZ2.1-2007 Occupational Exposure Limits for Hazardous Agents in the Workplace and TJ36-79 Hygienic Standards for Design of Industrial Enterprises as the assessment standards. The emission standard is subject to the requirements specified in HF [2008] No. 82 Document, and the requirements specify that "the accident and risk assessment standards are subject to the human body's acceptable daily intake of 4pgTEQ/k and 10% of the acceptable daily intake that enters into human body through breathing". The acceptable intake that enters into human body through breathing is 25.6pgTEQ, which is calculated according to Chinese adults' mean body weight of 64 kg. 12m^3 is taken for an adult's daily air intake and the maximum acceptable dioxin concentration that enters into human body through breathing is 2.13 pg/m^3. Refer to Table 8-1-2 for the specific standard values.

Table 8-1-2 Risk Assessment Standards for Atmospheric Pollutants

Serial No.	Name of Substances	Maximum Acceptable Concentration	Remark
1	Soot	10 mg/m^3	Maximum acceptable concentration in TJ36-79 workshop
2	HCl	7.5 mg/m^3	GBZ2.1-2007 maximum acceptable concentration
3	SO_2	5 mg/m^3	GBZ2.1-2007 time weighted average acceptable concentration
4	Dioxin	2.13 pg/m^3	Calculation results
5	NO_2	5 mg/m^3	GBZ2.1-2007 time weighted average acceptable concentration

8.1.3 Air Quality Impact Prediction and Assessment Under Abnormal Situation

8.1.4.1 Fault of Activated Carbon Injection Device

The activated carbon of the project's activated carbon injection device mainly adsorbs dioxin, heavy metal and other hazardous substances in the soot. The removal of hazardous substances in the jet pipe mainly happens on the surface of the filter bag and 50% is taken for the purification of this assessment. Assuming that there is a fault of 1 set of the activated carbon injection device, under normal operation of bag-type dust remover and other device, the

propagation of flue gas pollutants produced by the project will be predicted in AERMOD mode. Refer to Table 8-1-3 for the prediction results.

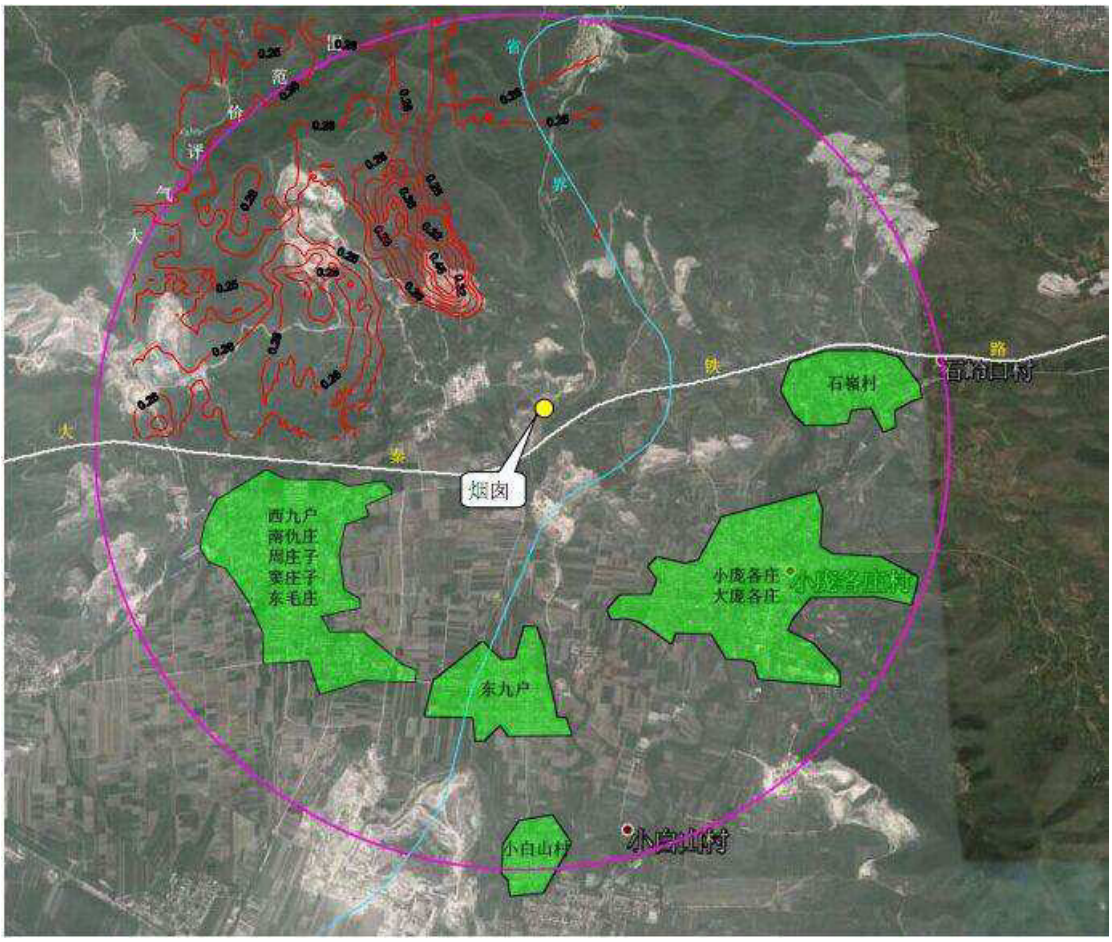


Table 8-1-3 Prediction Results of Dioxin Under Fault of Activated Carbon Injection Device

Serial No.	Name	Coordinates	Ground Level Concentration of Dioxin (pgTEQ/m^3)	Date of Occurrence (Y/M/D/H)
1	Villa District	（111，2039）	0.0143	12/01/05/11
2	Shiling Village	（1452，120）	0.0134	12/12/26/12
3	Small Pangge Village	（668，-898）	0.0098	12/08/11/07
4	Big Pangge Village	（1373，-586）	0.0167	12/12/19/12
5	Baishan Village	（23，-2468）	0.0069	12/03/20/08
6	East Jiuhu	（-108，-1322）	0.0074	12/03/20/08
7	West Jiuhu	（-994，-437）	0.0129	12/11/07/09
8	Nanchou Village	（-1237，-766）	0.0115	12/08/16/07
9	Zhouzhuangzi	（-1260，-923）	0.0115	12/09/06/08
10	Douzhuangzi	（-1143，-1150）	0.0112	12/09/06/08
11	Dongmao Village	（-1111，-1377）	0.0098	12/081607

12	Spot of Maximum Concentration	（-500，1550）	0.0342	12/01/03/05

When there is a fault of the activated carbon injection device, the ground level concentration of the dioxin in 11 ambient air environmentally sensitive areas and within the assessment scope meets the the standards, so there won't be obvious impact on the ambient air quality after the fault.

When there is concurrence of fault of the activated carbon injection device and extreme meteorological conditions, the pollutants will have on obvious impact on the ambient air quality. In order to avoid harmfulness to the public health, the construction unit's design must take various faults of dioxin purification device into consideration. In the design, the device of fault is considered to be replaced with the standby system to avoid the excessive emission of pollutants.

8.1.4.2 Fault of Deacidification Reaction Tower

The fault of the project's deacidification reaction tower mainly absorbs the acid gases in the flue gas. Assuming there is a fault of the deacidification reaction tower, the propagation of the flue gas pollutants produced by the project should be predicted. Refer to Table 10-1-4 for the prediction results.

Table 8-1-4 Prediction Results of Pollutants Under Fault of Deacidification Reaction Tower

Serial No.	Name	Coordinate	Ground Level Concentration (mg/m^3)		Date of Occurrence (Y/M/D/H)
			SO_2	HCl	
1	Villa District	（111，2039）	0.032	0.032	12/01/05/11
2	Shiling Village	（1452，120）	0.030	0.030	12/12/26/12
3	Small Pangge Village	（668，-898）	0.022	0.022	12/08/11/07
4	Big Pangge Village	（1373，-586）	0.037	0.037	12/12/19/12
5	Baishan Village	（23，-2468）	0.015	0.015	12/03/20/08
6	East Jiuhu	（-108，-1322）	0.016	0.016	12/03/20/08
7	West Jiuhu	（-994，-437）	0.029	0.029	12/11/07/09
8	Nanchou Village	（-1237，-766）	0.026	0.026	12/08/16/07

9	Zhouzhuangzi	（-1260，-923）	0.026	0.026	12/09/06/08
10	Douzhuangzi	（-1143，-1150）	0.025	0.025	12/09/06/08
11	Dongmao Village	（-1111，-1377）	0.022	0.022	12/08/16/07
12	Spot of Maximum Concentration	（-500，1550）	0.761	0.761	12/01/03/05

When there is a fault of the deacidification reaction tower, the 11 ambient air environmentally sensitive areas and the maximum ground level concentration meet the SO_2 and HCl standards. It can be known from the calculation that the maximum ground level concentration of SO_2 and HCl both meet the standards, so there won't be obvious impact on the ambient air quality after the fault.

8.1.4.3 Bag-type Dust Remover

The project's bag-type dust remover mainly removes the soot, heavy metal and dioxin produced by the incineration. When there is a fault of the bag-type dust remover, heavy metal and dioxin will be directly emitted without treatment. 20% decrease of the desorption of various atmospheric pollutants after the fault is taken for this assessment. Assuming there is a fault of 1 set of the bag-type dust remover, the propagation of the flue gas pollutants produced by the project should be predicted. Refer to Table 8-1-5 for the prediction results.

Table 8-1-5 Prediction Results of Pollutants Under Fault of Bag-type Dust Remover

Serial No.	Name	Coordinate	Ground Level Concentration		Date of Occurrence (Y/M/D/H)
			（mg/m^3） Soot (mg/m^3)	Dioxin ($pgTEQ/m^3$)	
1	Villa District	（111，2039）	0.100	0.0061	12/01/05/11
2	Shiling Village	（1452，120）	0.094	0.0057	12/12/26/12
3	Small Pangge Village	（668，-898）	0.069	0.0042	12/08/11/07
4	Big Pangge Village	（1373，-586）	0.116	0.0070	12/12/19/12
5	Baishan Village	（23，-2468）	0.049	0.0029	12/03/20/08
6	East Jiuhu	（-108，-1322）	0.051	0.0031	12/03/20/08
7	West Jiuhu	（-994，-437）	0.090	0.0055	12/11/07/09
8	Nanchou Village	（-1237，-766）	0.080	0.0049	12/08/16/07

9	Zhouzhuangzi	（-1260，-923）	0.080	0.0049	12/09/06/08
10	Douzhuangzi	（-1143，-1150）	0.078	0.0047	12/09/06/08
11	Dongmao Village	（-1111，-1377）	0.068	0.0042	12/08/16/07
12	Spot of Maximum Concentration	（-500，1550）	2.39	0.145	12/01/03/05

When there is a fault of the bag-type dust remover, the concentration of soot and dioxin in the 11 ambient air environmentally sensitive areas meets the standards and the maximum ground level concentration of soot and dioxin meets the corresponding standards.

8.1.4.4 SNCR System Fault

The project's SNCR system mainly removes the nitrogen oxide produced by the incineration. When there is a fault of SNCR system, the nitrogen oxide will directly enter the dust remover to react with the ammonia water in the bag-type dust remover and 10% is taken for the removal rate. Assuming there is a fault of the project's SNCR system, the propagation of the nitrogen dioxide produced by the project should be predicted. Refer to Table 8-1-6 for the prediction results.

Table 8-1-6 Prediction Results of Nitrogen Dioxide Under Fault of SNCR System

Serial No.	Name	Coordinate	Ground Level Concentration of Nitrogen Dioxide (mg/m^3)	Date of Occurrence (Y/M/D/H)
1	Villa District	（111，2039）	0.025	12/01/05/11
2	Shiling Village	（1452，120）	0.024	12/12/26/12
3	Small Pangge Village	（668，-898）	0.018	12/08/11/07
4	Big Pangge Village	（1373，-586）	0.030	12/12/19/12
5	Baishan Village	（23，-2468）	0.012	12/03/20/08
6	East Jiuhu	（-108，-1322）	0.013	12/03/20/08
7	West Jiuhu	（-994，-437）	0.023	12/11/07/09
8	Nanchou Village	（-1237，-766）	0.021	12/08/16/07
9	Zhouzhuangzi	（-1260，-923）	0.021	12/09/06/08
10	Douzhuangzi	（-1143，-1150）	0.020	12/09/06/08

11	Dongmao Village	（-1111，-1377）	0.017	12/08/16/07
12	Spot of Maximum Concentration	（-500，1550）	0.608	12/01/03/05

When there is a fault of the SNCR system, the concentration of the nitrogen dioxide in the 11 ambient air environmentally sensitive areas meets the standards and the maximum ground level concentration of nitrogen dioxide meets the corresponding standards.

8.1.5 Summary

It can be known from the four scenarios above that the emission of pollutants under faults of SNCR system, activated carbon injection device, deacidification reaction tower and bag-type dust remover in the project's single purification system is predicted to have no obvious impact on the ambient air quality. In order to guarantee safer operation, the management on the project should be strengthened during the operation period to minimize accidents. Once there is a fault, appropriate measures should be taken to timely repair the devices.

8.1.6 Atmospheric Environmental Risk Preventive Measures

(1) Strictly carry out the design, construction, operation and management as planned and implement the engineering design and all pollution control measures proposed in this report;
(2) The requirements for reliably conforming emission of pollutants should be specified for the procurement and bidding of key facilities and equipments for incineration and flue gas control measures;

(3) Strengthen the maintenance of incineration and flue gas purification equipments to avoid operation with fault. Once the there is a fault and the excessive emission of pollutants lasts for more than 30 minutes, the boiler must be stopped for repair;
(4) Set a scheduling for the garbage transport vehicle to strengthen the organization and deployment to make sure that the garbage transport vehicle can access to the waste unloading hall on time to prevent odor pollution caused during the vehicle's waiting.

8.2 Water Environment Risk Analysis

When there is a fault of the project's sewage treatment system, the waste water produced by all processes cannot be treated and then recycled, under such a circumstance, firstly stop the workshop washing to reduce the waste water, then discharge the waste water (domestic wastewater and leachate) produced by other processes into the regulating tank for storage. The volume of the project's leachate tank is 260m^3 and the volume of the regulating tank is 1500 m^3, which meet the requirements for about 15-day storage of leachate, thus the waste water won't be discharged outside. To guarantee that the sewage treatment unit can be appropriately regulated when there is a fault, this report suggests that:

(1) Strengthen the control of water quality and sludge state in all treatment units to strictly control the "sludge bulking", "sludge poisoning" and other factors that may affect the sewage treatment station's normal operation to timely find out problems and take appropriate measures.

When the fault can be removed within a short period of time (1 day), the wastewater can be temporarily stored in the regulating tank to be treated after removing the fault; otherwise, suspend the transport of garbage into the plant area.

8.3 Environmental Risk Contingency Plan

The project's environmental risk is mainly the excessive emission of pollutants after faults of the various treatment facilities, so the clearing of faults and the caused impact should be firstly taken into consideration when preparing the emergency contingency plan.

8.3.1 Atmospheric Environment Risk Contingency Plan

When there is a fault of a certain flue gas treatment facility, the construction unit must immediately start the contingency plan, which mainly includes:

(1) Find out the reasons of fault based on the prepared troubleshooting manual (or equipment maintenance information provided by relevant units) and judge that whether the faults can be cleared within 30 minutes, and the boiler is required to be stopped for repair if the fault cannot be cleared

within 30 minutes.

(2) Reporting of the faults to all levels of environmental protection administration departments;

(3) After the clearing the fault, it is required to entrust the environmental monitoring department to test the concentration of pollutants in the maximum concentration spot downwind.

8.3.2 Sewage Treatment Unit Accident Contingency Plan

(1) When there is a fault of the sewage treatment station, the leachate and municipal solid wastewater will temporarily be stored in the leachate tank or regulating tank and fire-water tank when necessary;

(2) Reporting of the faults to all levels of environmental protection administration departments;

(3) Entrust a professional unit to investigate and analyze the reasons of faults of sewage disposal system and remove the faults as soon as possible to realize normal operation.

9. Public Participation

9.1 Effect of Public Participation

According to the requirements of the State Council's No. 253 Directive and Law of the People's Republic of China on the Environmental Impact Assessment, public participation is an important part of the environment impact assessment. Public participation is a kind of two-way communication between the project unit (or the environment impact assessment unit) and the public, and it is an important method to harmonize and assess the construction project's social impact and environment impact. The purposes of the project's public participation are as follows:

(1) Let the public fully understand and accept the project to make the engineering construction have better social, environmental and economic benefits.

(2) Let the public understand the engineering construction's potential impact on the environment and it is important for coordinating the engineering construction and social impact.

(3) Let the public understand the the measures to eliminate or reduce the environmental impact to guarantee the rationality and operability of the environmental protection measures.

(4) Provide opportunities for the public, especially the affected public, to voice their opinions on and requirements for the project to indeed protect the affected public's interests and improve the environmental decision-making quality with public judgment.

(5) Better the public's understanding of the project's basic information and the potential environmental impact and collect public's opinions on, suggestions and requirement for the project.

9.2 Public Participation in Information Announcement

9.2.1 Content of Information Announcement

(1) First Announcement of Environmental Information

According to the requirements in Temporary Act of Environmental Impact Assessment of Public Participation (hereinafter referred to as "the Act"), the construction unit should disclose the following information to the public within 7 days after entrusting the environmental impact assessment institution:

a) Name and outline of the construction project;

b) The construction unit's name and contact information;
c) The environmental impact assessment institution's name and contact information;
d) The working procedures and responsibilities of the environmental impact assessment;
e) Major items that the public may voice their opinions on;
f) Main means for the public to voice their opinions.

The construction unit and environmental impact assessment institution should disclose the information above on the Center's website as required.

(2) Second Announcement of Environmental Information

According to the requirements specified in Temporary Act of Environmental Impact Assessment of Public Participation, the following information should be disclosed to the public during the preparation of the environmental impact assessment report (before the submission of of the environmental impact assessment report):

a) Brief introduction of the construction project;
b) Overview of the construction project's potential impact;
c) Key points of the policies and measures to prevent or alleviate the adverse environmental impact;
d) Key points of the environmental impact assessment conclusion proposed in the environmental impact assessment report;
e) Means and time of period for the public's reference to the abridged edition of the environmental impact assessment report and the public's necessary obtaining of supplementary information from the construction unit and environmental impact assessment institution;
f) The scope and major items that the public may voice their opinions on;
g) Specific means for the public to voice their opinions;
h) Beginning and ending time for the public to voice their opinions.

9.2.2 Disclose Mode of Environmental Assessment Information

The environmental impact assessment institution will disclose the environmental assessment information through local newspapers, in the villages around project siteand on the Internet. The announcements of information are as follows:

(1) The environmental assessment information was disclosed on Tianjin Environmental Impact Assessment Center's website and the construction unit's website for the first time on July 29, 2013. Refer to Figure 9-2-1 and Figure 9-2-2 for the screenshots of the information announcement.

(2) The environmental impact assessment information was published in Tonight The Economic Weekly, a medium with relative good circulation in Tianjin City, on July 30, 2013 and Yanzhao Metropolis Daily issued by Hebei Province on August 5, 2013, to guide the public to know relevant information through the Internet. Refer to Figure 9-2-3 and Figure 9-2-4 for the screenshots of the information announcement in newspapers.

(3) The notice of environmental impact assessment information was pasted on the assessment environmentally sensitive area in July 2013. Refer to Figure 12-2-5 for the disclosed information. The notices will be pasted on the village committees notice board, which are within the assessment scope.

(4) After preparation of the environmental impact assessment report, the environmental impact assessment information was disclosed for the second time during January 17 to January 30, 2014. Refer to Figure 9-2-6 for the screenshots of the second information announcement.

(5) The notice of environmental impact assessment information was pasted on the assessment environmentally sensitive area during January 17 to January 20, 2014. Refer to Figure 9-2-7 for the on-the-spot information announcement. The notices will be pasted on the village committees notice board, which are within the assessment scope. Also see on web: http://www.tjeiac.com/

Figure 9-2-1 Screenshot of Environmental Impact Assessment Institution's First Information

天津市蓟县生活垃圾焚烧发电项目第一次信息公示

时间：2013-7-29 〖 文字：大 中 小 〗

根据环发2006[28]号《环境影响评价公众参与暂行办法》有关要求，现对天津市蓟县生活垃圾焚烧发电项目进行公众参与信息公示，公示材料如下：

1、项目概况

天津绿色动力再生能源有限公司拟投资建设天津市蓟县生活垃圾焚烧发电项目，项目选址位于蓟县别山镇西九户村东北（原第一水泥厂），项目一期工程投资2.5亿元。项目一期设计处理规模为日焚烧生活垃圾700吨，拟采用2台350t/d三驱动炉排垃圾焚烧炉/1台12MW汽轮发电机组及烟气净化系统，年发电量0.8155亿kwh。发电量除供本项目自用电外，剩余电量送外网售电。项目计划2014年3月开工建设，2015年6月建成。

2、建设单位名称及环境影响评价单位名称和联系方式

建设单位：天津绿色动力再生能源有限公司

联系人：王汉清 联系方式：022-29176802 传真：022-29176802

信箱：wanghq@dynagreen.com.cn

环评单位：天津市环境影响评价中心

联系人：张莉 联系方式：022-87671901 传真：022-87671901

信箱：rose-8051@163.com

3、环评程序及主要工作内容

（1）环评程序

建设单位委托（签定工作合同）→建设单位提供技术资料→向公众公布工程概况→编制环境影响报告书→进行公众参与→环境影响报告书上报审查→环评单位修改、上报环保行政主管部门审批。

（2）环评主要工作内容

环境影响评价的主要工作内容是通过分析、预测和评价工程在施工、运营过程对环境影响的程度和范围，提出环境保护措施，并要求建设单位进行实施，确保各项影响满足有关标准要求或将影响降低到公众可接受程度。

Figure 9-2-2 Screenshot of Construction Unit's First Information Announcement

3. Environmental Assessment Procedures and Key Responsibilities

(1) Environmental Assessment Procedures

Construction unit's entrustment (of signing the work contract) → construction unit provides the technical data → announces the engineering overview to the public → prepares the environmental impact report → Start the public participation → Submit the environmental impact report to superior for review → environmental impact assessment institution revises the report and submits the revised report to environmental protection administration departments for review

(2) Key Responsibilities for Environmental Assessment

Environmental impact assessment is mainly to propose environmental protection measures based on the analysis, prediction and assessment of the engineering's impact on the environment during the construction and operation periods and request the construction unit to carry out the measures to make sure that all impacts meet relevant requirements or be reduced to the public's acceptable degree.

B08 财富 | Fortune 2013年7月30日

今晚经济周报 JINWAN · ECONOMIC WEEKLY

工京东方被质疑屡亏屡融

公司称这次一定盈利

本报讯 据经济之声《天下公司》报道，京东方是近日在电视、报纸中出现频率最高的上市公司。因为它狮子大张口，要向股市融资 460 亿。如果再融资方案通过，京东方将成为今年 A 股市场中的融资王。

A 股市场本来就很寡淡。京东方的再融资方案一出，股市立马泥沙俱下，股指连续两天下跌，个股惨绿一片，哀鸿遍野。而始作俑者京东方也未能幸免，周四大跌 8.3%，周五又跌了 1.37%，两天跌去近 10%。按照股民的话叫做"损人不利己"。

股民们很讨厌京东方，他们在网上列下了京东方的各种"罪证"，归纳起来有三点。第一，京东方是"烧钱大王"。上市十年来，向股市抽了 800 亿的血，但业绩却总不见好转，还连连亏损。股市大跌，京东方也成为众矢之的，股价跌得只有 2 块钱。

第二，京东方是"铁公鸡"。十年融了 800 亿，但是在回报投资者方面是典型的"铁公鸡"，十年仅分红 4000 万，投入产出比不到千分一。

第三，靠股市的融资，京东方每次都有惊无险，衰而不死。但在每次融资之后，公司经营状况总是未见好转。据说，京东方所投资的各种项目和技术，都产能过剩。人家都研发到第 13 代液晶面板了，京东方还准备花大价钱玩 8.5 代。

一位股市分析师表示，仅凭这"三宗罪"，就不能让京东方再融资下去。要不然，京东方真把 A 股当提款机了。

这位股市分析师表示："我觉得如果京东方要再融资，市场虽然不是同仇敌忾，但至少大家都会连连摇头，因为京东方在市场最负盛名的就是不断的融资，但是这种融资都不能产生效应，而且不断的亏损。很多时候它都是靠补贴以及营业外收入、投资收益等来凑。实际公司的情况很不理想，每次公司募集基金时都把它的前景说的很好，但是公司的产品和市场始终差一点，老是赚不到钱。"

股民们怨声载道，但京东方却觉得自己很冤。它在公告中解释道，今年上半年公司刚刚扭亏为盈，现在正是快马加鞭准备扩大产能的时候，股民们却准备用脚投票，这着实让人不理解。

日前，记者以一位股民的身份，对话了京东方公司一位不愿意透露姓名的工作人员。对于记者抛出的"三宗罪"，京东方的这位工作人员都一一做了回答，不知道他的回答是否能够令您满意。

"第一宗罪"，京东方是"烧钱大王"。

十年融了 800 亿，为何还要继续圈钱？这位工作人员的回答是，公司快盈利了，不追加规模不行。

工作人员：以前股东也老是骂，说你们融钱融钱，结果我们现在盈利了，我们预计上半年八点多个亿，我们也赚钱了，不能说我们融了钱没用到正地方，我们都用在了主营业务上。而且从长期来看，这是对公司、对股东非常有利的事情，也要考虑到公司的战略发展。

"第二宗罪"，京东方是"铁公鸡"。

十年融了 800 亿，却只给股民分红了 4000 万。投入产出比太低了。这位工作人员的回答是，分红少是为了存钱扩大产能。

工作人员：我们之前是有分红的。我们没有达到分红的条件，如果达到的话肯定是要考虑的。另外，尤其是中国大陆的产业处在往上发展的时期，现在投资还是会多一些，为了扩大主业的产能。

"第三宗罪"，赌投资。

京东方所投资的各种项目和技术，都产能过剩。人家都不玩了，京东方还在花大价钱玩。这位工作人员的回答是：公司的产品战略很先进，你不懂。

工作人员：我们觉得现在智能手机、平板电脑这个产业以后的发展前景、空间很大。我们现在的产品一个是液晶电视，另外一个就是智能手机。

尽管股民们都异口同声的选择用脚投票，但京东方却并不愁找不到买家。据了解，不少机构已经表态，愿意接受京东方的再融资。再过几天，京东方将召开股东大会，确定最终的融资方案。一旦通过，今年的最大的融资事件将正式开启。

IPO重启时点或将延后 诸多机构“摩拳擦掌”

近日有消息称，已有 IPO 过会企业的保荐机构接到监管层要求，填写最新一期的财务信息反馈，考虑到财务数据有效期的限制，市场预期 IPO 重启时点可能因此延后。

重启时间或再延后

在目前 80 多家已过会企业中，大多数公司的财务数据还是截至 2012 年底的。一般情况下，过会企业的财务数据有效期为 6 个月，到期后可以适当延长，但很少超过 7 个月。也就是说，如果过了 7 月底，还没有拿到上市批文，就需要更新财务报表。而若更新财务报表则意味着 IPO 重启时间的延后。

有分析认为，更新财务信息并非更新数据这么简单，更新完的报表仍需经过专业机构审计，这一过程通常要一到两周时间。“而这次和以往还不同，不排除监管层出于谨慎考虑，要求大家再走一遍财务核查程序，这无疑又将拉长整个准备过程。”有投行人士分析称。

据了解，近日已有 IPO 过会企业的保荐机构接到监管层要求，填写最新一期的财务信息反馈。“从监管层这一动态判断，后期很可能进一步要求正式更新企业财务信息，这或将开启过会企业新一轮财务数据更新周期。加之此次批量发行概率较大，首批企业能在 8 月底前挂牌就算不错了。”有业内人士如是表示。

不过，更新财务数据这一监管要求可能对一些过会企业不利。有分析认为，一些传统行业的过会公司上半年业绩下滑可能较为明显，如果确实如此的话，监管层可能要求其重新上会，这是企业和保荐机构最不想看到的。

据有关统计，在已过会的 80 多家企业中，机械类企业有 11 家，建筑建材类 4 家，化工类 4 家，煤炭类 1 家，这些传统行业数量占比合计超过两成。

诸多机构“摩拳擦掌”

尽管 IPO 重启时间有可能进一步推后，但丝毫没有挫伤利益相关方的“盼新”热情。

一叶落，而知天下秋。“券商的营业厅已经客普得连水都不让喝了。”某位网友的吐槽从另外一个侧面反映出券商渴望 IPO 的急切心情。

“原本 A 股暂停 IPO 的初衷是为了缓解市场持续下跌的压力，但近 10 个月的市场表现证明暂停 IPO 无效。A 股在经过为期仅 4 个月的短暂牛市之后，就再度走入熊市，当下的上证指数和深成指数甚至比暂停 IPO 前还要低。因此，没有理由不尽快重启 IPO。”某位证券公司人士明确表示。

与此同时，基金机构也在作积极准备。很多基金研究员已对排队企业进行投资分析，有私募基金正在疏通渠道参与“打新”，更有专为 IPO 重启成立的新基金。利益似乎方都在摩拳擦掌。

很多基金经理对这一轮 IPO 重启后的“打新”格外期待，其研究员已经展开对排队公司的研究。有新发公募基金的基金经理甚至放话将全仓“打新”，而私募基金也已悄悄和基金专户开始沟通“打新”的通道业务。

“如果新股发行很密集，研究员来不及一个个进行实地调研，拿出深度报告，我会把所有的新股当作一个组合来执行，个别地方亏点不要紧，只要今年或者这一段时间的操作策略总体赚钱就行了。”某基金经理表示。

对于诸多机构的“摩拳擦掌”，有业内人士认为，本轮 IPO 重启的第一批公司审核会比较严格，因此公司质量、财务报表的真实性比较好，所以大家炒新的动力很强。开局后估计不仅机构会参与。而且，开头破发的可能性太小了，A 股市场从来都是逢新必炒，没有例外。在熊市里炒新股都能赚钱，更何况今年还是个结构市呢。（聚焦中国 IPO 栏目组马敦远综合整理，栏目组电话：010—51673189）

Figure 9-2-3 Tonight The Economic Weekly’s Announcement

Figure 9-2-4 Yanzhao Metropolis Daily's Announcement

Figure 9-2-5 First Information Announcement at the Environmentally Sensitive Areas (located in Zhouzhuangzi village, Xijiuhu village, Dongmaozhuang village,Taozitou village and Da'an village)

Figure 9-2-6 Screenshot of Second Information Announcement on Environmental Impact Assessment Institution's Website

Figure 9-2-7 Second Information Announcement

9.3 Content and Means of Public Participation

The project mainly collects the public's opinions through questionnaires and the Internet. 200 questionnaires have been delivered to the villages in the project's assessment scope. The survey of public participation is conducted by the construction unit.

The questionnaire has two parts: "Project Introduction" and "Questionnaire". The "Project Introduction" mainly makes introduction of the project's engineering background, key items, scale, investment, address and other information, and describes the project's potential impact on the environment and the environmental protection measures. Refer to Attachment 7 for the questionnaires of public participation.

After draft preparation of the environmental impact assessment report and before submission of the report, the construction unit has, according to the requirements specified in Temporary Act of Environmental Impact Assessment of Public Participation, made the second information announcement of the environmental information on Tianjin Environmental Impact Assessment Center's website (www.tjeiac.com.cn) from January 10, 2014, specified the project's environmental information and the key points of conclusion in the report in details and explicitly specified the scope, items, specific means, beginning and ending time of the public participation to make sure that the public will give better opinions and suggestions.

The second announcement of public participation mainly includes:

(I). Overview of the construction project;

(II). Overview of the construction project's potential impact on the environment;

(III). Key points of the policies and measures to prevent or alleviate the adverse environmental impact;

(IV). Key points of the environmental impact assessment conclusion proposed in the environmental impact assessment report;

(V). Means for the public's reference to the abridged edition of the environmental impact assessment report;

(VI). Refer to the public participation questionnaire for the scope and major items of the public participation;

(VII). Channels for the public to voice their opinions, contact persons and contact information, .

(VIII). The beginning and ending time for the public to voice their opinions is January 17 to

30, 2014.

As at the date before submission of the report, there is no opinion and suggestion on the project from the public on the Internet.

9.4 Information of Respondents of Public Participation

The project's respondents of public participation are mainly the affected public within the project's assessment scope. The respondents are extensively representative, because they are of different ages and genders. The opinions in the questionary are respondents' personal opinions.

Refer to Table 9-4-1 and Table 9-4-2 for the respondents' information.

Table 9-4-1 Distribution of Respondents of Public Participation

Serial No.	Respondents Places of Origin	Questionnaire (Piece)	Percentage (%)
1	East Jiuhu	20	10
2	Small Pangge Village	8	4
3	Big Pangge Village	14	7
4	Shiling Village	19	9.5
5	West Jiuhu	33	16.5
6	Nanchou Village	30	15
7	Douzhuangzi	20	10
8	Dongmao Village	20	10
9	Zhouzhuangzi	20	10
10	Small Baishan Village	16	8
Total		200	100

Note: Since there is no resident in Villa Distirct, so there is no survey about the district.

Table 9-4-2 Summary of Respondents'Background Information Unit: Person

Item	Gender		Age			Degree of Education		
	Male	Female	<40	40-60	>60	High School and above	Middle School	Primary School
Quantity	174	26	63	112	25	64	122	24
Percentage (%)	87	13	31.5	56	12.5	32	61	12

9.5 Analysis of Survey Result of Public Participation

Refer to Table 9-5-1 for the statistical results of the project's survey.

Table 9-5-1 Statistical Results of Public Opinions

Serial Numbers of Questions		Statistical Results			
1	Option	Well understand	Hear of	Be unaware of	
	Persons	69	125	6	
	Percentage (%)	34.5	62.5	3	
2	Option	Important	Unimportant	Whatever	Be unaware of
	Persons	199	1	0	0
	Percentage (%)	99.5	0.5	0	0
3	Option	Good	General	Poor	Be unaware of
	Persons	9	188	3	0
	Percentage (%)	4.5	94	1.5	0
4	Option	Water pollution	Atmospheric contamination	Noise pollution	Others (no impact)
	Persons	11	181	5	3
	Percentage (%)	5.5	90.5	2.5	1.5
5	Option	Present environment situations can be alleviated		Present environment situations cannot be alleviated	
	Persons	199		1	
	Percentage (%)	99.5		0.5	
6	Option	Fugitive dust	Noise	Sewage	Construction garbage
	Persons	103	54	11	109
	Percentage (%)	51.5	27	5.5	54.5
7	Option	Beneficial	Harmful	Be unaware of	
	Persons	93	0	107	
	Percentage (%)	46.5	0	53.5	
8	Option	Odors	Noise	Water pollution	Others
	Persons	195	4	4	0
	Percentage (%)	97.5	2	2	
9	Option	Beneficial	Harmful	No impact	Be unaware of
	Persons	184	0	15	1
	Percentage (%)	92	0	7.5	0.5
10	Option	Actively support	Basically agree	Be opposed to	Not concerned about

	Persons	109	84	0	7
	Percentage (%)	54.5	42	0	3.5

The following conclusions can be reached based on the survey results:

(1) Since the project's environmental impact information is announced among the village committee before the survey, 34.5% of the general public well understand the construction project, 62.5% hear of the project and 6 respondents are totally unaware of the project.
(2) Most respondents think the environmental problems are important and only 0.5% think that the environmental problems are unimportant.
(3) 94% of the respondents think that the present environmental status in the area is general, 4.5% think that the environmental quality in the area is good and 1.5% think that the present environmental status in the area is poor.
(4) As for the present environmental problems in the populated area, 90.5% of the respondents think that the problems are the atmospheric pollution, 5.5% think that the problem is water pollution, 2.5% think that the problem is noise pollution and 3 respondents think that the environment quality in the area is good and there is no environmental problems.
(5) 99.5% of the general public think that the waste incineration plant is helpful to alleviate the present environmental problems and the remaining 0.5% think that it is impossible to alleviate the problems.
(6) 54.5% of the respondents are concerned about the construction garbage, 51.5% are concerned about the fugitive dust, 27% are concerned about the noise pollution and 5.5% are concerned about the water pollution.
(7) 46.5% of the general public think that the waste incineration plant is beneficial to the environmental protection and 53.5% show their uncertainty of the impact of the project.
(8) 97.5% of the general public think that the major environmental problems caused by the waste incineration plant are odors and 2% think that the problems are noise pollution and sewage.
(9) 92% of the general public think that the project is beneficial to the economic development in the area, 7.5% think that there is no impact and 0.5% state that they are unaware of the project's impact on the economic development.
(10) 96.5% of the respondents actively support and basically agree with the construction

project and 3.5% of the public are not concerned about the project, thus there is no respondent is opposed to the project.

To sum up, most of the respondents actively support and basically agree with the project. The construction unit should pay enough attention to the fugitive dust, noise pollution, construction waste and other pollutants that the public is concerned about, to strengthen the control of the noise and fugitive dust produced during the construction period.

10. Analysis of Control of Total Pollutants Emission

Control of total emission of pollutants is an important measure for China's management on environmental protection. Control of total emission of pollutants is request of the environmental protection laws and regulations, because it is not only an effective measure for promoting the strategic adjustment of economic structure and the fundamental transformation of economic growth pattern, but also an effective measure for promoting the industry technological progress and improving the management level. This measure can guarantee the mutual promotion of environmental protection and economic development.

In addition, the project's total pollutants should be controlled based on the project nature, ambient environment quality requirements, environmental objectives and control of total emission of the pollutants produced by urban environmental planning, thus not only the available environmental capacity is provided for the urban and industrial development, but also the ambient environment quality is guaranteed, therefore, social and economic sustainable development, resource protection and environmental protection can be realized.

9.1 Calculation of Emission of Major Pollutants

The emission and discharge of COD_{Cr} and ammonia nitrogen in the wastewater and the SO_2, soot and NO_x in the waste gases are required to be controlled. There is zero discharge of the waste water, so the discharge of waste water does not involve in the total discharge standards. Refer to Table 9-1-1 for total emission of all pollutants.

Table 9-1-1 Total Emission of Major Pollutants Unit: t/a

Pollutants	NO_x	Soot	SO_2
Yield	385.96	9230.40	1025.60
Treatment of Reduction Quantity	180.84	9219.89	943.55
Emission	205.12	20.51	82.05

Note: 8,000 hours are taken for the annual operation hours.

9.2 Rational Analysis of Total Emission of Pollutants

Flue gas control, sewage treatment, fly ash landfill and other measures are taken for the

project, so the project's pollutants meet the emission and discharge standards. The environmental protection administration departments are advised to take these data as reference to the control standards for the total emission of current pollutants. Regional balance methods are suggested for the increased emission of pollutants to aim for "increasing production and decreasing pollution".

9.3 Suggestions on Control Measures of Total Emission of Pollutants

(1) Establish perfect environmental protection management organization and management system to make sure that every one is responsible for the environmental protection.
(2) Implement the post responsibility system for the environmental protection.
(3) All leachate and wastewater will be recycled after treatment, so there is no discharge outside.
(4) Make sure that all pollution control measures are appropriately taken and accident discharge is prohibited.

11. Grievance Redress Mechanism

To settle unforeseen issues effectively, an effective and transparent channel for lodging complaints and grievances will be established. The grievance redress mechanism (GRM) is detailed in the EMP and the basic process is presented below. The EMP, including the GRM, will be refined during the detailed design phase of the project when more design details become available. The updated documents will be approved by the ADB.

Basic steps for resolving complaints are as follows and illustrated in Figure A.1.

14.1 Step 1: For environmental problems during the construction stage, the affected persons (AP) can register their complaints directly with the contractors as well as the Dynagreen, JPMO, or JEPB. Contractors are required to set up a complaint hotline and anonymous drop-box and designate a person in charge of handling complaints, and to advertise the hotline number at the main entrance to each construction site. The contractors will maintain and update a Complaint Register to document all complaints. Unless the comment was received anonymously, the contractors are required to restank to the complainant in writing within 7 calendar days on their proposed solution and how it will be implemented. If the problem is resolved and the complainant is satisfied with the solution, the grievance handling ends here. The contractors are required to report all complaints received, handled, resolved and unresolved to JPMO monthly.

14.2 Step 2: For environmental problems that could not be resolved at the contractor level, the affected person can take the grievance to the JPMO and JEPB. On receiving complaints by the JPMO or JEPB, the party receiving the complaints must notify the other party and document the complaint in writing in a Complaint Register. The JPMO must immediately inform the JPMO Environmental Specialist of a complaint and to agree on a course of action.The JPMO and JEPB must reply to each complain in writing within 14 calendar days on the proposed solution and how it will be implemented. If the problem is resolved and the complainant is satisfied with the solution, the JPMO should document the complaint and resolution process in its Complaint Register, with quarterly reporting to Dynagreen.

14.3 Step 3: If the affected person is not satisfied with the proposed solutions in Step 2, he/she can, upon receiving the reply, take the grievance to the Dynagreen and JPMO (which will be received by the JPMO Environment or Social Specialist). Upon receiving the complaint, JPMO must deal with it within 14 calendar days. Once a complaint is documented and put on file, JPMO through Dynagreen will immediately notify ADB. After discussing the complaint and potential solutions among ADB, JPMO, the E&S OFFICER, the contractor, and the affected person, JPMO must provide clear answers to the complainant within 14 calendar days from when the complaint is documented and put on file.

The tracking and documenting of grievance resolutions by JPMO will include the following elements: (i) tracking forms and procedures for gathering information from project personnel

and complainant(s); (ii) regular updating of the GRM database by the JPMO Environment and/or Social Specialist; (iii) processes for informing stakeholders about the status of a case; and (iv) procedures to retrieve data for reporting purposes, including the periodic reports to the ADB.

At any time, an affected person may contact ADB (Private Sector Operations Department) directly, including the ADB Resident Mission in the PRC.

If the above steps are unsuccessful, people who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make a good faith effort to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.[1]

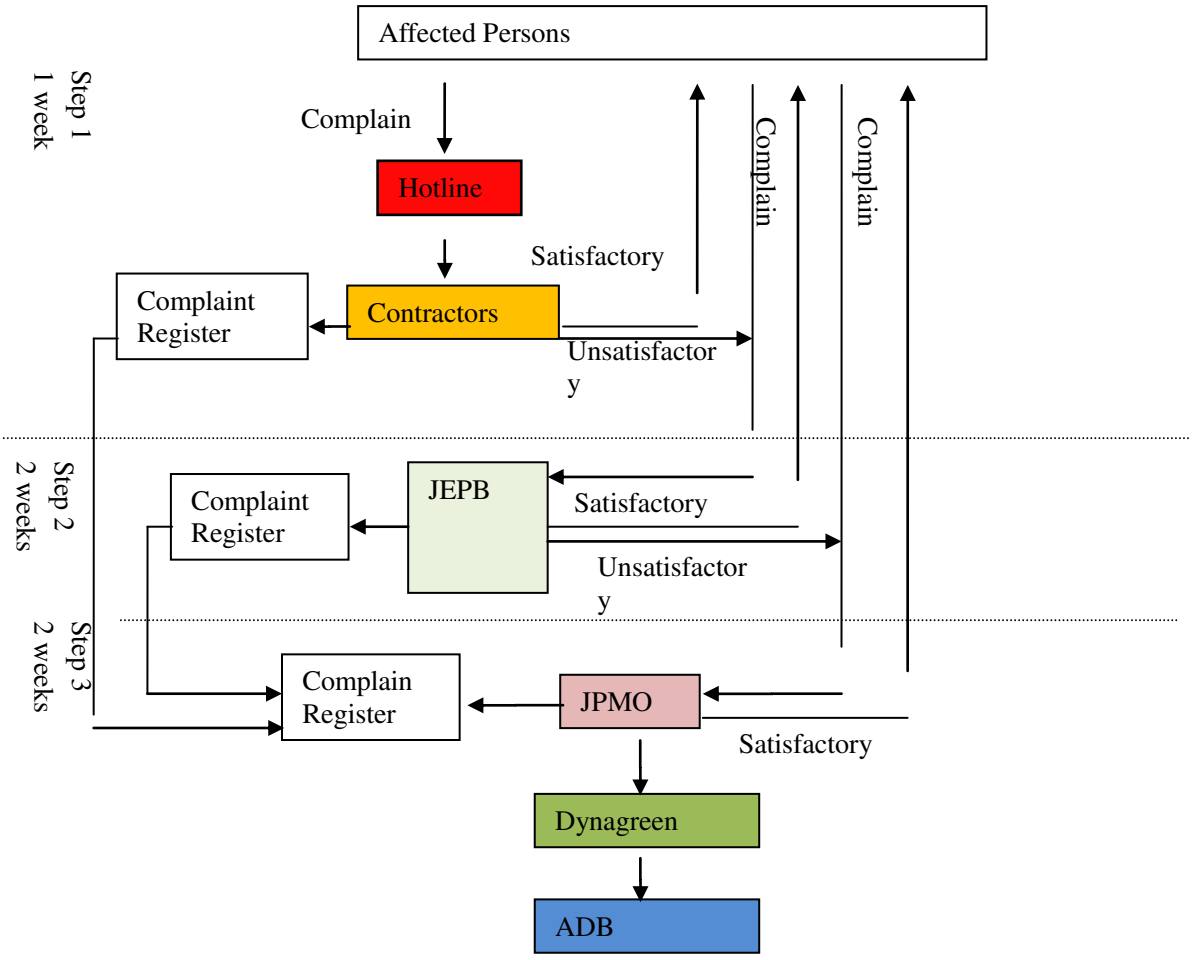


Figure10.1: Proposed Grievance Redress Mechanism

1 See: http://compliance.adb.org/

12. Analysis of Social Impact

11.1 Project's Environmental and Social Benefits

Tianjin Ji County's Municipal Solid Waste to Energy Project (Phase I) is located in Bieshan Town, Ji County, and its services cover all areas in Ji County, Tianjin. The project will be beneficial to Tianjin's municipal infrastructure, health safety, landscape, investment environment and social public employment, .

(1) Impact on Ji County's Municipal Infrastructure

It is well-known that garbage disposal is always the municipal infrastructure for a city, and the mode and level of garbage disposal is an important external sign of a city's civilization. Garbage disposal is related to the landscape and cleanliness of a city's appearance and the health safety of the residents. The project will guarantee a joined treatment of garbage collection, transport and the final waste-to-energy. The municipal solid waste will be reduced 85% to 90% after being incinerated, and such a disposal eases the tensions between the large floor space of landfill and the shortage of land for Ji County's increasing urbanization.

(2) Impact on Public Health Safety

The project will be beneficial to improving Tianjin's environmental health and citizens' physical health, because the project affectively controls the garbage's adverse impact on the living environment and the breeding of mosquito and flies as well as eliminate the disease transmission, and then the residents' physical health safety is guaranteed. Meanwhile, the sealed waste transfer greatly alleviates the adverse psychological and sensory stimulation to residents as well as improves the citizens' living environment and physical health.

(3) Impact on Ji County's Landscape

Tianjin's landscape construction is always the city's keys point of construction. Tianjin Ji County's Municipal Solid Waste to Energy Project (Phase I) will effectively extend the service life of Tianjin Ji County's Huanmei Waste Disposal Plant, speed up the process of urban garbage's reduction, reutilization and hazard-free treatment, alleviate the temporary stacking and avoid the environmental pollution caused by garbage stacking to fully develop Tianjin's landscape advantages, improve Ji County's city grade and promote the county's development.

(4) Impact on Community's Public Employment

The project will provide some job opportunities for the local labor market. Firstly, some transient and temporary job opportunities will be provided during the construction period of Tianjin Ji County's Municipal Solid Waste to Energy Project (Phase I); secondly, some long-term and stable job opportunities, including jobs of direct garbage disposal, vehicle repair and maintenance, jobs of new production (production of garbage bags) department that is dependent on garbage disposal and management of garbage disposal plant, ., will be provided during the operation period. Yet it is required to be pointed that, with the development of garbage disposal means and modernization, there will be stricter requirements for the workers' quality, so the job opportunities will be provided for persons of relatively better education level.

(5) Impact on Ji County's Sustainable Development of Economy

The construction of the project is based on sustainable utilization of resources and good ecological environment. The project protects the natural resources and keeps the sustainable supply capacity of resources to gradually harmonize the resources, environmental, economic and social development.

The thermal power produced by the incineration will provide energy for the society, and the scrap iron and other metal materials produced by the incineration will provide useful metal materials for the society after be recycled by the magnetic separation. Therefore, construction of the project protects the ecological environment, saves the social resources and brings fortunes.

In a word, the construction of Tianjin Ji County's Municipal Solid Waste to Energy Project is beneficial to perfecting Tianjin Ji County's urban infrastructure, improving urban environmental hygiene and the residents' living environment and physical health, developing Tianjin's landscape construction and further bettering Ji County's environment quality. Meanwhile, it is beneficial to the social public employment, effectively improving the city grade, promoting Ji County's urban development and improving the residents' living standard and quality.

11.2 Odor Impact of Garbage Transport

The project's municipal solid wastes are from Ji County's urban areas, industrial parks and surrounding towns, which cover Ji County's all areas. Municipal solid waste will be collected by each village's dustmen on specified time to the specified places, and the collected garbage will be timely transported to the nearby buried dustbins. Then each town's relevant department is responsible for transporting the garbage to the compression transfer station,

which will compress the garbage for volume reduction, and then the county appearance department is responsible for transporting the garbage to incineration plant for incineration disposal. The main traffic arteries for the garbage transport are Zhongchang Road and 102 National Avenue.

According to relevant requirements, all garbages are sealed in the garbage transport vehicle, so there won't be any emission of H_2S, NH_3, fugitive dust and other pollutants; meanwhile, the garbage transport vehicle is equipped with garbage leachate collecting devices, therefore, there won't be leachate leakage during the transportation period or there won't be H_2S and NH_3. The indoor waste unloading hall will prevent the propagation of odors.

During the operation period, the project's daily garbage disposal capacity is 700t, and will be 88 loads of garbage every day if the garbage is transported by an 8t truck. The daily garbage transport is conducted during 6:00 to 12:00 a.m. and the average transport quantity is 15 loads / h. There are various fermentative organic matters in the municipal solid waste, so the garbage will let out odors, especially under high-temperature condition. The major pollutants in the waste gases are organic matters, H_2S and NH_3. Therefore, it is required to control the discharging rate, strengthen the vehicle management and shorten the vehicle waiting time to reduce the impact of odor emission caused during the garbage vehicle's waiting period.

Ji County Urban Bureau of Parks is responsible for transporting the project's garbage to the plant area, and the construction must specify the transport party's environmental protection obligations in an agreement. Firstly, when collecting the garbage, the transport party must confirm that the garbage to be transported to the plant area is municipal solid waste, no mixture of industrial garbage or other solid wastes is allowed; secondly, the transport vehicle should be back-loaded compaction garbage vehicle that meets the indicator and technical requirements specified in Catalogue of Environmental Protection Industry Equipments (Products) that the State Currently Encourages the Development (revised in 2007), and vehicles must be sealed and there must be preventive measures for garbage leachate leakage. The city's appearance department must timely clean the garbage transport vehicle, which must comply with the transport routes specified by Tianjin City Appearance Environmental Management Committee. The garbage transport vehicle is prohibited to pass through the roads within the towns and villages.

11.3 Analysis of Transportation's Impact on Environment

During the operation period, the project's daily garbage disposal capacity is 700t, and will be averagely 88 loads of one-way garbage every day if the garbage is transported by an 8t truck. The daily garbage transport is intensively conducted during 6:00 to 12:00 a.m. and the

transport quantity, about 45 loads / h, in rush hours is as 1.5 times as the average quantity. If the transport of incinerator slags is taken into consideration, there will be more transport vehicle.

Zhongchang Road and 102 National Avenue are preliminarily confirmed as the main traffic arteries for the garbage transport to the plant areas. Therefore, Zhongchang Road and 102 National Avenue are the project's main traffic arteries for the garbage transport. At present, there is large traffic flow on the garbage transport arteries, and the project's garbage vehicle, to a certain degree, increases the traffic flow on the arteries, but the increased traffic flow is rather slightly, so there won't be obvious impact on the arteries' present traffic loading.

13. Feasibility Analysis of Site Selection

12.1 Conformance Analysis of Industrial Policies

According to the Catalogue for the Guidance on Adjustment of Industrial Structure, the urban garbage's reduction, reutilization and hazard-free treatment and multiple purpose projects are the encouraged projects. The project meets the industrial policy requirements.

According to HF [2008] No. 82 Document Notice on Management Strengthening of Environmental Impact Assessment of Biomass-to-Energy Project, the municipal solid waste to energy project should preferentially select heat supply unit to improve the environmental benefits and social benefits. Yet due to the project's location at spacious area, there is no stable outside heat consumer, so it is not available for the project to use the heat supply unit. To sum up, the project meets the industrial policy requirements.

12.2 Conformance Analysis of Planning

12.2.1 Conformance with Tianjin Urban Master Planning (2005~2020)

The designated function of Tianjin of "Tianjin is the economic center in circum-Bohai-sea region and it is required to be gradually built into an international port city, an ecological city and the economic center in the north" is explicitly specified in Tianjin Urban Master Planning (2005~2020). Tianjin's development goals are: Be a northern economic center of advanced technologies and manufacturing, first-rate services, strong comprehensive competitiveness, great openness and perfect entrepreneurial environment, an international port city of applicable development trend of global integration, convenient transportation, high-efficient information networks and strong radiating capacity, an ecological city of high-efficient resource utilization, perfect security system, good ecological environment and pleasant living environment and a famous cultural city of profound historical and cultural heritage, outstanding modern historic features, social harmony and developed technology education culture. The strategic goals of Tianjin's urban spatial development are: double city and double port, extension in both directions, development of one center and two cities and good ecology in north and south.

In the urban master planning, the requirements for the comprehensive control of solid wastes in the environmental protection planning are "the rate of multipurpose utilization of industrial solid wastes should be higher than 98%, the rate of hazard-free treatment of hazardous

wastes should be higher than100% and the rate of harmless treatment of municipal solid waste should be higher than 95%". Meanwhile, the requirements of "the disposal of municipal solid waste should adhere to the principle of urban garbage's reduction, reutilization and harmless treatment, the classification of garbage sources should be promoted and the municipal solid waste should be of classified collection and transport and overall treatment" are specified in the general regulations.

Tianjin Dynagreen Renewable Energy Co., Ltd. is planning to invest RMB 299,954,600 to conduct Tianjin Ji County's Municipal Solid Waste to Energy Project (Phase I) at northeast part of West Jiuhu Village, Bieshan Town (the address of former No.1 Cement Factory). The project plans to set up 2 incineration-flue gas purification lines with the daily disposal capacity of 350 tons and a 1 set of 12MW steam turbine generator unit, which will produce thermal energy and electric energy through municipal solid waste incineration. It can be known from the planning above that the project meets the industrial policy requirements.

12.2.2 Conformance of Layout Planning of Tianjin Municipal Sanitation Facilities (2009~2020)

According to Layout Planning of Tianjin Municipal Sanitation Facilities (2009~2020), Ji County is planning to set up a integrated waste treatment plant with the daily disposal capacity of 700 tons, and the plant will be located in Youguzhuang Town in the southwest part of Ji County. However, the site in Youguzhuang Town will be moved to Bieshan Town for its numerous ground attachments and structures and inconvenient transportation, and waste treatment plant will be changed into a waste-to-energy power plant. At present, the layout planning of Tianjin municipal sanitation facilities has being adjusted, and the project will meet the industrial policy requirements after the adjustment. Refer to Attachment 3 for description of adjustment of the planning.

12.3 Feasibility of Site Selection

(1) The site selection meets the requirement of "The municipal solid waste incineration plant is suitable to be located at the edge or outside places of the urban planning construction area" specified in GB50337-2003 Code for Planning of Urban Environmental Sanitation Facilities. The site of the project is located at the edge of the urban planning construction area, so the project meets the standards.

(2) The site selection meets the requirements of "The municipal solid waste incineration plant should be located at outside places of the urban planning construction area and

meet the urban master planning and environmental health specialized planning. The site shall not cause pollution to the surface drainage system and impact on the cultural heritage and scenic spots." specified in CJJ90-2002 Technical Code for Projects of Municipal Waste Incineration. The project's site selection meets the above requirements.

(3) Within 1 km areas nearby the site, there are no current or planned residence zones, school, hospital and other environment-sensitive targets.

(4) According to the impact prediction, the hourly maximum concentration of the project's nitrogen oxide and chloride exceeds the standards with a rate of 0.197%, such a slight over-limit won't have adverse impact on the atmospheric environment. The emission of other pollutants meets relevant standards and the impact of other pollutants meets relevant environmental standards.

(5) According to the requirement of "environment protection zone of new and reconstruction projects shall not be shorter than 300 m" specified in HF (2008) No. 82 Document Notice on Enhancing Environment Impact Assessment of Biomass-to Energy Projects, the project has to set a 300-m environment protection zone. There is no environment-sensitive target within 300-m ambient areas, so the project meets the requirement for environment protection zone.

(6) According to JXDTSZ No. 0021 Notice on Site Selection Opinions on Tianjin Municipal Planning Area's Administrative Licensing Items issued in 2013, the project's site is the garbage disposal land, so the project meets the urban master planning requirements.

To sum up, it is considered in this assessment report that the site of municipal solid waste-to-energy power plant is feasible.

12.4 Suggestion on Utilization Planning of Lands Surrounding the Site

Waste incineration will produce a certain amount of dioxin, though the project's dioxin emission may meet relevant national standards, the dioxin will be gathered in ambient soils after being propagated. Since the dioxin has chemical stability and is easily to be absorbed by adipose tissue, it will permanently be stored in human body once it enters into human body. However, in the natural environment, the microorganism and hydrolysis has minor impact on the dioxin molecular structure, therefore, the dioxin in natural environment is hard to degrade and eliminate the concentration in soils. The harm of dioxin concentration to human health is a long-term process, there in no present professional research about it in China, and the harm of dioxin concentration in soils to human health cannot be quantitatively calculated through mathematical models. In the viewpoint of environmental safety and based

on the distance of predicted atmospheric maximum ground level concentration in this assessment report, the following suggestions are given in this report for the utilization planning of the ambient lands:

(1) Nursery and other crops that are out of the human food chain are suggested to be planted in the agricultural lands within 1 km areas nearby the project's exhaust funnel.

(2) Within 1 km areas nearby the project's exhaust funnel, it is not suitable to build residence zones, school, hospital and other environment-sensitive targets.

14. Environmental Management and Environmental Monitoring

Management is one of the key points of the garbage disposal plant's effective operation. Based on the situations of China's waste incineration plants, the waste incineration equipments basically operate normally. The plant has stipulated the operating instructions for all production links, however, some persons fail to strictly comply with the operating instructions. The electrically operated gate of the garbage storage pit should only be opened when discharging the garbage and closed in other periods of time to keep consistent with the negative pressure in the incinerator, thus the entrainment of waste odors into the atmospheric environment can be effectively prevented. But due to the frequent garbage discharging, the operators fail to timely close the gate for the convenience of discharging, and the waste leachate leaked on the discharging platform is not timely cleaned, so there are severe odors in front of the garbage storage pit.

A strict management system must be set for the increasing garbage year by year, because efficient and effect management measures are the important for the garbage disposal plant's normal operation and active role of promoting the environmental benefits. In addition, effective economic policies must be proposed and relevant legal system and technical system must be perfected to guarantee the waste-to-energy power plant's normal operation and protection of people's living environment.

13.1 Purposes of Environmental Management and Environmental Monitoring

According to national and Tianjin's environmental protection laws and regulations and based on the project's characteristics, the construction area's environment characteristics, the environmental management program and monitoring plan have been respectively made in this report for the construction period and operation period to reduce the impact of the project's fugitive dust, noise and all pollutants on the environment, to effectively supervise and control the project's pollutant emission and environment quality and provide detailed and reliable data for the area's environmental management.

13.2 Environmental Management, Supervision and Monitoring plan during Construction Period

The project's construction unit should have an environmental protection office to be specially

responsible for the environmental protection during the construction period. The construction unit is responsible for stipulating special provisions for the environmental protection in the construction plan to develop targeted environmental protection management measures and detailed environmental protection plans according to national relevant construction management regulations and operation specifications and based on the project's specific construction plan and the pollution control measures proposed in this report. The environmental protection management measures and plans should be strictly carried out after being approved by environmental protection departments.

The project should carry out the environmental supervision system and the supervisors' rights and responsibilities are as follows:

(1) Regularly inspect the construction site and supervise the construction unit's implementation of the environmental protection measures to timely restrain and correct nonconforming construction;
(2) Investigate and dispose the pollution problems occur during the construction period;
(3) Submit the environmental protection interim report to the environmental protection administration departments and accept the departments' guidance and supervision;
(4) Supervisors shall have the right to correct the construction unit's nonconformance and issue the stoppage notice if the unit refuses to correct its nonconformance;

The local environmental monitor station is responsible for the environmental monitoring during the project's construction period and regularly monitoring the pollution factors of construction period. Construction noise and fugitive dust will mainly be monitored.

13.3 Environmental Management and Monitoring plan during Operation Period

After completion of the project's construction work, the environmental management must be strengthened. An environmental protection management department should be set to supervise and manage the pollutants produced during the operation period.

13.3.1 Environmental Management Plan

The plant's environmental management structure mainly has the following responsibilities:

(1) Besides carrying out relevant leaders' directives related to environmental protection, the project's environmental protection institution also should accept Tianjin Environmental Protection Bureau and Ji County Environmental Protection Bureau's inspection and supervision to regularly and irregularly report the implementation of all management

measures and environmental protection data to provide services for the area's integrated environmental management;

(2) Implement the environmental protection regulations and standards and conduct environmental management according to the principle of "three functions at the same time" and "one control measure and double conformance"; (the principle means design, construct and operate at the same time and the total emission will be under control , and the local and national standards will be within.)

(3) Organize the preparation and revision of the project's environmental protection management regulations and supervise the implementation of those regulations;

(4) Prepare and implement all environmental protection rules and plans according to the environment quality requirements specified by the state, local government and industrial competent department and based on the project's practical situations to harmonize the economic development and environmental protection;

(5) Cooperate with the local environmental monitoring department to conduct the environmental monitoring;

(6) Inspect the operation of the project's all environmental protection facilities to fully and deeply control the production and emission of all pollutants;

Environmental protection institution is divided into environmental management section and environmental monitoring section and also divided into internal and external sections according to the subjects of management and monitoring. Refer to Figure 13-3-1 for the project's environmental protection structure.

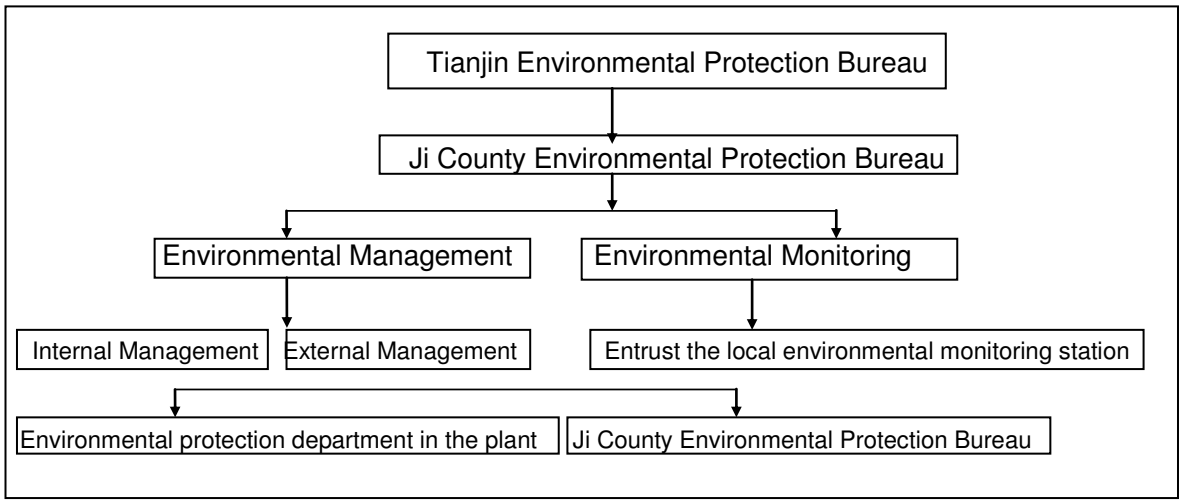


Figure 13-3-1 Construction Unit's Environmental Protection Institution System Diagram

13.3.2 Environmental Monitoring Plan

(1) Monitoring in the Plant

Refer to Table 13-3-1 for the plant's environmental monitoring plan.

Table 13-3-1 Environmental Monitoring Plan

Category	Monitoring Spots	Monitoring Items	Monitoring Frequency	Responsible group	Budget
aste Gases	80m exhaust funnel	Soot, flue gas concentration, carbon monoxide, nitrogen oxide, sulfur dioxide, hydrogen chloride, mercury, cadmium and plumbum	Quarterly (excluding the items of continuous monitoring)	The local environmental protection bureau	60000Yuan
		Dioxin	Annually	The local environmental protection bureau	120000Yuanv
	Boundary surroundings	Odor concentration, NH3, H2S and methyl mercaptan	Quarterly	The local environmental protection bureau	30000Yuanr
Vastewater	π exit of sewage treatment station	pH, CODcr, BOD5, SS, ammonia nitrogen, total phosphorus, Hg, Cd, Pb, Cr, hexavalent chromium and As	Quarterly (excluding the items of continuous monitoring)	The local environmental protection bureau	80000Yuan
Noise	Boundary surroundings	Equivalent A sound level	Semi-annually	The local environmental protection bureau	10000Yuan
olid waste leachate	Fly ash and other solidified matters	Mercury, copper, zinc, plumbum, cadmium, beryllium, barium, nickel, arsenic, total chromium, hexavalent chromium and selenium	Semi-annually	The local environmental protection bureau	10000Yuan

(2) External Monitoring

a) Dioxin Monitoring

Refer to Table 13-3-2 for the external dioxin monitoring plan.

Table 13-3-2 External Dioxin Monitoring Plan

Category	Monitoring Spots	Time of Monitoring	Detection Method
Ambient Air Monitoring	Nearest environmentally sensitive area downwind of the chimney's predominant wind direction	Confirm the environmental background before the operation and irregularly monitor	HJ/T77-2001 Standard for Dioxin Analysis Methods
	Maximum ground level concentration downwind (about 1.55 km downwind) of the chimney's predominant wind		

	direction	the dioxin after the operation	
Soil Monitoring	Upwind of the chimney's predominant wind direction		
	Downwind of the chimney's predominant wind direction		

b) Monitoring of Other Pollutants

The local environmental protection bureau is responsible for uniformly arranging the external monitoring of other pollutants, making specific external environmental monitoring plan based on the project's characteristics and the ambient characteristics and carrying out the plan.

13.3.3 Environmental Protection Acceptance Monitoring Scheme

After trial operation of the project, the environmental protection competent department should inspect the engineering's environmental protection facilities for acceptance according to the national "three functions at the same time" requirements. Refer to Table 13-3-3 for the suggestions on the project's "three functions at the same time" environmental protection acceptance.

Table 13-3-3 List of Environmental Protection "Three Functions at the Same Time" Acceptance

Items	Substances of Treatment	Treatment Facilities	Quantity (set)	Monitoring Factors and Frequency of Measurement	Standards
Wastewater	Garbage leachate, waste unloading hall's flushing water, workshop's floor flushing water and domestic wastewater	Sewage Treatment System	1 set	Daily monitor the pH, CODcr, BOD_5, SS, ammonia nitrogen, total phosphorus, Hg, Cd, Pb, Cr, hexavalent chromium and As at the treatment station's outlet three days in a row	GB/T 18920-2002 Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Water Consumption
Waste Gases	Flue gas produced by waste incineration	Flue gas purification system and online monitoring instrument	2	Daily monitor the soot, flue gas concentration, carbon monoxide, nitrogen oxide, sulfur dioxide, hydrogen chloride, mercury, cadmium, plumbum and dioxin exhaust funnel three days in a row	Flue gas designed emission limits
	Lime and cement storage	Bag-type dust remover	2		GB16297-2012 Integrated Emission Standards for Atmospheric Pollutants (Second Level)
	Garbage pond and leachate collecting tank	Activated carbon air purification device	2	Daily monitor the boundary odor concentration, sulfuretted hydrogen, ammonia gas and methyl mercaptan three days in a row	Emission Standards for Odorous Pollutants DB12/－059－95
	Canteen's oil fume	Flue gas purification device	1	—	Emission Standards of Cooking Fume (GB18483-2001)

Noise	Noise caused by the operation of various machines	Selection of low-noise equipment, shock absorption to the equipment groundwork, installation of noise-abatement equipment and other measures	—	Daily monitor the boundary ambient pollutants in the day and at night three days in a row	Emission Standard for Industrial Enterprises Noise at Boundary Class 2 (GB12348-2008)
Solid Wastes	Incinerator slag, leachate treatment and sludge	Buried as general wastes	—	—	—
	Fly ash	Buried after solidification and compliance test	—	—	
	Waste metals	Sale	—	—	
	Spent activated carbon and municipal solid waste	Incineration	—	—	
Greening	45% greening rate in the plant and at the boundary				
Standardization of Sewage Outlet	Waste gas treatment equipment	Flue gas online monitoring instrument	1	—	
	Waste gas discharge outlet	Environmental protection signboard	1	—	

15. Conclusions and Recommendations

14.1 General Conclusion of Environmental Impact Assessment

The project's construction complies with Tianjin Overall Planning of Urban Development 2005-2020, and after the adjustment of Layout Planning of Tianjin Municipal Sanitation Facilities (2009~2020), the project's construction meets the planning requirements. After completing this project, Ji County may realize its urban garbage's reduction, reutilization and hazard-free treatment, which has obvious environmental benefits and social benefits, so the project meets the industrial policy requirements. During operation period, the waste gases, wastewater and noise emission meets the standards and all the solid wastes are appropriately disposed, so there won't be secondary pollution, and the pollutants' impact on environmentally sensitive areas meets relevant environmental standards. The project meets the requirements for clean production and the requirements of pollutants' total emission can be achieved. To sum up, the project, on the condition of carrying out all pollution control measures proposed in this report and all pollutant emission meeting the standards, has the environmental feasibility.

14.2 Recommendations

(1) Environmental protection work should be also conducted after the enterprise starts operation:
(2) Strengthen the sorting of garbage to reduce the content of heavy metal and chlorine elements in the wastes to reduce the content of heavy metal and dioxin in the flue gas as far as possible;
(3) Entrust a professionally qualified unit to have secondary design of the environmental protection and use the proven pollution abatement equipments provided by domestic and international manufacturers.
(4) Nursery and other crops that are out of the human food chain are suggested to be built and planted in the agricultural lands within 1 km radius of the project's exhaust funnel.
(5) Within 1 km radius of the project's exhaust funnel, it is not suitable to build

residential area, school, hospital and other environmentally sensitive buildings.

Environmental Management Plan for the Jixian Waste to Energy Project

People's Republic of China

Prepared by the Dynagreen Environmental Protection Group Co., Ltd

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A Introduction

1. This Environmental Management Plan (EMP) is developed for the Jixian Municipal Solid Waste to Energy Project (the Project) and defines all potential impacts of the project components and the mitigation and protection measures with the objective of avoiding or reducing these impacts to acceptable levels. The EMP also defines the institutional arrangements and mechanisms, the roles and responsibilities of different institutions, procedures and budgets for implementation of the EMP. The EMP seeks to ensure continuously improving environmental protection activities during preconstruction, construction, and operation in order to prevent, reduce, or mitigate adverse impacts and risks. The EMP draws on the findings of the project IEE, and discussions and agreements with relevant government agencies and the Asian Development Bank (ADB).

2. This EMP is based on proposed project designs and domestic EIR. The EMP, together with the IEE will be disclosed on the ADB public website (www.adb.org).It will also be included as a separate annex in all bidding and contract documents. The contractors will be informed of their obligations to implement the EMP, and to provide for EMP implementation costs in their bids for project works.

3. The EMP includes an environmental monitoring program. The monitoring results will be used to evaluate (i) the extent and severity of actual environmental impacts against the predicted impacts, (ii) the performance of the environmental protection measures and compliance with relevant laws and regulations, (iii) trends of impacts, and (iv) overall effectiveness of the project EMP.

Institutional arrangements and responsibilities for EMP implementation

4. The Dynagreen Environmental Protection Group Co., Ltd has established Jixian Project Management Office (environmental and social unit), who will be responsible for the day-to-day management of the project and the implementation of the EMP. it constitute Project manager, Environmental Engineer and Health and Safety Engineer.

5. Environmental and social unit will implement project components, administer and monitor contractors and suppliers, and be responsible for construction supervision and quality control.

6. The environmental and social unit will do the following.

(i) Prepare and provide the following specification clauses for incorporation in the bidding procedures: (i) environmental management requirements to be budgeted by the bidders in their proposals; (ii) environmental clauses for contractual terms and conditions; and (iii) the EMP.
(ii) Translate the EMP into Chinese-language and ensure that it remains consistent with this original version in English-language.
(iii) Ensure the EMP is implemented by the contractors, and that all contractors and project agencies comply with the EMP.
(iv) Implement the Grievance Redress Mechanism
(v) Prepare and submit annual environmental monitoring reports to ADB.
(vi) Appoint one qualified environment specialist on its staff to implement the EMP, including supervision of the environmental and social unit and contractors, collection, storage and analysis of the monitoring data, and preparation of the annual environmental monitoring reports.

7. The Jixian Environmental Monitoring Station (JEMS) (under the Jixian Environmental Protection Bureau) will be contracted by the environmental and social unit to implement the environmental monitoring program described in this EMP for the construction stage. The environmental and social unit will implement the environmental monitoring program for the operational stage. JEMS is a qualified entity to conduct the internal environmental monitoring. A qualified third party will do the external monitoring for the project.

E&S officer and E&S unit

i. Before project implementation.

- Conduct a final review and - if necessary - revision of the EMP, to ensure that any environmental impacts that may result from the finalized engineering designs are identified and addressed in the EMP. Any revisions in mitigation measures may also require updating of the EMP budget.
- Submit the revised EMP to Dynagreen for review and approval.
- Support the environmental and social unit to ensure that tender and bidding documents, and civil works contracts, contain provisions requiring contractors to comply with the mitigation measures in the EMP, including compliance with national labor standards and measures to compliment with the international core labor standards[2], and that relevant sections of the project EMP (or updated EMP, if prepared) are incorporated in the bidding and contract documents.
- Establish the GRM.
- Develop procedures to collect, enter, store, and analyze the progress on implementation of the EMP, specifically: (a) any complaints and issues received and how these were addressed (GRM); (b) data collected by the JEMS for the EMP environmental monitoring program, and the interpretation of this data (e.g. is project construction within the limits of air quality, noise levels . specified in the EMP?); (c) compliance of the contractors with the EMP; (d) a reporting schedule for the preparation and submission of the annual environmental monitoring reports to ADB.
- Provide training to environmental and social unit and contractors on the specific requirements of the EMP.
- EMP independent evaluation
- Assess the project components' environmental readiness prior to implementation based on the readiness indicators defined in Table A.3.

ii. During project implementation.

- Conduct regular EMP compliance assessments; undertake site visits as required, identify any environment-related and social-related (impact to communities, labor issues, .)Implementation issues, propose necessary corrective actions, and prepare these in a corrective action plan.
- Assist environmental and social unit to prepare annual environmental monitoring progress reports for submission to ADB.
- Provide periodic 'refresher' training sessions to environmental and social unit and contractors on the EMP, to ensure that on-site personnel continue to comply with the EMP.
- Assist the environmental and social unit in conducting consultation meetings with relevant

[2]The core labor standards are the elimination of all forms of forced or compulsory labor; the abolition of child labor; elimination of discrimination in respect of employment and occupation; and freedom of association and the effective recognition of the right to collective bargaining, as per the relevant conventions of the International Labor Organization.

stakeholders as required, informing them of imminent construction works, updating them on the latest project development activities, and the GRM.

8. Construction contractors. The construction contractors will be responsible for implementing the EMP mitigation measures during construction, under the supervision of the environmental and social unit. The contractors will need to understand their requirements under the EMP. In their bids, contractors will be required to respond to the specific environmental management requirements in the EMP. Each contractor will be required to assign a specific member of their work team who will be directly responsible for the team's environmental, health and safety management, and compliance with labor standards. The contractors will work directly with the environmental and social unit Environmental Specialist and E&S officer to ensure that prior to any works, the EMP is jointly reviewed and understood, and any site-specific measures are identified and agreed.

9. Overall environmental and social responsibilities are outlined in Table A.1.

Table A.1: Environmental responsibility

Phase	Responsible Agency	Environmental Responsibility
Project preparation	Design Institutes on behalf of environmental and social unit	Prepare project FSRs, EIR and EMP, RPs, conduct public consultation
	Giizhou EPB	Review and approve the project EIR and EMP
	Environmental consultant	Provide technical assistance, review domestic EIA, prepare IEE report
	ADB	Review and approve the IEE and EMP, including disclosure
Engineering detail design	Design Institutes on behalf of environmental and social unit	Incorporate mitigation measures defined in the EMP into engineering detail designs; Update the EMP in cooperation with the E&S officer
	environmental and social unit, E&S officer	Review updated EMP, confirm that mitigation measures have been included in engineering detail design
	ADB	Approve updated EMP, including disclosure
Tender & contracting	environmental and social unitand contractors	Incorporate EMP clauses in tender documents and contracts
	E&S officer	Review bidding documents; confirm project's readiness
Construction	environmental and social unit	Supervise contractors and ensure compliance with the EMP for their respective components; coordinate construction supervision and quality control; act as local entry point for the project grievance redress mechanism (GRM).
	Dynagreen, APMP	Appoint one environment specialistand social specialist on its staff; supervise the effective implementation of the EMP and social aspects; coordinate periodic environmental impact monitoring according to the approved monitoring plan; coordinate the project level GRM; prepare semi-annual environment progress reports and submit them to ADB; conduct public consultation and inspect implementation of mitigation measures.
	Contractors	Assign EMP implementation responsibilities; ensure implementation and monitoring ofenvironment, health and safety measures and compliance with national labor standards and measures to comply with relevant core labor standards; implement mitigation measures; conduct frequent noise and dust monitoring around construction sites.
	JEMS (contracted by environmental and social unit)	Undertake internal environmental monitoring; submit quarterly monitoring results to environmental and social unit,JEPB.
	E&S officer	Advise on the mitigation measures; provide comprehensive technical support to Dynagreen and environmental and social unitfor environmental management; conduct training; conduct annual

Phase	Responsible Agency	Environmental Responsibility
		EMP compliance review; support environmental and social unit in preparing quarterly project progress reports and semi-annual environment monitoring reports
	JEPB	Conduct periodic inspections of all proposed projects relative to compliance with PRC regulations and standards.
Operation	Dynagreen, environmental and social unit	Ensure proper operation of component facilities according to design standards, and implement mitigation measures and public consultations
	Dynagreen, E&S officer	Conduct EMP compliance review, instruct ZPMP on environmental management requirements; coordinate internal environmental monitoring; prepare quarterly project progress reports and semi-annual environment monitoring reports
	JEMS (contracted by the environmental and social unit who are also the O&M Units)	Undertake internal environmental and social monitoring for the first year of operation; submit quarterly monitoring results to environmental and social unit,Dynagreen, JEPB.
	JEPB	Undertake periodic and random environmental and social monitoring and inspect environmental and social (labor) compliance
	ADB	Review and approve environmental progress report, disclose on ADB website
Notes: ADB = Asian Development Bank; JEMS =Jixian Environment Monitoring Station; JEPB =Jixian Environmental Protection Bureau; environmental and social unit = Jixian Project Management Office; E&S officer = Environmental and social officer.		

B Summary of potential impacts and mitigation measures

10. Potential environmental issues and impacts during the pre-construction, construction and operation phases, and corresponding mitigation measures, are summarized in Table A.2. These include two types of mitigation measures:

(i) Measures that will permanently become part of the infrastructure such as flue gas purification facilities and odor removal equipment for the solid wastes. These will need to be included in the design of the facility by the design institutes. The costs of building and maintaining these systems have already been included in the infrastructure construction and operating costs and therefore will not be double-counted as part of the EMP costs.

(ii) Temporary measures during the construction stage (e.g. dust suppression by watering, use of quiet / low noise powered mechanical equipment, flocculants used to facilitate sedimentation of suspended solids in construction site runoff). These will need to be included in the tender documents; otherwise they will not be budgeted by the contractor and will not be implemented.

11. The mitigation measures defined in the EMP will be (i) checked and where necessary re-designed by the design institutes; (ii) incorporated into tender documents (where appropriate), construction contracts, and operational management plans; and (iii) implemented by contractors under supervision of environmental and social unit. The effectiveness of these measures will be evaluated based on the results of the environmental impact monitoring conducted by JEMS, and through EMP compliance verification conducted by the environmental and social unit and E&S officer.

Table A.2: Summary of Potential Impacts and Mitigation Measures

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
Detailed Design Stage						
Design of flue gas treatment system	Air quality	Air pollution	Design combined process of semi-dry process + active carbon spraying + bag filter system	Guangzhou Light Industrial Design Institute	environmental and social unit	Included in design contract
Design of NOx removal system	Air quality	NOx emission	Design of SNCR system (Selective non-catalytic reduction method)	Guangzhou Light Industrial Design Institute	environmental and social unit	Included in design contract
Design of odor escape	Odor	Odor escape from various places	Design of odor prevention system such as wind curtains at entrance and exit of MSW discharging hall, the MSW storage will be designed as entirely closed, and maintain at negative pressure state. The top is to be installed with extraction openings of primary wind and secondary wind with filter devices, and it is to suction odorous gases into the incinerator as combustion air for the incinerator, so as to prevent escape of odors.	Guangzhou Light Industrial Design Institute	environmental and social unit	Included in design contract
Design of leachate collection and treatment	wastewater	Wastewater discharge	Design of “physicochemical + UASB anaerobic reactor + MBR membrane bioreactor + two-step FU ultrafiltration membrane system	Guangzhou Light Industrial Design Institute	environmental and social unit	Included in design contract
Design of fly ash and slag collection and treatment	Solid waste	Solid waste impact	Slag will be entirely sold as raw material for brick plants; according to the MSW incineration fly dust leaching toxicity identification report in the actual production of the proposed project, solidified fly dusts will be directly sent to Jixian City MSW Landfill for landfill or transported to eligible dangerous wastes disposal agency for final disposal.	Guangzhou Light Industrial Design Institute	environmental and social unit	Included in design contract
Water quality	Water quality and public health	Pipe burst	Design of pipe materials and connections must be adequate to prevent pipe burst.	Guangzhou Light Industrial Design Institute	environmental and social unit	Included in design contract
On-line monitoring	Waste gas and wastewater	Air pollution, odor emission and water pollution	Design ofwaste gas and wastewater online monitoring devices	Guangzhou Light Industrial Design Institute	environmental and social unit	Included in design contract

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
Climate	Climate change	GHG emissions	Take into account energy efficiency, energy conservation and low GHG emissions in all building and systems designs and equipment selection for the wastewater pump stations.	Guangzhou Light Industrial Design Institute	environmental and social unit	Included in design contract
Pre-construction Stage						
Institutional strengthening	-	Lack of environmental and social management capacities within Dynagreen and environmental and social unit	Appoint qualified environment and social specialist on staff within Dynagreen and environmental and social unit Contract Environmental and social officer (E&S officer) within loan administration consultant services; Conduct environment management training.	Dynagreen, environmental and social unit, E&S officer	ADB	environmental and social unit
	-	Lack of environmental and social monitoring capability and qualification	Contract Jixian Environmental Monitoring Station to conduct project impact monitoring during construction.	environmental and social unit	ADB	environmental and social unit
			Contract Jixian Environmental Monitoring Station to conduct project impact monitoring during the operational stage.	environmental and social unit	environmental and social unit	environmental and social unit
Tender documents	Air quality	Dust (TSP) impact to sensitive receptors	Put into tender documents dust suppression measures: Water unpaved areas, backfill areas and haul roads 7-8 times each day; Erect hoarding around dusty activities; Strengthen the management of stockpile areas with frequent watering or covering with tarpaulin; Minimize the storage time of construction and demolition wastes on site by regularly removing them off site; Do not overload trucks for transporting earth materials to avoid spilling dusty materials onto public roads. Equip trucks for transporting earth materials with covers or tarpaulin to cover up the earthy materials during transport; Install wheel washing equipment or conduct wheel washing manually at each exit of the works area to prevent trucks from carrying muddy or dusty substance onto public roads; Immediately cleanup all muddy or dusty materials on public roads outside the exits of the works areas; Sensibly plan the transport routes and time to avoid busy traffic and heavily populated areas	Guangzhou Light Industrial Design Institute	environmental and social unit; E&S officer	Included in tendering agency contract

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
			when transporting earthy materials; Immediately plant vegetation in all temporary land take areas upon completion of construction to prevent dust and soil erosion.			
		Odor impact to sensitive receptors	Put into tender documents that the transport of MSW from the site of origin to the plant site must be in sealed containers.	Guangzhou Light Industrial Design Institute	environmental and social unit; E&S officer	Included in tendering agency contract
	Noise	PME noise impact to sensitive receptors	Put into tender documents the following noise mitigation measures: Use quiet equipment; Adopt good O&M of machinery; Use temporary hoardings or noise barriers to shield off noise sources; Minimize night time construction between 2200 and 0600 hours. If night time construction is needed, consult and notify local communities beforehand;	Guangzhou Light Industrial Design Institute	environmental and social unit; E&S officer	Included in tendering agency contract
	Water quality	Construction site wastewater impact on water bodies	Put into tender documents the following measures to treat wastewater and runoff from construction sites: Provide portable toilets or small package WWTPs for workers and canteens Install sedimentation tanks on-site to treat process water and muddy runoff	Guangzhou Light Industrial Design Institute	environmental and social unit; E&S officer	Included in tendering agency contract
	Solid waste	Disposal or storage of excavated spoil	Specify in tender documents the spoil disposal or storage sites and that only these sites could be used.	Guangzhou Light Industrial Design Institute	environmental and social unit; E&S officer	Included in tendering agency contract
	Labor, health &safety	Occupational health & safety of workers Compliance with labor standards (national and core labor standards)	Specify in tender documents the provision of personal safety and protective equipment such as safety hats and shoes, eye goggles, respiratory masks, . to all construction workers as well as responsibility of contractors to comply with national labor standards (minimum wages, insurance,) and core labor standards (prohibition of child labor, bonded labor, and non-discrimination).	Guangzhou Light Industrial Design Institute	environmental and social unit; E&S officer	Included in tendering agency contract
Construction traffic	Traffic	Construction vehicles causing traffic congestion	Plan transport routes for construction vehicles and specify in tender documents to forbid vehicles from using other roads and during peak traffic hours.	Guangzhou Light Industrial Design	environmental and social unit;	Included in tendering agency

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
				Institute, Local traffic police	E&S officer	contract
					Estimated cost for Design and Pre-construction stage: Included in detailed design and contract tender fees	
Construction Stage						
Construction site good practice	Air quality	Dust (TSP) during construction	Frequent watering of unpaved areas, backfill areas and haul roads; Erect hoarding around dusty activities; Strengthen the management of stockpile areas with frequent watering or covering with tarpaulin; Minimize the storage time of construction and demolition wastes on site by regularly removing them off site; Do not overload trucks for transporting earth materials to avoid spilling dusty materials onto public roads; Equip trucks for transporting earth materials with covers or tarpaulin to cover up the earthy materials during transport; Install wheel washing equipment or conduct wheel washing manually at each exit of the works area to prevent trucks from carrying muddy or dusty substance onto public roads; Immediately cleanup all muddy or dusty materials on public roads outside the exits of the works areas; Sensibly plan the transport routes and time to avoid busy traffic and heavily populated areas when transporting earthy materials; Immediately plan vegetation in all temporary land take areas upon completion of construction to prevent dust and soil erosion.	Contractor	environmental and social unit,E&S officer	$30,000

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
	Noise	Noise from PME and vehicles	Sensibly schedule construction activities, avoid noisy equipment working concurrently; Select advanced quiet equipment and construction method, and tightly control the use of self-provided generators; Comply with local requirements in areas with sensitive receptors very close by. If night time work is needed, set up temporary noise barrier, minimize use of noisy equipment, and consult and notify local communities beforehand; Control speed of bulldozer, excavator, crusher and other transport vehicles travelling on site, adopt noise reduction measures on equipment, strengthen equipment repair and maintenance to keep them in good working condition; Limit the speed of vehicles travelling (less than 20 km/hr), forbid the use of horns unless absolutely necessary, minimize the use of whistles; Maintain continual communication with nearbyschools to avoid noisy activities near the schools during examination periods.	Contractor	environmental and social unit, E&S officer	$30,000
	Water quality	Construction site wastewater discharge	Domestic and cafeteria wastewater will go through biochemical treatment and grease trap prior to discharge; The cafeteria will be designed and construct for employment and provide breakfast, lunch and dinner. Timely cleanup scattered materials on site, stockpiles must adopt measures to prevent being washed into water bodies by rain water; Reuse equipment and wheel wash WW for dust suppression;	Contractor	environmental and social unit, E&S officer	$30,000
	Solid waste	Construction site refuse and spoil disposal	Transport construction waste in enclosed containers; Establish enclosed waste collection points on site, with separation of domestic waste and construction waste; Set up centralized domestic waste collection point and transport offsite for disposal regularly by sanitation department; Dispose spoil at designated disposal site. Backfilled area if not being used must be planted with vegetation to prevent soil erosion.	Contractor	environmental and social unit,E&S officer	$30,000

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
	Physical cultural resources	Destruction of cultural relics in stream bed and soil	Contractor must comply with PRC's Cultural Relics Protection Law and Cultural Relics Protection Law Implementation Regulations if such relics are discovered, stop work immediately and notify the relevant authorities, adopt protection measures and notify the Security Bureau to protect the site.	Contractor	environmental and social unit,E&S officer	None
Health and Safety	Occupational health and safety	Construction site sanitation	Effectively clean and disinfect the site. During site formation, spray with phenolated water for disinfection. Disinfect toilets and refuse piles and timely remove solid waste; Minimise the risk of fly- or mosquito-borne diseases by maintaining well-drained and hygienic project sites; Remove standing water bodies and cover drums and other containers to avoid formation of stagnant water; Ensure personnel are aware of potential disease risks; Enforce on-site hygiene regulations to prevent litter; Provide public toilets in accordance with the requirements of labor management and sanitation departments in the living areas on construction site, and appoint designated staff responsible for cleaning and disinfection.	Contractor	environmental and social unit,E&S officer	$30,000
		Occupational safety	Provide safety hats and shoes to all construction workers and enforce their use by the workers; Provide ear plugs to workers working near noisy PME.	Contractor	environmental and social unit,E&S officer	$30,000
		Food safety	Inspect and supervise food hygiene in cafeteria on site regularly. Cafeteria workers must have valid health permits. Once food poisoning is discovered, implement effective control measures immediately to prevent it from spreading.	Contractor	environmental and social unit,E&S officer	None
		Disease prevention and safety awareness	Construction workers must have physical examination before start working on site. If infectious disease is found, the patient must be isolated for treatment to prevent the disease from spreading. From the 2nd year onwards, conduct physical examination on 20% of the workers every year. Establish health clinic at location where workers are concentrated, which should be equipped	Contractor	environmental and social unit,E&S officer	$30,000

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
			with common medical supplies and medication for simple treatment and emergency treatment for accidents. Specify the persons responsible for health and epidemic prevention, education on food hygiene, and disease prevention, to raise the awareness of workers.			
	Community health and safety	Temporary traffic management	A traffic control and operation plan will be prepared together with the local traffic management authority prior to any construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings with an emphasis on ensuring public safety through clear signs, controls and planning in advance.	Contractor, local traffic police	environmental and social unit,E&S officer	DYNAGREEN (traffic police department)
		Information disclosure	Residents and businesses will be informed in advance through media of the construction activities, given the dates and duration of expected disruption.	Contractor	environmental and social unit,E&S officer	None
		Access to construction sites	Clear signs will be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials, excavations, . and raising awareness on safety issues. All sites will be made secure, discouraging access by members of the public through appropriate fencing whenever appropriate.	Contractor	environmental and social unit,E&S officer	None
		Utility services interruptions	Assess construction locations in advance for potential disruption to services and identify risks before starting construction. If temporary disruption is unavoidable, develop a plan to minimize disruption with relevant authorities e.g. power company, water supply company, communication company, and communicate dates and duration in advance to all affected people.	Contractor, local service providers	environmental and social unit,E&S officer	None
	Compliance with labor standards	Lack of compliance with national and core labor standards leading to violation of rights of workers	Contractors to comply with national labor standards on minimum wages, insurance, . Recruitment office to design and implement measures to ensure that there is no discrimination during hiring and that no child labor or bonded labor will be engaged in the construction activities.	Contractor	environmental and social unit,E&S officer	
Grievance redress	Social & environmental	Handling and resolving complaints on contractors	Establish a GRM, appoint a GRM coordinator within environmental and social unit. Brief and provide training to GRM access points (environmental and social unit,contractors).	Contractor, environmental and	JEPB, E&S officer	environmental and social unit budget,

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
mechanism			Disclose GRM to affected people before construction begins at the main entrance to each construction site. Maintain and update a Complaint Register to document all complaints.	social unit,, E&S officer		
						Estimated cost for the Construction Stage: $210,000
Operational Stage						
	Noise	Noise from steam engine room, cooling tower, incinerator room, circulating water pump room	In stall high efficiency microporous silencer for instantaneous steam venting of boilers. Keep the equipments in good working condition and with regular maintenance.	environmental and social unit	Dynagreen	O&M Unit's operation budget
	Flue gas	Air pollution	Regular check online monitoring system, and alarm system to keep all facilities in good operational condition.	environmental and social unit	Dynagreen	O&M Unit's operation budget
	Leachate	wastewater	Regular check online monitoring system, and alarm system to keep all facilities in good operational condition.	environmental and social unit	Dynagreen	O&M Unit's operation budget
	Fly ash	Solid waste	Regular check online monitoring system, and alarm system to keep all facilities in good operational condition. Proper treatment and after stabilization in plant, be transported to auxiliary landfill for burying	environmental and social unit	Dynagreen	O&M Unit's operation budget
	Slag		Regular check online monitoring system, and alarm system to keep all facilities in good operational condition. After treatment in plant, comprehensively use as construction material.	environmental and social unit	Dynagreen	O&M Unit's operation budget
						Estimated cost for the Operational Stage: the cost will be included in the O&M budget

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementing Entity	Supervising Entity	Source of funds
Key: ADB = Asian Development Bank;CESMT = Community Environmental Supervision and Management Team(villagers committees);Dynagreen = Dynagreen Environment Protection Group Co., Ltd; JEMS= Jixian Environment Monitoring Station; JEPB = Jixian Environmental Protection Bureau;environmental and social unit = Jixian Project Management Office; E&S officer = Environmental and social officer.; O&M = operation & maintenance; PME = powered mechanical equipment; TSP = total suspended particles.						

Monitoring and reporting

12. Three types of project monitoring will be conducted under the EMP.[3]

(i) Project readiness monitoring. To be conducted by the E&S officer.

(ii) Project impact monitoring. To be conducted by:(a) the Jixian Environmental Monitoring Station (JEMS) under the Jixian EPB (for air, water, noise); and (b) the contractors, who will be required to conduct frequent noise and air quality monitoring around construction sites and to report monitoring results in the framework of their weekly progress reports to environmental and social unit.

(iii) Independent evaluation. To be conducted by the E&S officer. To verify EMP compliance during project implementation.

13. ADB will oversee project compliance on the basis of the annual environmental monitoring reports provided by Dynagreen and site visits (as needed). Monitoring and reporting arrangements defined for this project are described below.

14. Project readiness monitoring. Before construction, the E&S officer will assess the project's readiness in terms of environmental management based on a set of indicators (Table A.3) and report it to environmental and social unit. This assessment will demonstrate that environmental commitments are being carried out and environmental management systems are in place before construction starts, or suggest corrective actions to ensure that all requirements are met.

Table A.3: Project Readiness Assessment Indicators

Indicator	Criteria	Assessment
EMP update	• EMP was updated after technical detail design & approved by ADB	Yes No
Compliance with loan covenants	• The borrower complies with loan covenants related to project design and environmental management planning	Yes No
Public involvement effectiveness	• Meaningful consultation completed	Yes No
	• GRM established with entry points	Yes No
Environmental Supervision in place	• E&S officer is in place	Yes No
	• Environment specialists appointed by environmental and social unit	Yes No
	• Environment monitoring station contracted by environmental and social unit	Yes No

[3]In addition to project-specific monitoring, Jixian EPB will conduct independent ambient and/or enforcement monitoring as per national requirements. This is separate to, and not funded by, the project.

Indicator	Criteria	Assessment
Bidding documents and contracts with environmental safeguards	• Bidding documents and contracts incorporating the environmental activities and safeguards listed as loan assurances	Yes No
	• Bidding documents and contracts incorporating the impact mitigation and environmental management provisions of the EMP	Yes No
	• Environmental requirements of EMP included in contract documents for construction contracts	Yes No
EMP financial support	• The required funds have been set aside for EMP implementation	Yes No

15. Project impact monitoring. Table A.4(a) and Table A.4(b) show the environmental monitoring program designed for this project, defining the scope, location, parameter, duration and frequency, and responsible agencies, for monitoring during the construction and operational stages. Internal environmental monitoring will include monitoring of air quality, noise and water quality.

16. The internal environmental monitoring results will be compared with relevant PRC and international performance standards (Table A.5). Non-compliance with these standards will be highlighted in the monitoring reports. Monitoring results will be (i) submitted by JEMS to environmental and social unit on a monthly basis, and (ii) then reported by environmental and social unit to ADB in annual environmental monitoring reports (prepared with the support of the E&S officer – Table A.6).

Table A. 4(a): Environmental Monitoring Program During Construction

Item	Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementing Entity	Supervising Entity	Estimated Cost
Construction Stage						
Dust and noise	TSP, L_{Aeq}	At boundaries of all construction sites	2 times/ year during construction period	Contractor	environmental and social unit	Included in Contractor budget
Air quality	TSP	At boundaries of all construction sites	1 day (24-hr continuous sampling) per month when there is construction occurring within 200 m of the monitoring location	JEMS (contracted through environmental and social unit)	environmental and social unit	$20,000
Noise	L_{Aeq}	At boundaries of all construction sites	2 times per day (day time and night time); 1 day per month when there is construction occurring within 200 m of the monitoring location	JEMS (contracted through environmental and social unit)	environmental and social unit;	$20,000
Social	Community	3-person Community Environmental Supervision and Management Team (CESMT) to monitor the environmental conditions during construction	Ad hoc	CESMT (contracted through environmental and social unit)	environmental and social unit	$9,000
						$49,000

Item	Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementing Entity	Supervising Entity	Estimated Cost
Notes: CESMT = Community Environmental Supervision and Management Team; JEMS= Jixian Environment Monitoring Station; JEPB = Jixian Environmental Protection Bureau; environmental and social unit = Jixian Project Management Office.						

Table A.4(b)Environmental Monitoring Program During Operation

Item		Monitoring Location	Sites	Parameters	Frequency	Internal/external	Estimated Cost
Gas	Online flue gas monitoring	Stack	2	Volume flow、dust、O_2、CO、NO_2、SO_2、HCl、HF	On-line	Internal	Included in O&M budget
		Furnace	2	Temp、CO、oxygen content	On-line	Internal	Included in O&M budget
	Sampling	Stack	2	Dust、HCl、SO_2、NO_2、CO、HF、Hg、Cd, Pb	Quarterly	Internal	Included in O&M budget
				Dioxin	Once a year	External RMB 20,000 Yuan	
		Plant boundary	4	H_2S、NH_3, Odor	Once during summer	External RMB 10,000 Yuan	
Waste water	Sampling	Inlet and outlet of leachate treatment system	1	pH、$CODc_r$、BOD_5、SS、NH_3-N、Hg、Cd, Pb	Once every shift	Internal	Included in O&M budget
	Sampling	Plant wastewater outlet	1	pH、$CODc_r$、BOD_5、SS、NH_3-N、Hg、Cd, Pb	Once every shift	Internal	Included in O&M budget
Noise	Plant boundary		4	Leq(A)	Quarterly	Internal	Included in O&M budget
Ambient air	Da'an Viliage		5	SO_2、NO_2、TSP、PM_{10}、Hg, Cd, Pb、HCl、HF	Twice a year	Internal	Included in O&M budget
	Project Plant		2	Dioxin	Once a year	External	Included in O&M budget
	xijiuhu Viliage		3	H_2S、NH3、CH3SH、Odor	Twice a year	External	Included in O&M budget
Ground water	One at 10m away from solid waste storage pit One at 10m away from main building		4	pH、Hardness, total solvable solid waste,NH3-N,、permanganate index、Nitrate, Nitrite, Volatile phenol、cyanide、Fluoride、As, Hg, Cr, Pb, Cd, Zn, Total coliform, depth of well and ground water	Twice a year	External	Included in O&M budget
Soil	Side of solid waste storage house		1	pH、Cd, Hg, As, Cu, Pb, Zn, Cr, Ni	Once a year	External	Included in O&M budget
	One at 300m northwest of the plant One at 800m southeast of the plant		2	Dioxin			

Solid waste	Fly Ash Leaching Test	1	Fly Ash Leaching Test	Once a month	External	Included in O&M budget

Table A.5: Monitoring Indicators and Applicable PRC Standards[4]

Phase	Indicator	Standard
Construction	TSP	Class II Ambient Air Quality Standard (GB 3095-1996)
	Noise limits of PME at boundary of construction site	Environmental Quality Standard for Noise (GB3096-2008) Class 2 and the Class 2 limit value specified in Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-2008)
	Water quality	Standard for Pollution Control on the Landfill Site of Municipal Solid Waste (GB37 16889－2008) and Wastewater Discharge Standards for Discharge of Municipal Sewers (CJ343-2010)
Operation	Odor (NH_3, H_2S)	Emission Standards for Odor Pollutants (GB14544-93)
	Noise	Emission Standard for Industrial Enterprises Noise at Boundary (GB 12348-2008) Environmental Quality Standard for Noise (GB3096-2008)
	Slag	General Solid Waste Storage and Disposal Site Pollution Control Standards (GB18559-2001); Pollution Control Standard for Hazardous Waste Storage (GB18597-2001)
	Fly ash	Standard for Pollution Control on the Landfill Site of Municipal Solid Waste (GB 16889—2008)
	Leachate	Water Quality Standard for Industrial Uses (GB/T19923-2005) Reuse of Urban Recycling Water--Water Quality Standard for Urban Miscellaneous Water Consumption (GB/T18920-2002)

Note: DO = dissolved oxygen, PME = powered mechanical equipment, TSP = total suspended particles.

17. The Plant will purchase environmental monitoring instruments for the purpose of regular monitoring. Table A.6 listed the instruments needed.

Table A.6 Environmental Monitoring Instruments for the Project

No.	Equipments	Qty	Cost (10,000CNY)
(1)	1/10000 balance	1	2
(2)	pH meter	2	0.2
(3)	heating resistance furnace	1	0.6
(4)	heat oven thermostat	1	0.4

[4]The project applies PRC standards. A comparison of PRC standards with internationally accepted standards (as defined in the World Bank's Environment Health and Safety Guidelines) was conducted for the EIA. The comparison confirmed that PRC standards are either internationally accepted, or have comparable standard limits with most of the international standards.

No.	Equipments	Qty	Cost (10,000CNY)
(5)	current type flowmeter	2	1.0
(6)	Refrigerator	2	0.5
(7)	Computer, printer	2	2.0
(8)	Proportional sampler	2	5.0
(9)	Reagents and glassware	some	2.0
(10)	Flue gas on-line monitoring system	1	10.00
(11)	Multifunctional noise analyzer	4	0.6
(12)	COD measure instrument	1	2.0
(13)	Biochemical incubator	1	1.0
(14)	chemical analysis glassware	some	2.0
(15)	others	--	24.0
(16)	Flue gas sampler	2	1
(17)	Constant temperature and flow air sampler	4	1
(18)	Integrated sampler	4	1
(19)	absorption bottle	20	30
(20)	Acoustic calibrator	1	0.1
(21)	Atomic fluorescence photometer	1	10
Sum			96.40

18. Independent evaluation. Independent evaluation on EMP implementation will be undertaken by the E&S officer. environmental and social unit will report the E&S officer's independent evaluation to ADB on the project's adherence to the EMP, information on project implementation, environmental performance of the contractors, and environmental compliance through quarterly project progress reports and annual environmental monitoring reports (Table A.6). The E&S officer will support environmental and social unit in developing the annual environmental monitoring reports. The reports should confirm the project's compliance with the EMP and local legislation (including the PRC's EIA requirements), the results of independent evaluation (both contractor compliance with the EMP and the results of environmental monitoring by the JEMS), identify any environment related implementation issues and necessary corrective actions, and reflect these in a corrective action plan. The operation and performance of the project GRM, environmental institutional strengthening and training, and compliance with all covenants under the project will be included in the report.

19. Monitoring by ADB. Besides reviewing the annual environment monitoring reports from environmental and social unit E&S officer, ADB missions will inspect the project progress and implementation on site. For environmental and labor issues, inspections will focus mainly on (i) monitoring data; (ii) the implementation status of project performance indicators specified in the loan documents for the environment, environmental and labor compliance, implementation of the EMP, and environmental institutional strengthening and training; (iii) the environmental performance of contractors, E&S officer, and environmental and social unit; and

(iv) operation and performance of the project GRM, among others. The performance of the contractors in respect of environmental compliance will be recorded and will be considered in the next bid evaluations.

20. Environmental acceptance monitoring and reporting.Following the PRC Regulation on Project Completion Environmental Audit (MEP, 2001), within three months after the completion of each project component, an environmental acceptance monitoring and audit report for the component shall be prepared by a licensed environmental monitoring institute.The report will be reviewed and approved by JEPB, and then reported to ADB (Table A.7). The environmental acceptance reports of the component completions will indicate the timing, extent, effectiveness of completed mitigation and of maintenance, and the needs for additional mitigation measures and monitoring during operations.

Table A.7: Reporting Plan

Reports		From	To	Frequency
Construction Phase				
Internal progress reports by contractors	Internal project progress report by construction contractors, including monitoring results	Contractors	environmental and social unit, Dynagreen	Monthly
Internal environmental monitoring	Environmental monitoring report	JEMS,	JEPB, environmental and social unit Dynagreen	Monthly
	Environment progress and monitoring reports	Dynagreen	ADB	Semi-annual
Acceptance report	Environmental acceptance monitoring and audit report	Licensed institute	JEPB	Once; within 3 months of completion of physical works
Operational Phase				
Internal environmental monitoring	Environmental monitoring report (first year of operation)	JEMS	JEPB, environmental and social unit Dynagreen	Quarterly
	Environment progress and monitoring report	Dynagreen	ADB	Annual
Notes: ADB = Asian Development Bank; JEMS= Jixian Environment Monitoring Station; JEPB = Jixian Environmental Protection Bureau; environmental and social unit = Jixian Project Management Office				

Institutional Capacity Building and Training

21. The capacity of Dynagreen, environmental and social unit, and contractors' staff responsible for EMP implementation and supervision will be strengthened. All parties involved

in implementing and supervising the EMP must have an understanding of the goals, methods, and practices of project environmental management. The project will address the lack of capacities and expertise in environmental management through (i) institutional capacity building, and (ii) training.

22. Institutional strengthening. The capacities of the Dynagreen, environmental and social unit to coordinate environmental management will be strengthened through a set of measures:

(i) The appointment of a qualified environment specialist within the Dynagreen andenvironmental and social unitstaff to be in charge of EMP coordination, including GRM.

(ii) the E&S officer will guide Dynagreen, environmental and social unit in implementing the EMP and ensure compliance with ADB's Safeguard Policy Statement (SPS 2009).

23. Training. Dynagreen, environmental and social unit, contractors and O&M units will receive training in EMP implementation, supervision, and reporting, and on the Grievance Redress Mechanism (Table A.8).

Table A.8: Training Program

Training	Attendees	Contents	Times	Period (days)	No. of persons	Cost ($/person /day)	Total Cost
EMP adjustment and implementation	Dynagreen, environmental and social unit, contractors	Development and adjustment of the EMP, roles and responsibilities, monitoring, supervision and reporting procedures, review of experience (after 12 months)	Twice - Once prior to, and once after the first year of project implementation	2	15	100	$6,000
Grievance Redress Mechanism	Dynagreen, environmental and social unit contractors, JEPB	Roles and responsibilities, Procedures, review of experience (after 12 months)	Twice - Once prior to, and once after the first year of project implementation	1	10	100	$2,000
Environmental protection	Dynagreen, environmental and social unit contractors, JEPB	Pollution control on construction sites (air, noise, wastewater, solid waste)	Once (during project implementation)	2	10	100	$2,000
Environmental monitoring	Dynagreen, environmental and social unit contractors, JEPB	Monitoring methods, data collection and processing, reporting systems	Once (at beginning of project construction)	1	10	100	$1,000
						Total estimated cost:	$11,000

Notes: ADB = Asian Development Bank; JEPB = Jixian Environmental Protection Bureau; environmental and social unit = Jixian Project Management Office; O&M = operation and maintenance.

24. Capacity building. In addition to training for EMP implementation, the project will provide consulting services and training to assist and train the staff of Dynagreen, environmental and social unit, project management, environmental management, land acquisition and resettlement, procurement, as well as external resettlement and environmental monitoring.

Consultation, Participation and Information Disclosure

25. Consultation during Project Preparation. Section 13 of the EIA describes the public participation and consultation implemented during project preparation.

26. Future Public Consultation Plan. Plans for public involvement during construction and operation stages were developed during project preparation. These include public participation in (i) monitoring impacts and mitigation measures during the construction and operation stages; (ii) evaluating environmental and economic benefits and social impacts; and (iii) interviewing the public after the project is completed. These plans will include several types of public involvement, including site visits, workshops, investigation of specific issues, interviews, and public hearings. The budget for public consultation is estimated to be $8,500.

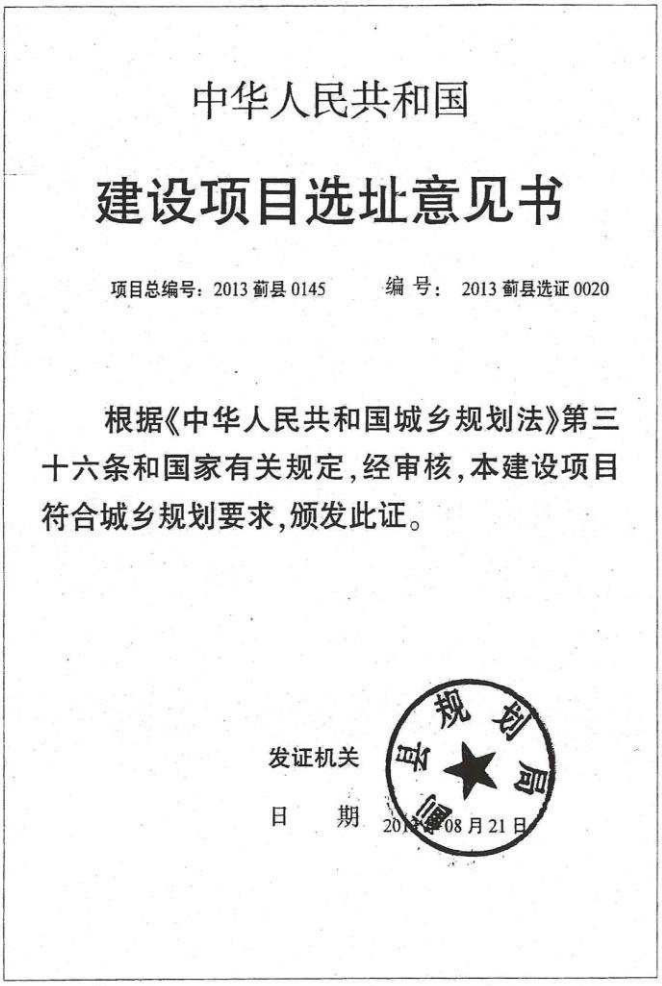
Mechanisms for Feedback and Adjustment

27. The EMP is a living document. The need to update and adjust the EMP will be reviewed when there are design changes, changes in construction methods and program, unfavorable environmental monitoring results or inappropriate monitoring locations, and ineffective or inadequate mitigation measures. Based on environmental monitoring and reporting systems in place, environmental and social unit (with the support of the E&S officer) shall assess whether further mitigation measures are required as corrective action, or improvement in environmental management practices are required. environmental and social unit will inform ADB promptly on any changes to the project and needed adjustments to the EMP. The updated EMP will be submitted to ADB for review and approval, and will be disclosed on Dynagreen project website

Attachments

1. Comments on Proposed Project Location and Notice, Ji County Planning Bureau;

附件 1



中华人民共和国

建设项目选址意见书

项目总编号：2013 蓟县 0145　　编 号：2013 蓟县选证 0020

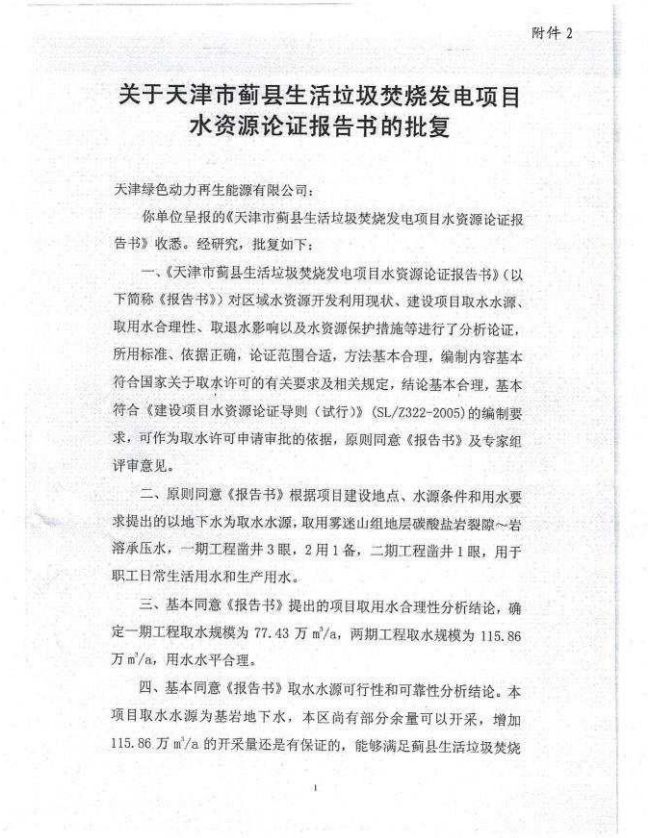
根据《中华人民共和国城乡规划法》第三十六条和国家有关规定，经审核，本建设项目符合城乡规划要求，颁发此证。

发证机关　　规划局

日　期　　2013 年 08 月 21 日

Title: Comments on Proposed Project Location and Notice, Ji County Planning Bureau;
Date: 8/21/2013
Provisions: the project site is in accordance with the requirements of the Urban and Rural planning.

2. Approval on Water Resources Argumentation of Municipal Solid Waste Incineration Power Generation Project in Ji County, Tianjin City, Water Authority of Ji County;



附件 2

关于天津市蓟县生活垃圾焚烧发电项目水资源论证报告书的批复

天津绿色动力再生能源有限公司：

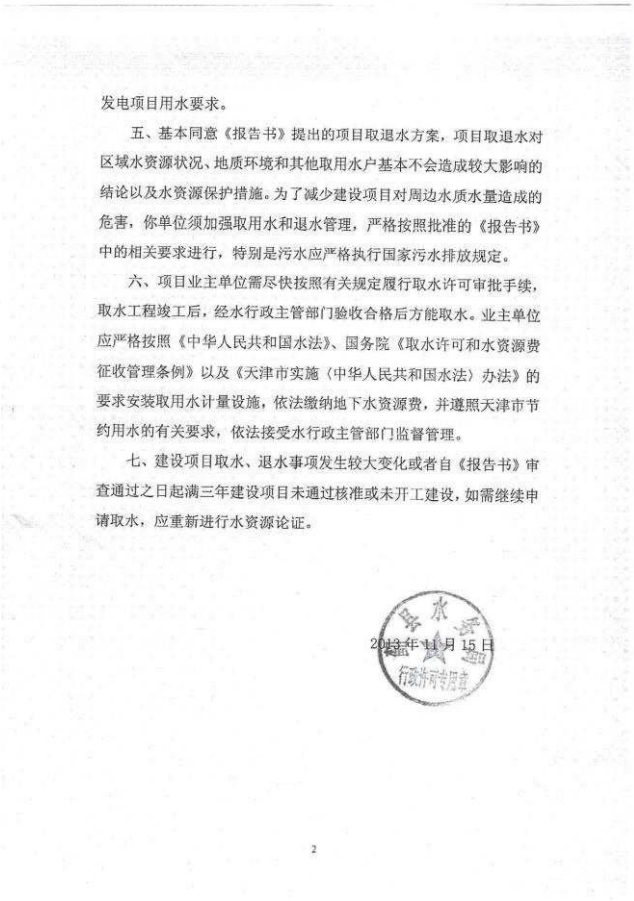
你单位呈报的《天津市蓟县生活垃圾焚烧发电项目水资源论证报告书》收悉。经研究，批复如下：

一、《天津市蓟县生活垃圾焚烧发电项目水资源论证报告书》（以下简称《报告书》）对区域水资源开发利用现状、建设项目取水水源、取用水合理性、取退水影响以及水资源保护措施等进行了分析论证，所用标准、依据正确，论证范围合适，方法基本合理，编制内容基本符合国家关于取水许可的有关要求及相关规定，结论基本合理，基本符合《建设项目水资源论证导则（试行）》（SL/Z322-2005）的编制要求，可作为取水许可申请审批的依据，原则同意《报告书》及专家组评审意见。

二、原则同意《报告书》根据项目建设地点、水源条件和用水要求提出的以地下水为取水水源，取用雾迷山组地层碳酸盐岩裂隙～岩溶承压水，一期工程凿井3眼，2用1备，二期工程凿井1眼，用于职工日常生活用水和生产用水。

三、基本同意《报告书》提出的项目取用水合理性分析结论，确定一期工程取水规模为77.43万m^3/a，两期工程取水规模为115.86万m^3/a，用水水平合理。

四、基本同意《报告书》取水水源可行性和可靠性分析结论。本项目取水水源为基岩地下水，本区尚有部分余量可以开采，增加115.86万m^3/a的开采量还是有保证的，能够满足蓟县生活垃圾焚烧



发电项目用水要求。

五、基本同意《报告书》提出的项目取退水方案，项目取退水对区域水资源状况、地质环境和其他取用水户基本不会造成较大影响的结论以及水资源保护措施。为了减少建设项目对周边水质水量造成的危害，你单位须加强取用水和退水管理，严格按照批准的《报告书》中的相关要求进行，特别是污水应严格执行国家污水排放规定。

六、项目业主单位需尽快按照有关规定履行取水许可审批手续，取水工程竣工后，经水行政主管部门验收合格后方能取水。业主单位应严格按照《中华人民共和国水法》、国务院《取水许可和水资源费征收管理条例》以及《天津市实施〈中华人民共和国水法〉办法》的要求安装取用水计量设施，依法缴纳地下水资源费，并遵照天津市节约用水的有关要求，依法接受水行政主管部门监督管理。

七、建设项目取水、退水事项发生较大变化或者自《报告书》审查通过之日起满三年建设项目未通过核准或未开工建设，如需继续申请取水，应重新进行水资源论证。

2013年11月15日

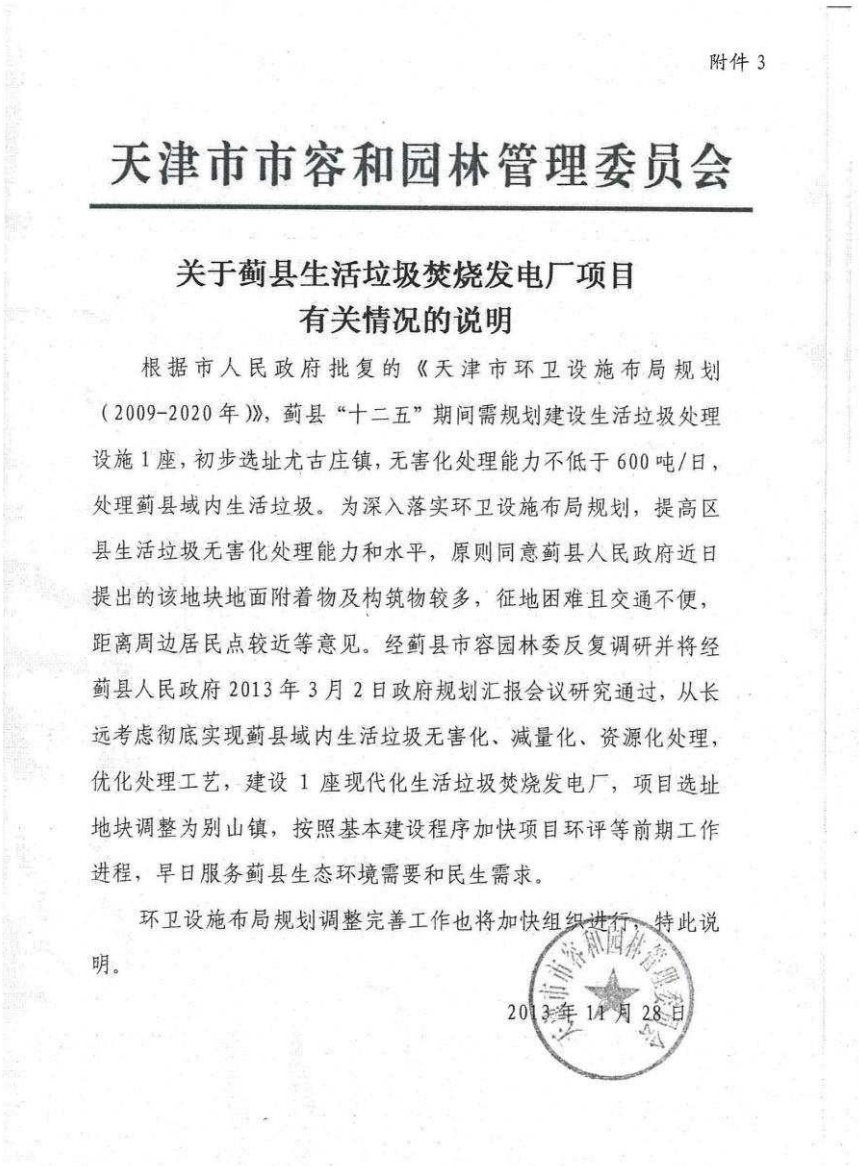
Title: Approval on Water Resources Argumentation of Municipal Solid Waste Incineration Power Generation Project in Ji County, Tianjin City, Water Authority of Ji County

Date: 11/15/2013

Provisions:

1. The water use of the proposed project complies with the “project water resource guidelines” (SL/Z322-2005);
2. In Phase 1, 3 wells will be sank and in Phase 2, one more well will sank;
3. In Phase 1, the water supply will be 774300m3/a, the total water supply of whole project will be 1158600m3/a;
4. The water source can afford the water supply;
5. The water use design in the report is approved, it meets the standards of the China Law;
6. The project runner have to committed to the local law and regulations;
7. If the project is delay for 3 years, this approval will be invalid.

3. Presentation on Municipal Solid Waste Incineration Power Generation Project of Ji County, Tianjin Management Committee of City Appearance and Garden;



附件 3

天津市市容和园林管理委员会

关于蓟县生活垃圾焚烧发电厂项目有关情况的说明

根据市人民政府批复的《天津市环卫设施布局规划（2009-2020年）》，蓟县“十二五”期间需规划建设生活垃圾处理设施1座，初步选址尤古庄镇，无害化处理能力不低于600吨/日，处理蓟县域内生活垃圾。为深入落实环卫设施布局规划，提高区县生活垃圾无害化处理能力和水平，原则同意蓟县人民政府近日提出的该地块地面附着物及构筑物较多，征地困难且交通不便，距离周边居民点较近等意见。经蓟县市容园林委反复调研并将经蓟县人民政府2013年3月2日政府规划汇报会议研究通过，从长远考虑彻底实现蓟县域内生活垃圾无害化、减量化、资源化处理，优化处理工艺，建设1座现代化生活垃圾焚烧发电厂，项目选址地块调整为别山镇，按照基本建设程序加快项目环评等前期工作进程，早日服务蓟县生态环境需要和民生需求。

环卫设施布局规划调整完善工作也将加快组织进行，特此说明。

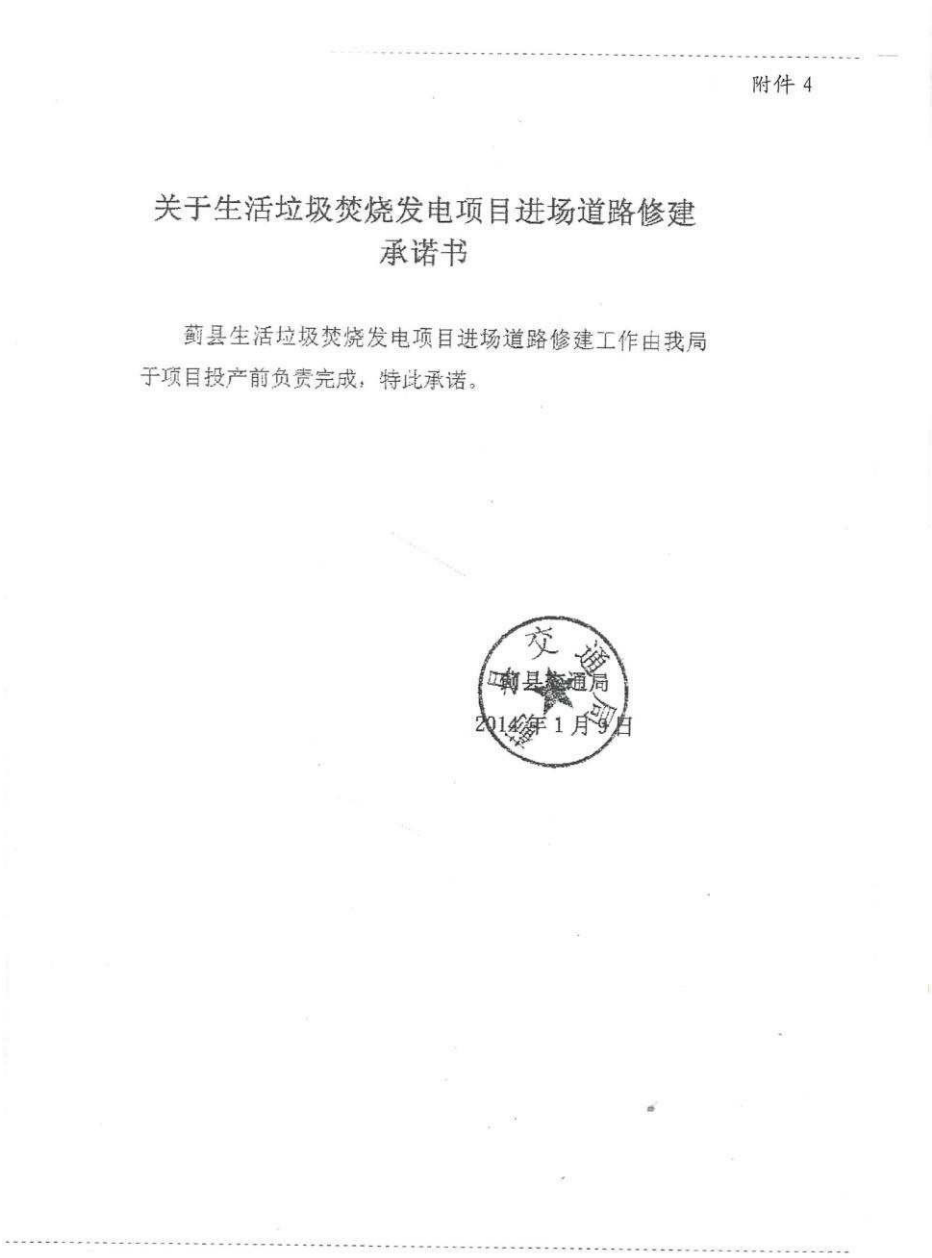
2013年11月28日

Title: Presentation on Municipal Solid Waste Incineration Power Generation Project of Ji County, Tianjin Management Committee of City Appearance and Garden;

Date:11/18/2013

Provisions: The project site change from Yougu Town to Bieshan Town, due to the inconvenient traffic and dense population.

4. Commitment Letter on Constructing Roads to Municipal Solid Waste Incineration Power Generation Project, Ji County Transportation Bureau;



附件 4

关于生活垃圾焚烧发电项目进场道路修建
承诺书

蓟县生活垃圾焚烧发电项目进场道路修建工作由我局于项目投产前负责完成，特此承诺。

交通局

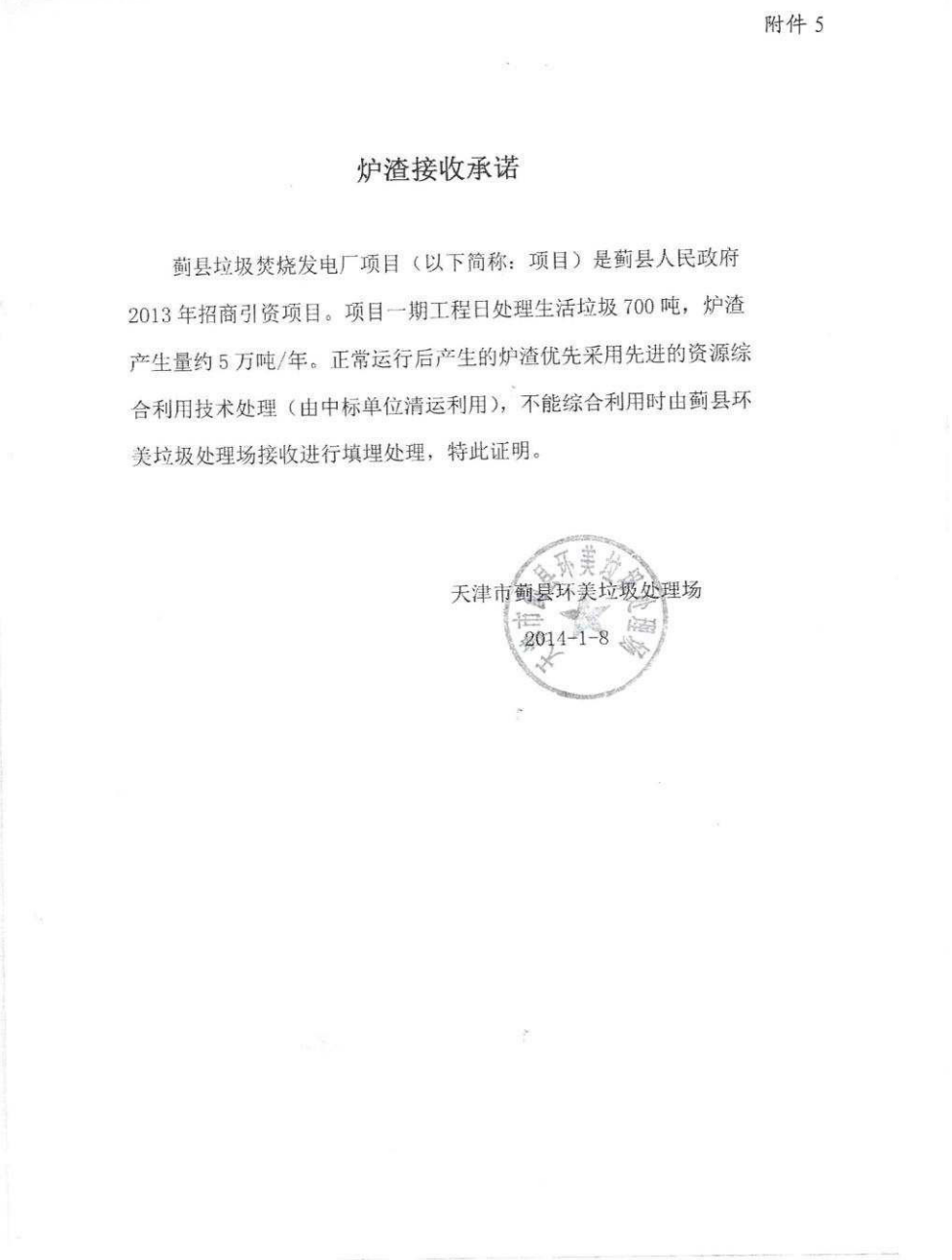
2014年1月9日

Title: Commitment Letter on Constructing Roads to Municipal Solid Waste Incineration Power Generation Project, Ji County Transportation Bureau;

Date: 1/9/2014

Provisions: the town traffic bureau will undertake the construction of the road to the project site and finish before the project's operation.

5. Slag Receiving Commitment, Huanmei Waste Treatment Plant in Ji County, Tianjin



附件 5

炉渣接收承诺

蓟县垃圾焚烧发电厂项目（以下简称：项目）是蓟县人民政府2013年招商引资项目。项目一期工程日处理生活垃圾700吨，炉渣产生量约5万吨/年。正常运行后产生的炉渣优先采用先进的资源综合利用技术处理（由中标单位清运利用），不能综合利用时由蓟县环美垃圾处理场接收进行填埋处理，特此证明。

天津市蓟县环美垃圾处理场

2014-1-8

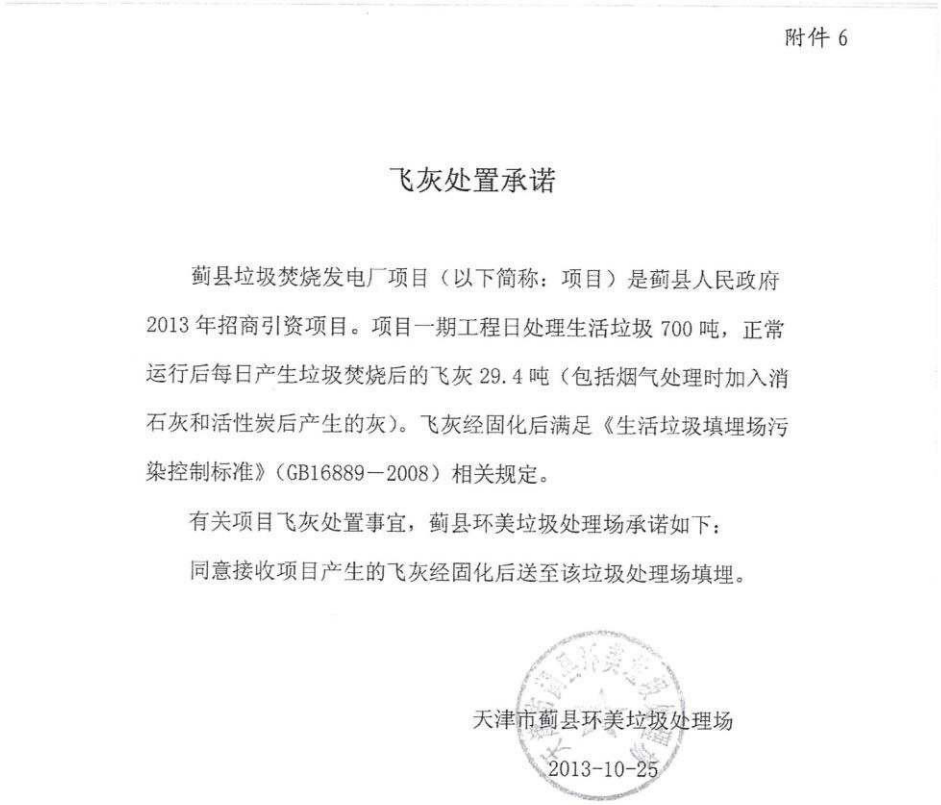
City

Title: Slag Receiving Commitment, Huanmei Waste Treatment Plant in Ji County, Tianjin City

Date: 1/8/2014

Provisions: the slag will be recycled, the subcontractor will be selected by public tender, and if the waste cannot be recycled, they will be sent to Huanmei landfill for landfilling;

6. Fly Ash Disposal Commitment, Huanmei Waste Treatment Plant in Ji County, Tianjin



附件 6

飞灰处置承诺

蓟县垃圾焚烧发电厂项目（以下简称：项目）是蓟县人民政府2013年招商引资项目。项目一期工程日处理生活垃圾700吨，正常运行后每日产生垃圾焚烧后的飞灰29.4吨（包括烟气处理时加入消石灰和活性炭后产生的灰）。飞灰经固化后满足《生活垃圾填埋场污染控制标准》（GB16889－2008）相关规定。

有关项目飞灰处置事宜，蓟县环美垃圾处理场承诺如下：

同意接收项目产生的飞灰经固化后送至该垃圾处理场填埋。

天津市蓟县环美垃圾处理场

2013-10-25

City

Title: Fly Ash Disposal Commitment, Huanmei Waste Treatment Plant in Ji County, Tianjin City

Date: 10/25/2013

Provisions: the slag will be made into bricks and it will meet the landfilling standard GB16889-2008, and they will be sent to Huanmei landfill for landfilling;

7. Sample of Effective Returned Questionnaire for Public Participation;

姓名	[illegible]	性别	男	年龄	63
学历	初中	联系方式		手机：15022556847	
家庭住址		天津市蓟县别山镇[illegible]村			

1、您对该建设项目的了解程度：	√a. 了解 b. 听说过 c. 不知道
2、您认为环境问题是否重要：	√a. 重要 b. 不重要 c. 无所谓 d. 不知道
3、您所居住的地区环境现状如何：	a. 好 √b. 一般 c. 差 d. 不知道
4、您所居住的地区有什么现状环境问题	a. 水污染 √b.大气污染 √c. 噪声污染 d. 其它 “其它”指什么：
5、该垃圾焚烧厂是否有助于缓解目前的环境问题	√a. 能缓解现状环境问题 b.不能缓解现状环境问题
6、项目施工期您最关心哪些影响：	a.扬尘 √b.噪声 c.污水 d.施工垃圾
7、该焚烧厂对环境影响如何：	a. 有利 b. 有害 √c.不知道 △
8、您认为生活垃圾焚烧厂造成的主要环境问题是什么：	√a. 恶臭及大气污染 b. 噪声 c. 水污染 d. 其它 “其它”指什么：
9、项目对地区经济发展影响如何：	a. 有利 b. 不利 √c. 无影响 d. 不知道
10、您对建设本项目的态度：	√a. 积极支持 b. 基本赞同 c. 反对 d. 不关心 “反对”的理由：
对本工程的建设有何具体意见（对日常生活、居住环境、附近地区景观、社会经济发展方面的影响等）： 希望建成一座花园式厂区，给别山地区添一景观。	

备注：请在同意的选项上画 √，有必要可选多项。如篇幅不够可写在反面。
反对请注明反对理由，否则视为无效。

Attachment 8: Category Ⅲ water standard on Environmental Quality Standards for Surface Water (GB3838-2002)

Standard limits of elementary items in Environmental Quality Standards for Surface Water

Unit: mg/L

Serial No.	Item/standard value/category	Category 1	Category 2	Category 3	Category 4	Category 5
1	Water temperature (˚C)	The man-made change in water temperature should be limited between: Average maximum temperature rise within a week≤ 1 Average maximum temperature drop within a week≤ 2				
2	pH value (dimensionless)	6-3				
3	Dissolved oxygen ≥	Saturation factor 50%(or 3.5)	6	5	3	2
4	Potassium permanganate index ≤	2	4	6	10	15
5	COD≤	15	15	20	30	40
6	BOD_3≤	3	3	4	6	10
7	Hydrocarbon （NH_4-N）≤	0.15	0.5	1.0	1.5	2.0
8	Total phosphorus (calculated by P) ≤	(Lake, reservoir 0.02)	(Lake, reservoir 0.1)	(Lake, reservoir 0.2)	(Lake, reservoir 0.3)	(Lake, reservoir 0.4)
9	Total nitrogen (Lake, reservoir, calculated by N)≤	0.2	0.5	1.0	1.5	2.0
10	Copper≤	0.02	1.0	1.0	1.0	1.0
11	Zinc ≤	0.05	1.0	1.0	2.0	2.0
12	Fluoride (calculated by F-)≤	1.0	1.0	1.0	1.5	1.5
13	Selenium ≤	0.01	0.01	0.01	0.02	0.02
14	Arsenic ≤	0.05	0.05	0.05	0.1	0.1
15	Mercury ≤	0.00005	0.005	0.0001	0.001	0.001
16	Cadmium≤	0.001	0.006	0.005	0.005	0.01
17	Chromium (sexavalence) ≤	0.01	0.06	0.05	0.5	0.1
18	Lead ≤	0.01	0.01	0.05	0.5	0.1
19	Hydride ≤	0.005	0.05	0.2	0.2	0.2
20	Volatile phenol ≤	0.002	0.002	0.005	0.01	0.1
21	Petroleum ≤	0.05	0.05	0.05	0.5	1.0
22	Cationic surface active agent ≤	0.2	0.2	0.2	0.3	0.3
23	Phosphide ≤	0.05	0.1	0.2	0.5	1.0
24	Maximum intestinal microflora (per liter) ≤	200	2000	10000	20000	40000

Attachment 9: Category III standard on Environmental Quality Standards for Underground Water (GB/T14848-93)

Table 1. Environmental Quality Standards for Underground Water						
Serial No.	Item/standard value/category	Category 1	Category 2	Category 3	Category 4	Category 5
1	Chromaticity	≤5	≤5	≤15	≤25	≤25
2	Odor	No	No	No	No	No
3	Turbidity	≤3	≤3	≤3	≤10	≤10

Table 1

Table 1 (continued)						
Serial No.	Item/standard value/category	Category 1	Category 2	Category 3	Category 4	Category 5
4	Visible substance	No	No	No	No	Yes
5	pH	6.5-8.5			5.5~6.5 8.5~9	5.5＞9
6	Total hardness (calculated by $CaCO_2$) (mg/L)	≤150	≤300	≤450	≤550	＞550
7	Total soluble solid (mg/L)	≤300	≤500	≤1000	≤2000	＞2020
8	Sulfate (mg/L)	≤50	≤150	≤250	≤350	＞350
9	Oxide (mg/L)	≤50	≤150	≤250	≤350	＞550
10	Iron (Fe)(mg/L)	≤0.1	≤0.2	≤0.3	≤3.5	＞1.5
11	Manganese (Mn)(mg/L)	≤0.01	≤0.01	≤0.1	≤0.5	＞1.0
12	Copper (Cu)(mg/L)	≤0.01	≤0.06	≤1.0	≤1.5	＞1.5
13	Zinc (Zn)(mg/L)	≤0.05	≤0.5	≤1.0	≤5.0	＞5.0
14	Mo (mg/L)	≤0.001	≤0.01	≤0.1	≤0.5	＞0.5
15	Cobalt (Co)(mg/L)	≤0.06	≤0.05	≤0.05	≤1.0	＞1.0
16	Volatile phenol(mg/L)	≤0.001	≤0.001	≤0.002	≤0.01	＞0.01
17	Cation synthetic detergent (mg/L)	Not detected	≤0.1	≤0.3	≤0.3	＞0.3
18	Manganese carbonate index (mg/L)	≤1.0	≤2.0	≤3.0	≤10	＞10
19	Lithium nitrate (calculated by N) (mg/L)	≤2.0	≤3.0	≤20	≤20	＞30
20	Dinitrite (calculated by N) (mg/L)	≤0.001	≤0.01	≤0.02	≤0.1	＞0.5
21	NH_4(mg/L)	≤0.02	≤0.02	≤0.3	≤0.5	＞2.0
22	Nitride (mg/L)	≤1.0	≤1.0	≤1.0	≤2.0	＞1.0
23	Monoiodide (mg/L)	≤0.1	≤0.1	≤0.2	≤3.0	＞1.0
24	Cyanide (mg/L)	≤0.001	≤0.01	≤0.05	≤0.1	＞0.001
25	Mercury (Hg) (mg/L)	≤0.00005	≤0.0001	≤0.001	≤0.001	＞0.05
26	Arsenic (As) (mg/L)	≤0.005	≤0.01	≤0.05	≤0.05	＞0.1
27	Selenium (Se) (mg/L)	≤0.01	≤0.01	≤0.01	≤0.1	＞0.01
28	Cd (mg/L)	≤0.0001	≤0.001	≤0.01	≤0.1	＞0.1
29	Chromium (sexavalence) (mg/L)	≤0.005	≤0.01	≤0.05	≤0.1	＞0.01
30	Plumbum (Pb) (mg/L)	≤0.025	≤0.01	≤0.05	≤0.1	＞0.1
31	Beryllium (Be)(mg/L)	≤0.00002	≤0.0001	≤0.0002	≤0.01	＞0.001

Serial No.	Item/standard value/category	Category 1	Category 2	Category 3	Category 4	Category 5
32	Ba (mg/L)	≤0.1	≤0.1	≤1.0	≤4.0	＞4.0
33	Ni (mg/L)	≤0.005	≤0.05	≤0.05	≤0.1	＞0.1
34	DDT (μg/L)	Should not be detected	≤0.005	≤1.0	≤1.0	＞1.0
35	BHC (μg/L)	≤0.005	≤0.05	≤5.0	≤5.0	＞5.0
36	Total coli group (/L)	≤3.0	≤3.0	≤3.0	≤100	＞100
37	Total number of bacteria (/L)	≤100	≤100	≤100	≤1000	＞1000
38	Total αradioactivity (Bq/L)	≤0.1	≤0.1	≤0.1	≤0.1	＞0.1

39	Total β radioactivity(Bq/L)	≤0.1	≤1.0	≤1.0	≤1.0	＞1.0

Attachment 10: Category II standard on Environmental Quality Standards for Soil (GB15618-1995).

Table 1 Environmental quality standard value for soil

mg/kg

Item/pH value of soil/class	Class 1	Class 2			Class 3
	Natural background	6.5	6.5-7.5	＞7.5	＞6.5
Copper ≤	0.20	0.30	0.30	0.60	1.0
Mercury ≤	0.15	0.30	0.50	1.0	1.5
Arsenic paddy field ≤	15	30	25	20	30
Dry land ≤	15	40	30	25	40
Copper farm land ≤	35	50	100	100	400
Fruit ranch ≤	-	150	200	200	400
Plumbum ≤	35	250	300	350	500
Chromium paddy field ≤	90	250	300	350	400
Dry land ≤	90	150	200	250	300
Zinc ≤	100	200	250	300	500
Nickel ≤	40	40	50	60	200
BHC≤	0.05				
DDT≤	0.05				

Attachment 11: Standard for Pollution Control on the Municipal Solid Waste Incineration (GB 18485-2001) (exposure draft).

Refer to Table 1 for the technical specifications of incinerator

Table 1 Technical specification of incinerator

Item	Flue gas outlet temperature	Flue gas residence time	Incinerator slag heat reduction rate	Oxygen content of flue gas at incinerator outlet
Indicator	≥850	≥2	≤5	6~12
	≥1000	≥1		

Technical requirements for the chimney of incinerator

Height requirements of the incinerator chimney

Height of the incinerator chimney is determined by requirements on environmental impact assessment, but not below the height specified in Table 2.

Table 2 Height requirements of the chimney of incinerator

Handling capacity t/d	Minimum allowable height of chimney m
<100	25
100~300	40
>300	60

Note: The evaluation should be made on the basis of the total handing capacity of incinerators in case there are many waste incinerators in the same factory area.

In case there is any building within a 200m radius around the incinerator chimney, the chimney should be 3m higher than such building.

Table 3 Emission limits of air pollutants from incinerator

Serial No.	Item	Unit	Meaning of the value	Limit value
1	Smoke	mg/m^3	Average of measured value	81
2	Smoke density	Ringelman scale	Measured value	1
3	Carbon monoxide	mg/m^3	Hourly average value	150
4	Nitric oxide	mg/m^3	Hourly average value	400
5	Carbon dioxide	mg/m^3	Hourly average value	250
6	Hydrogen chloride	mg/m^3	Hourly average value	75
7	Mercury	mg/m^3	Average of measured value	0.2
8	Cadmium	mg/m^3	Average of measured value	0.1
9	Plumbum	mg/m^3	Average of measured value	1.6
10	Dioxin	Ng TEQ/m^3	Average of measured value	1.0

Attachment 12: Integrated Emission Standard of Air Pollutants (GB 16297-1996), class 2

Table 1 Emission limits of air pollutants for existing pollution sources								
Serial No.	Pollutant	Maximum allowable emission concentration Mg/m3	Maximum allowable emission rate, kg/l				Monitored concentration threshold of fugitive emission	
			Height of exhaust funnel	Class 1	Class 2	Class 3	Monitoring spot	Concentration Mg/m3
1	Sulfur dioxide	1200 (generation of sulfur, sulfur dioxide, sulfuric acid and other sulfur compound)	15	1.6	3.0	4.1	Set a reference point in the upwind direction of fugitive emission source; set monitoring point in the downwind direction)	0.15 (the concentration difference between the reference point and monitoring point)
			20	2.6	5.1	7.7		
		700 (application of sulfur, sulfur dioxide, sulfuric acid and other sulfur compound)	30	8.8	17	26		
			40	15	30	45		
			50	23	45	69		
			60	33	64	98		
			70	47	91	140		
			80	63	120	190		
			90	82	160	240		
			100	100	200	310		
2		1700 (generation of nitric acid, nitrogenous fertilizer and explosives)	15	0.47	0.91	1.4	Set a reference point in the upwind direction of fugitive emission source; set monitoring point in the downwind direction)	0.50 (the concentration difference between the reference point and monitoring point)
			20	0.77	1.5	2.3		
		420 (nitric acid application and so on)	30	2.6	5.1	7.7		
			40	4.6	8.9	14		
			50	7.0	14	21		
			60	9.9	19	29		
			70	14	27	41		
			80	19	37	56		
			90	24	47	72		
			100	31	61	92		

Serial No.	Pollutant	Maximum allowable emission concentration Mg/m3	Maximum allowable emission rate, kg/l				Monitored concentration threshold of fugitive emission	
			Height of exhaust funnel	Class 1	Class 2	Class 3	Monitoring spot	Concentration Mg/m3
3	Particulate matter	22 (carbon black dust, dye dust)	15	Emission forbidden	0.60	0.87	The point of highest concentration outside the boundary.	Invisible
			20		1.0	1.5		
			30		4.0	5.9		
			40		6.8	10		
		80 (glass fiber dust, quartz dust, mineral cotton dust)	15	Emission forbidden	2.2	3.1	Set a reference point in the upwind direction of fugitive emission source; set monitoring point in	2.0 (the concentration difference between the reference point and monitoring
			20		3.7	5.3		
			30		14	21		
			40		25	37		

							the downwind direction)	point)
		150 (other)	15 20 30 40 50 60		4.1 6.9 27 46 70 100	5.9 10 40 69 110 150	Set a reference point at the upwind direction of fugitive emission source; set monitoring point at the downwind direction)	5.0 (the concentration difference between the reference point and monitoring point)
4	Hydrogen chloride	150	15 20 30 40 50 60 70 80	Emission forbidden	0.30 0.5 1.7 3.0 4.5 6.4 9.1 12	0.46 0.77 2.6 4.5 6.9 9.8 14 19	The point of highest concentration outside the boundary.	0.25
5	Mist of chromic acid	0.080	15 20 30 40 50 60	Emission forbidden	0.009 0.015 0.051 0.089 0.014 0.19	0.014 0.023 0.078 0.13 0.21 0.29	The point of highest concentration outside the boundary.	0.0075
6	Sulfuric acid mist	1000 (explosive manufacturer) 70 (other)	15 20 30 40 50 60 70 80	Emission forbidden	1.8 3.1 10 18 27 39 55 7	2.8 4.5 16 27 41 59 83 110	The point of highest concentration outside the boundary.	1.5

Serial No.	Pollutant	Maximum allowable emission concentration Mg/m3	Maximum allowable emission rate, kg/l				Monitored concentration threshold of fugitive emission	
			Height of exhaust funnel	Class 1	Class 2	Class 3	Monitoring spot	Concentration Mg/m3
7	Fluoride	100 (ordinary superphosphate industry) 11 (other)	15 20 30 40 50 60 70 80	Emission forbidden	0.12 0.20 0.69 1.2 1.8 2.6 3.6 4.9	0.18 0.31 1.0 1.8 2.7 3.9 5.5 7.5	Set a reference point in the upwind direction of fugitive emission source; set monitoring point in the downwind direction)	20 μg/m3 (the concentration difference between the reference point and monitoring point)
8	Chlorine	85	25 30 40 50 60 70	Emission forbidden	0.60 1.0 3.4 5.9 9.1 13	0.90 1.5 5.2 9.0 14 20	The point of highest concentration outside the boundary.	0.50

			80		18	28		
9	Plumbum and its compound	0.90	15 20 30 40 50 60 70 80 90 100	Emission forbidden	0.005 0.007 0.031 0.055 0.085 0.12 0.17 0.23 0.31 0.35	0.007 0.011 0.048 0.083 0.13 0.18 0.26 0.35 0.47 0.60	The point of highest concentration outside the boundary.	0.0075
10	Mercury and its compounds	0.015		Emission forbidden	1.8×10^{-3} 3.1×10^{-3} 10×10^{-3} 18×10^{-3} 28×10^{-3} 39×10^{-3}	2.8×10^{-3} 4.6×10^{-3} 16×10^{-3} 27×10^{-3} 41×10^{-3} 59×10^{-3}	The point of highest concentration outside the boundary.	0.0015
11	Cadmium and its compounds	1.0		Emission forbidden	0.060 0.10 0.34 0.59 0.91 1.3 1.8 2.5	0.090 0.15 0.52 0.90 1.4 2.0 2.8 3.7	The point of highest concentration outside the boundary.	0.050

Serial No.	Pollutant	Maximum allowable emission concentration Mg/m3	Maximum allowable emission rate, kg/l				Monitored concentration threshold of fugitive emission	
			Height of exhaust funnel	Class 1	Class 2	Class 3	Monitoring spot	Concentration Mg/m3
12	Beryllium and its compounds	0.015	15 20 30 40 50 60 70 80	Emission forbidden	1.3×10^{-3} 2.2×10^{-3} 7.3×10^{-3} 13×10^{-3} 19×10^{-3} 27×10^{-3} 39×10^{-3} 52×10^{-3}	2.0×10^{-3} 3.3×10^{-3} 11×10^{-3} 19×10^{-3} 29×10^{-3} 41×10^{-3} 58×10^{-3} 79×10^{-3}	The point of highest concentration outside the boundary.	0.011
13	Nickel and its compounds	5.0	15 20 30 40 50 60 70 80	Emission forbidden	0.18 0.31 1.0 1.8 2.7 3.9 5.5 7.4	0.28 0.46 1.6 2.7 4.1 5.9 8.2 11	The point of highest concentration outside the boundary.	0.050
14	Tin and its compounds	10		Emission forbidden	0.35 0.61 2.1 3.5 5.4 7.7 11	0.55 0.93 3.1 5.4 8.2 12 17	The point of highest concentration outside the boundary.	0.30

					15	22		
15	Benzene	17		Emission forbidden	0.60 1.0 33 6.0	0.90 1.5 5.2 9.0	The point of highest concentration outside the boundary.	0.50
16	Methyl benzene	60		Emission forbidden	3.6 6.1 21 36	5.5 9.3 31 54	The point of highest concentration outside the boundary.	3.0
17	Xylene	90		Emission forbidden	1.2 2.0 6.9 12	1.8 3.1 10 18	The point of highest concentration outside the boundary.	1.5

Serial No.	Pollutant	Maximum allowable emission concentration Mg/m3	Maximum allowable emission rate, kg/l				Monitored concentration threshold of fugitive emission	
			Height of exhaust funnel	Class 1	Class 2	Class 3	Monitoring spot	Concentration Mg/m3
18	Phenols	115	15 20 30 40 50 60	Emission forbidden	0.12 0.20 0.68 1.2 1.8 2.6	0.18 0.31 1.0 1.8 2.7 3.9	The point of highest concentration outside the boundary.	0.10
19	Formaldehyde	30	15 20 30 40 50 60	Emission forbidden	0.30 0.51 1.7 3.0 4.5 6.4	0.46 0.77 2.6 4.5 .9 9.8	The point of highest concentration outside the boundary.	0.25
20	Acetaldehyde	150	15 20 30 40 50 60	Emission forbidden	0.060 0.10 0.34 0.59 0.91 1.3	0.090 0.15 0.52 0.90 1.4 2.0	The point of highest concentration outside the boundary.	0.050
21	Acrylonitrile	26	15 20 30 40 50 60	Emission forbidden	0.91 1.5 5.1 8.9 14 19	1.4 2.3 7.8 13 21 29	The point of highest concentration outside the boundary.	0.75
22	Acrolein	20	15 20 30 40 50 60	Emission forbidden	0.61 1.0 3.4 5.98 9.1 13	0.92 1.5 5.2 9.0 14 20	The point of highest concentration outside the boundary.	0.50
23	Hydrogen cyanide	2.3	25	Emission	0.18	0.28	The point of	0.030

			30 40 50 60 70 80	forbidden	0.31 1.0 1.8 2.7 3.9 5.5	0.46 1.6 2.7 4.1 5.9 8.3	highest concentration outside the boundary.	

Serial No.	Pollutant	Maximum allowable emission concentration Mg/m3	Maximum allowable emission rate, kg/l				Monitored concentration threshold of fugitive emission	
			Height of exhaust funnel	Class 1	Class 2	Class 3	Monitoring spot	Concentration Mg/m3
24	Methyl alcohol	220	15 20 30 40 50 60	Emission forbidden	6.1 10 34 59 91 130	9.2 15 52 90 140 200	The point of highest concentration outside the boundary.	15
25	Anilines	25	0.61 1.0 3.4 5.9 9.1 13	Emission forbidden	0.61 1.0 3.4 5.9 9.1 13	0.92 1.5 5.2 9.0 14 20	The point of highest concentration outside the boundary.	0.50
26	Chlorobenzenes	85	0.67 1.0 2.9 5.0 7.7 11 15 21 27 34	Emission forbidden	0.67 1.0 2.9 5.0 7.7 11 15 21 27 34	0.92 1.5 4.4 7.6 12 17 23 32 41 52	The point of highest concentration outside the boundary.	0.50
27	Nitrobenzene	20	0.060 0.10 0.34 0.59 0.91 1.3	Emission forbidden	0.060 0.10 0.34 0.59 0.91 1.3	0.090 0.15 0.52 0.90 1.4 2.0	The point of highest concentration outside the boundary.	0.050
28	Vinyl chloride	65	0.91 1.5 5.0 8.9 14	Emission forbidden	0.91 1.5 5.0 8.9 14	1.4 2.3 7.8 13 21	The point of highest concentration outside the boundary.	0.75

			19		19	29		

Serial No.	Pollutant	Maximum allowable emission concentration Mg/m3	Maximum allowable emission rate, kg/l				Monitored concentration threshold of fugitive emission	
			Height of exhaust funnel	Class 1	Class 2	Class 3	Monitoring spot	Concentration Mg/m3
29	Benzo(a)pyrene	0.50×10^{-3} (production and processing of asphalt and carbon products)	15 20 30 40 50 60	Emission forbidden	0.06×10^{-3} 0.10×10^{-3} 0.34×10^{-3} 0.59×10^{-3} 0.90×10^{-3} 1.3×10^{-3}	0.09×10^{-3} 0.15×10^{-3} 0.51×10^{-3} 0.89×10^{-3} 1.4×10^{-3} 2.0×10^{-3}	The point of highest concentration outside the boundary.	
30	Phosgene	5.0	25 30 40 50	Emission forbidden	0.12 0.20 0.69 1.2	0.18 0.31 1.0 1.8	The point of highest concentration outside the boundary.	
31	Asphalt fume	280 (blown asphalt) 80 (smelting, dip-coating) 150 (mixing)	15 20 30 40 50 60 70 80	0.11 0.19 0.82 1.4 2.2 3.0 4.5 6.2	0.22 0.36 1.6 2.8 4.3 5.9 8.7 12	0.34 0.55 2.4 4.2 6.6 9.0 13 18	No obvious fugitive emission is allowed in the manufacturing equipment.	
32	Asbestos dust	2 fibers/cm^3 Or $20mg/m^3$	15 20 30 40 50	Emission forbidden	0.65 1.1 4.2 7.2 11	0.98 1.7 6.4 11 17	No obvious fugitive emission is allowed in the manufacturing equipment.	
33	Non-methane hydrocarbon	150 (use solvent gasoline or other mixed hydrocarbons)	15 20 30 40	Emission forbidden	12 20 63 120	18 30 100 170	The point of highest concentration outside the boundary.	5.0

1) In general, the reference point should be set at the distance of 2-50m in the upwind direction of fugitive emission source, while the monitoring point to be set at the distance of 2-50m in the downwind direction of fugitive emission source. See the attachment C for details. The same below.
2) The point of highest concentration outside the boundary should be set within the range of 10m from the boundary of emission source. In case the point of highest concentration of fugitive emission source is predicted to go beyond the 10m range, transfer the monitoring point to the predicted point of highest concentration, see attachment C for details. The same below.
3) It refers to all kinds of dust containing more than 10% of free silicon dioxide.
4) The exhaust funnel used to emit hydrogen should not be lower than 25m.
5) The exhaust funnel used to emit hydrogen chloride should not be lower than 25m.
6) The exhaust funnel used to emit phosgene should not be lower than 25m.

Attachment 13: Emission Standards for Odorous Pollutants (GB14544-93)

Table 1 Standard limit of Boundary Odorous Pollutants

Serial No.	Controlled item	Unit	Class 1	Class 2		Class 3	
				Newly built and reconstruction	Existing	Newly built and reconstruction	Existing
1	Ammonia	Mg/m^3	1.0	1.5	2.0	4.0	5.0
2	Timethylamine	Mg/m^3	0.05	0.08	0.15	0.45	0.80
3	Hydrogen sulfide	Mg/m^3	0.03	0.06	0.10	0.32	0.60
4	Methyl mercaptan	Mg/m^3	0.004	0.007	0.010	0.020	0.35
5	Dimethyl sulfide	Mg/m^3	0.03	0.07	0.15	0.55	1.10
6	Dimethyl disulfide	Mg/m^3	0.03	0.06	0.13	0.42	0.71
7	Carbon disulfide	Mg/m^3	2.0	3.0	5.0	8.0	10
8	Styrene	Mg/m3	3.0	5.0	7.0	14	19
9	Odor concentration	Dimensionless	10	20	30	60	70

Attachment 14: Standard for Pollution Control on the Landfill Site of Municipal Solid Waste (GB 16889-2008)

Table 2: Limits for emission concentration of water pollutants in the existing and newly built landfill sites of municipal solid waste

Serial No.	Controlled pollutants	Limits for emission concentration	Monitoring location of pollutant emission
1	Chromaticity (dilution ratio)	40	Discharge outlet of conventional waste water treatment equipment
2	Chemical oxygen demand ($C0_2$)/(mg/L)	100	Discharge outlet of conventional waste water treatment equipment
3	Biochemical oxygen demand (BOD_3)/(mg/L)	30	Discharge outlet of conventional waste water treatment equipment
4	Suspended solid (mg/L)	30	Discharge outlet of conventional waste water treatment equipment
5	Total nitrogen (mg/L)	40	Discharge outlet of conventional waste water treatment equipment
6	Ammonia nitrogen (mg/L)	25	Discharge outlet of conventional waste water treatment equipment
7	Total phosphorus (mg/L)	3	Discharge outlet of conventional waste water treatment equipment
8	Number of fecal coliforms (/L)	10000	Discharge outlet of conventional waste water treatment equipment
9	Total mercury (mg/L)	0.001	Discharge outlet of conventional waste water treatment equipment
10	Total cadmium(mg/L)	0.01	Discharge outlet of conventional waste water treatment equipment
11	Total chromium (mg/L)	0.1	Discharge outlet of conventional waste water treatment equipment
12	Hexavalent chromium (mg/L)	0.05	Discharge outlet of conventional waste water treatment equipment
13	Total arsenic (mg/L)	0.1	Discharge outlet of conventional waste water treatment equipment
14	Total lead (mg/L)	0.1	Discharge outlet of conventional waste water treatment equipment

Attachment 15: Standard for Pollution Control on the Landfill Site of Municipal Solid Waste (GB 16889-2008) (leachate)

Table 3: Special emission limits for water pollutants in the existing and newly built landfill sites of municipal solid waste

Serial No.	Controlled pollutant	Limits for emission concentration	Monitoring location of pollutant emission
1	Chromaticity (dilution ratio)	30	Discharge outlet of conventional waste water treatment equipment
2	Chemical oxygen demand ($C0_2$)/(mg/L)	60	Discharge outlet of conventional waste water treatment equipment
3	Biochemical oxygen demand (BOD_3)/(mg/L)	20	Discharge outlet of conventional waste water treatment equipment
4	Suspended solid (mg/L)	30	Discharge outlet of conventional waste water treatment equipment
5	Total nitrogen (mg/L)	20	Discharge outlet of conventional waste water treatment equipment
6	Ammonia nitrogen (mg/L)	8	Discharge outlet of conventional waste water treatment equipment
7	Total phosphorus (mg/L)	1.5	Discharge outlet of conventional waste water treatment equipment
8	Number of fecal coliforms (/L)	10000	Discharge outlet of conventional waste water treatment equipment
9	Total mercury (mg/L)	0.001	Discharge outlet of conventional waste water treatment equipment
10	Total cadmium(mg/L)	0.01	Discharge outlet of conventional waste water treatment equipment
11	Total chromium (mg/L)	0.1	Discharge outlet of conventional waste water treatment equipment
12	Hexavalent chromium (mg/L)	0.05	Discharge outlet of conventional waste water treatment equipment
13	Total arsenic (mg/L)	0.1	Discharge outlet of conventional waste water treatment equipment
14	Total lead (mg/L)	0.1	Discharge outlet of conventional waste water treatment equipment

Attachment 16: Integrated Waste Water Discharge Standard (GB 8978-1996), class 1

Table 2 Maximum allowable emission concentration for Category 2 pollutants
(Units built before December 31, 1997)

Serial No.	Pollutants	Application scope	Class 1 standard	Class 2 standard	Class 3 standard
1	pH	All pollutant discharging units	6~9	6`9	6-9
2	Chromaticity (dilution ratio)	Dyeing industry	50	180	-
		Other pollutant discharging units	50	80	-
3	Suspended solids (SS)	Mining, mineral separation and coal preparation industry			
		Separation of lode gold ores			
		Separation of placer gold ores in remote areas			
		Secondary effluent treatment plant in cities and towns			
		Other pollutant discharging units			
4	Five-day biochemical oxygen demand (BOD_2)	Cane sugar production, ramie degumming, wet-process fiber board			
		Beet sugar production, alcohol, monosodium glutamate, leather, synthetic fiber pulp			
		Secondary sewage treatment plant in cities and towns			
		Other pollutant discharging units			
5	Chemical oxygen demand (COD)	Beet sugar production, coking, synthetic fatty acid, wet-process fiber board, dyestuff, scouring, organic phosphorus pesticide industry			
		Monosodium glutamate, alcohol, medicine material, bio-pharmaceuticals, ramie degumming, leather, synthetic fiber pulp			
		Petroleum chemical industry (including petroleum refining)			
		Secondary sewage treatment plant in cities and towns			
		Other pollutant discharging units			
6	Petroleum	All pollutant discharging units			
7	Animal and vegetable oil	All pollutant discharging units			
8	Volatile phenol	All pollutant discharging units			
9	Total cyanide compounds	Film developing (ferricyanide)			
		Other pollutant discharging units			

Attachment 17: Category Ⅱ standard on Emission Standard for Industrial Enterprises Noise at Factory Boundary (GB 12348—2008)

Table 1 Emission limits for industrial enterprises noise at factory boundary

Unit: dB (A)

Category of functional zone of acoustic environment outside the boundary	Time	
	Day time	Night time
0	50	40

Category of functional zone of acoustic environment outside the boundary	Time	
	Day time	Night time
1	55	45
2	60	50
3	65	55
4	70	55

Attachment 18: Noise Limits for Construction Site (GB12532-2011)

Day time	Night time
70	55

Day time	Night time
70	55

Attachment 19: Water standard requirement for road sweeping and municipal gardening specified in The Reuse of Urban Recycling Water-Water Quality Standard for Urban Miscellaneous Water Consumption (GB/T18920-2002)

Table 1 Water Quality Standard for Urban Miscellaneous Water Consumption

Serial No.	Item	Toilet flushing	Road sweeping, fire fighting	Municipal gardening	Vehicle cleaning	Building construction
1	pH	6.0~9.0				
2	Chromaticity	30				
3	Smell	No foul smell				
4	Turbidity (NTU)	5	10	10	5	20
5	Total dissolved solids (mg/L)	1500	1500	1000	1000	-
6	Five-day biochemical oxygen demand (BOD_2) (mg/L)	10	15	20	10	15
7	Ammonia nitrogen (mg/L)	10	10	20	10	20
8	Anionic surfactant (mg/L)	1.0	1.0	1.0	0.5	1.0
9	Iron (mg/L)	0.3	-	-	0.3	-
10	Manganese (mg/L)	0.1	-	-	0.1	-
11	Dissolved oxygen	1.0				
12	Total residential chlorine (mg/L)	After touching 30 min, ≥1.0; at the end of pipe network, ≥0.2				
13	Total coliform group (/L)	3				

Attachment 20 Water quality standard for supplementary water in open circulating cooling water system specified in The Reuse of Urban Recycling Water-Water Quality Standard for Industrial Uses (GB/T19923-2005).

Table 1 Reuse of Urban Recycling Water-Water Quality Standard for Industrial Uses

Serial No.	Controlled item	Cooling water		Washing water	Boiler feed water	Water for processes and products
		Once-through cooling water	supplementary water in open circulating cooling water system			
1	pH value	6.5-9.	6.5-8.5	6.5-9.0	6.5-8.5	6.5-8.5
2	Suspended solids (SS) (mg/L) ≤	30	-	30	-	-
3	Turbidity (NTU)≤	-	5	-	5	5
4	Chromaticity ≤	30	30	30	30	30
5	Biochemical oxygen demand (BOD_5) (mg/L)≤	30	10	30	10	10
6	Chemical oxygen demand (COD_{Cr}) (mg/L)≤	-	60	-	60	60
7	Iron (mg/L)≤	-	0.3	0.3	0.3	0.3
8	Manganese (mg/L) ≤	-	0.1	0.1	0.1	0.1
9	Chloridion (mg/L) ≤	250	250	250	250	250
10	Silicon dioxide ($SiCO_2$)≤	50	50	-	30	30
11	Total hardness (calculated by $CaCO_3$, mg/L) ≤	450	450	450	450	450
12	Total alkalinity (calculated by $CaCO_3$, mg/L) ≤	350	350	350	350	350
13	Sulfate (mg/L)≤	600	250	250	250	250
14	Ammonia nitrogen (calculated by N, mg/L)≤	-	10	-	10	10
15	Total phosphorus (calculated by P, mg/L)≤	-	1	-	1	1
16	Total dissolved solids (mg/L)≤	1000	1000	1000	1000	1000
17	Petroleum (mg/L) ≤	-	1	-	1	1
18	Anionic surfactant (mg/L)≤	-	0.5	-	0.5	0.5
19	Residual nitrogen ≥	0.05	0.05	0.05	0.05	0.05
20	Total coliform group (/L) ≤	2000	2000	2000	2000	2000

Note: 1. In case the heat exchanger of open circulating cooling system is made of copper, the content of ammonia nitrogen in the circulating cooling system should be less than 1mg/L.

2 The tube end value in the process of chlorine disinfection.

Attachment 21 IFC EHS Guidelines for Waste Management Facilitiesabout dioxin emission standard"

2.2 Occupational Health and Safety Performance

Occupational Health and Safety Guidelines

Occupational health and safety performance should be evaluated against internationally published exposure guidelines, of which examples include the Threshold Limit Value (TLV®) occupational exposure guidelines and Biological Exposure Indices (BEIs®) published by American Conference of Governmental Industrial Hygienists (ACGIH), the United States National Institute for Occupational Health and Safety (NIOSH), Permissible Exposure Limits (PELs) published by the Occupational Safety and Health Administration of the United States (OSHA), Indicative Occupational Exposure Limit Values published by European Union member states, or other similar sources.

Accident and Fatality Rates

Projects should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities. Facility rates may be benchmarked against the performance of facilities in this sector in developed countries through consultation with published sources (e.g. US Bureau of Labor Statistics and UK Health and Safety Executive).

Occupational Health and Safety Monitoring

The working environment should be monitored for occupational hazards relevant to the specific project. Monitoring should be designed and implemented by credentialed professionals as part of an occupational health and safety monitoring program. Facilities should also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents. Additional guidance on occupational health and safety monitoring programs is provided in the **General EHS Guidelines**

Table 1. Air Emission Standards for MSW Incinerators in the EU and US

Parameter	EU	USA[a]
Total Suspended Particulates	10 mg/m3 (24-hr average)	20 mg/dscm
Sulfur Dioxide (SO_2)	50 mg/m3 (24-hr average)	30 ppmv (or 80% reduction)[b]
Oxides of Nitrogen (NO_x)	200 – 400 mg/m3 (24-hr average)	150 ppmv (24-hr average)
Opacity	n/a	10%
Hydrochloric Acid (HCl)	10 mg/m3	25 ppmv (or 95% reduction)[b]
Dioxins and Furans	0.1 ng TEQ/m3 [6 – 8 hr average]	13 ng/dscm (total mass)
Cadmium	0.05 – 0.1 mg/m3 [0.5 – 8 hr average]	0.010 mg/dscm
Carbon Monoxide (CO)	50 – 150 mg/m3	50 – 150 ppmv[c]
Lead (Pb)	(See Total Metals below)	0.140 mg/dscm
Mercury (Hg)	0.05 – 0.1 mg/m3 [0.5 – 8 hr average]	0.050 mg/dscm (or 85% reduction)[b]
Total Metals	0.5 – 1 mg/m3 [0.5 – 8 hr average]	n/a
Hydrogen fluoride (HF)	1 mg/m3	n/a

Sources:
- EU Directive 2000/76/EC (applicable to MSW and Hazardous Waste Incinerators)
- US EPA Standards of Performance for Large Municipal Waste Combustors, 40 CFR Part 60 Subpart Eb.

Notes:
a All values corrected to 7% oxygen
b Whichever is less stringent
c Depending on the type of unit: modular starved air, and modular excess air—50 ppm (4-hr average); mass burn waterwall, mass burn refractory, and circulating fluidized bed combustor—100 ppm (4-hr average); mass burn rotary waterwall—100 ppm (24-hr average); pulverized coal/refuse-derived fuel mixed fuel-fired combustor—150 ppm (4-hr average); refuse-derived fuel stoker, and spreader stoker coal/refuse -derived fuel mixed fuel-fired combustor—150 ppm (24-hr average).
mg/m3 = milligrams per cubic meter; mg/dscm = milligrams per dry standard cubic meter; ppmv = parts per million by volume; TEQ = Toxicity Equivalent Units;