ADB

Initial Environmental Examination

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

Prepared by South China Institute of Environmental Sciences and Dynagreen Environmental Protection Group Co., Ltd for the Asian Development Bank

Asian Development Bank

ABBREVIATIONS

ADB	Asian Development Bank
AQG	Air Quality Guideline
As	Arsenic
HEMS	Huizhou Environmental Monitoring Station
HEPB	Huizhou Environmental Protection Bureau
BOD_5	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
EA	Executing Agency
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
F	Fluoride
FSR	Feasibility Study Report
GHG	Greenhouse gas
GRM	Grievance redress mechanism
HPMO	Huizhou Project Management Office
HRSG	Heat Recovery Steam Generator
Hg	Mercury
I	Iodide
IMn	Permanganate index
LAS	Linear alkylbenzene sulfonate (= anionic surfactant)

Mn	Manganese
MBR	Membrane Bio—Reactor
MSW	Municipal solid waste
MEP	Ministry of Environmental Protection of the People's Republic of China
NH3-N	Ammonia nitrogen
N	Nitrogen
NO2	Nitrogen dioxide
NO2 -	Nitrite
NO3 -	Nitrate
PRC	People's Republic of China
Pb	Lead
pH	Measure of acidity (<7) and alkalinity (>7) based on hydrogen ion concentration
PLC	Programmable Logic Controller
PMO	Project Management Office
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

°C	Celsius
μ	micron
ug/L	microgram per liter
Bq/L	Becquerel per liter
dB	decibel
km	kilometer
km^2	square kilometer
km^3	cubic 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/m^3	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 m^2

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

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4. Photos of the south，east，north and west of the project
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6. The General Layout of the project
7. The map location of the project site
8. Category Ⅲ Water Standard On Environmental Quality Standards For Surface Water (Gb3838-2002)
9. Category III Standard On Environmental Quality Standards For Underground Water (Gb/T14848-93)
10. Category II Standard On Environmental Quality Standards For Soil (Gb15618-1995).
11. Standard For Pollution Control On The Municipal Solid Waste Incineration (Gb 18485-2001) (Exposure Draft).
12. Integrated Emission Standard Of Air Pollutants (Gb 16297-1996), Class 2
13. Emission Standards For Odorous Pollutants (Gb14544-93)
14. Standard For Pollution Control On The Landfill Site Of Municipal Solid Waste (Gb 16889-2008)
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16. Integrated Waste Water Discharge Standard (Gb 8978-1996), Class 1
17. CategoryⅡ Standard On Emission Standard For Industrial Enterprises Noise At Factory Boundary (Gb 12348-2008)
18. Noise Limits For Construction Site (Gb12532-2011)
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)
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).
21. IFC EHS Guidelines For Waste Management Facilities
22. Primary air monitoring and supplementary air monitoring data

Executive Summary

ES1.1 Project overview and location

The Huizhou Waste-to-Energy Plant (the project), is located in Lanzilong Village, Shatian Town, Huiyang District, Huizhou City, Guangdong Province with a total investment of RMB 598.6399 million.

The project is designed with daily average treatment of municipal solid wastes of 1,200t (3*400) equivalent to an annual treatment of wastes of 438,000t. It is equipped with 3x400t/d mechanical grate boilers and 2 straight condensing turbine generator sets (1*15MW+1*9MW). The project is composed of a waste receiving and unloading system, waste incineration disposal system, a combustion air system, flue gas treatment system and steam turbine system, in addition to ash system, compressed air system, electrical system, instrumentation and control system, chemical water purification system, water supply system, sewage system, environmental protection and plant production workshop and office and other auxiliary engineering systems.

Among the three sites identified as potential location of the project, Lanzilong was identified to meet with the criteria set for Waste-to-Energy Project site selection.

ES1.2 Engineering analysis

ES1.2.1 Wastewater

According to engineering analysis, the waste leachate, production and domestic wastewater generated by the project will be treated by leachate treatment system of the “Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City”, the effluent after treatment will reach Urban Non-drinking Water Quality for Reuse of Recycled Urban Wastewater (GB/T18920-2002), the Industrial Water Quality for Reuse of Recycled Urban Wastewater (GB/T19923-2005), the Class I standard (2nd Period) of Discharge Limits of Water Pollutants (DB4426-2001) and the Class I standard of Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008) (subject to the strictest one).

Effluent after treatment should, after reuse of recycled water, reach relevant regulatory requirements in the Reuse of Urban Recycling Water－Water Quality Standard for Industrial Uses (GB/T19923-2005) and then discharged to reuse water system. The wastewater will be recycled and the factory will not discharge any wastewater.

Domestic sewage, about 18m^3/d, after subject to treatment in reclaimed water treatment facility, will be sent to water recycling system, used for circulating tower and slag comprehensive utilization and greening without discharge.

Other wastewater, such as effluent from integrated automatic backwash water purifier, circulating water discharge and boiler, totaling 198.3m^3/d, will be directly sent to water reuse treatment system, used for circulating tower and slag comprehensive utilization and greening without discharge.

ES1.2.2 Waste gas

During operation, waste incineration power generation plant mainly generates waste gas from its waste storage system and incineration system, of which the former mainly generates odor and odorous pollutants, and pollutants produced by waste incineration mainly include smoke, acid gas, heavy metal pollutants and dioxin.

ES1.2.3 Noise

Major noise sources in the plant include aerodynamic noise, electromagnetic noise and mechanical vibration noise from mechanical equipments such as fan, induced draft fan, exhaust valve, the exhaust pipe, high-power pump, steam turbine generator set, and noises caused by garbage trucks and slag conveyors. Equipment noises are mainly low-frequency noise, generally with noise level below 85dB (A), only a few of them above 90dB (A), such as turbo generator set.

ES1.2.4 Solid waste

Solid wastes generated in the project mainly include 56,6000t/a of wastes and 16, 5000 t/a of fly ash. Slag is comprehensively utilized in the plant or used to make bricks for sale outside; for fly ash, it will be solidified and subject to leaching toxicity test. Those compliant with GB16889-2008 will be transported to landfill for disposal and those not compliant with GB16889-2008 will be safely disposed by Huizhou Dongjiang Veolia Environmental Services Ltd. Huizhou Dongjiang Veolia Environmental Services Ltd. is a qualified unit to dispose the hazardous waste, and it has to take the responsibility to guarantee the slag's safely disposal. In addition, the solifidation technology will ensure that the fly ash complies with the "landfill pollution control standards"（GB16889-2008）, and the fly ash will be sent to landfill directly.

ES1.3 Status quo of regional environment quality

ES1.3.1 Present ambient air quality

Present ambient air quality monitoring and evaluation results show that, with exception to some measurement points (Hantangao and Ailingzai) where odor exceeds standard limit, other present concentration monitoring result of atmospheric pollutants do not exceed standard limit, compliant with relevant environmental quality standard.

Concentration of atmospheric pollutants in Jinju Natural Reserve, the Category I Area, is compliant with environmental quality standard. The higher ratio to the standard value PM10 in Category I Area is mostly directly related to bare soil near the monitoring point, deemed as natural fugitive dust.

Atmospheric monitoring data were collected from Environmental Impact Assessment Report on Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City (the 1st stage) on March 19 to 29, 2013. A total of 6 monitoring points have been set up, including monitoring factors: regular pollutants and odor factors.

In general, some regions in the project evaluation scope have odor pollution and, beyond that, regional ambient air quality is good.

ES1.3.2 Current situation of surface water environment quantity

Baseline data from various locations - upstream and downstream of the proposed site were gathered. Section 1# is located at a brook before the plant, about 500m upstream of the site; section 2# is located at Huangshatian Reservoir, about 500m at the downstream of the reservoir; section 3# is located at Huangshatian Reservoir, 500m the upstream of intersection between Shanxi River and Danshui River; section 5# is located at Shatian River; and section 6# at Shantian Reservoir.

Three indicators - COD, BOD_5 and potassium permanganate index - as well as monitoring data relating to 1#~4# section all exceed evaluation standard. Heavy metal indexes are not detected in most of sections and if found, the detected value is quite low, compliant with environmental quality standard.

For other indicators, the monitored value of total phosphorus and fecal coliform are found beyond standard limit in section 2#, 4# and 5#. Among which, monitored value of total phosphorus and fecal coliform in section 2# is 20 times higher than standard value, while DO indicator in section 1#, 5# and 6# measurement point is compliant with standard, and those in other sections are beyond standard requirement.

BOD_5, mercury, lead, cadmium, sulfide, petroleum, volatile phenol, hexavalent chromium and nitrate nitrogen are not detected. COD, BOD_5, potassium permanganate and fecal coliform indexes in some sections beyond standard limit are mainly caused by pollution due to sewage discharge. In addition, fecal coliform in some sections beyond standard limit is possibly related to the fugitive stacking of municipal solid wastes in the region.

In general, the water environment in the project area is poor, of which section 2# has the worst pollution. According to monitoring data and data analysis, it is found that with exception to Shatian Reservoir in the project region, other water body has poor water quality.

ES1.3.3 Current situation of groundwater environment quality

The project is located in a V-shaped valley, a condition favorable for the discharge of surface water and ground water. The stratum in the project region has poor permeation, water supplement and discharge take place in situ, and are largely subject to atmospheric precipitation. Based on site survey and relevant information, most of the site is covered by fruit trees, the remaining are used as chicken farm, pig farm, fishpond and waste yard. Domestic wastewater and farming are the major underground water pollution sources.

Affected by above human activities, some indicators of underground water in the region have exceeded Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93). In some monitoring points, pH value, potassium permanganate index and nitrite nitrogen are beyond standard limit. Both turbidity and total coliform bacteria are beyond standard requirement. With exception to nickel in some monitoring points, heavy metal indicators are all compliant with standard requirement. In general, the underground water in the project area has been polluted to some extent and the water quality is ordinary. Most of the area is planted with fruit trees and the other areas are used as chicken farm, fish ponds and landfills. Every day there are waste water and waste gas emissions. The waste contains Lead, nickel, nitrite, ammonia, cyanide and phenols, which percolates into the ground, and the domestic waste and farming also the pollution source to the groundwater.

ES1.3.4 Current situation of soil and plant environment quality

Monitoring indexes at each monitoring point have reached Class II standard requirement in the Environmental Quality Standard for Soils (GB15618-1995) and the ratio to standard value is relatively low.

The evaluation standard for soil environmental quality will be subject to Class II standard specified in the Environmental Quality Standard for Soils (GB15618-1995) and single-factor index method is used. Indicators such as Pb, Cu, Zn, Cd, Cr, As, Ni and Hg in monitoring points are monitored in accordance with Class II standard (soil limit value for agricultural production and human health) specified in the Environmental Quality Standard for Soils (GB15618-1995).

Monitoring indexes at each monitoring point has reached Class II standard requirement in the Environmental Quality Standard for Soils (GB15618-1995) and the ratio to standard value is relatively low.

Sediment in Huangsha Reservoir and Danshui River has no toxicity, and the heavy metal level is lower than Class II standard limit in the Environmental Quality Standard for Soils (GB 15618—1995).

ES1.3.5 Current situation of acoustic environment

Present environmental noise at the land boundary is 40.00～46.2dB(A) (in daytime) and 44.3～48.7dB(A) (at night), which means good acoustic environment quality. At the sensitive area nearest to project site, Lanzilong, Tiantou Village, the ambient noise is 52.9dB(A) (in daytime) and 47.1dB(A) (at night). Ambient noise quality in the region is in general good, free from noticeable noise pollution.

ES1.3.6 Current situation of ecological environment

According to field investigation, plants within existing ecological evaluation range include: 1) arbor plants: pinus massoniana, longan, eucalyptus, bamboo, Taiwan acacia. (2) shrubs: euphorbiaceae, papaya, myrtle, psychotria rubra, pubescent holly root, ivy tree bark. (3) vine plants: mikania micrantha, smilax, Chinese fevervine herb and root, zebrawood, embelia, lygodium japonicum. (4) herbaceous plants: dicranopteris pedata, clerodendrum fortunatum, miscanthus floridulus, adiantum, cyclosorus parasiticus, sticktight, intermediate bothriochloa, rose mallow root, eupatorium catarium, cynodon dactylon, wild citronella, imperata cylindrica, ischaemum ciliare, cotoneaster, cynodon dactylon, cesmodium heterocarpum, herba euphorbiae hirtae, panicum repens, wire grass, ditch millet.

The project site shows ideal ecological restoration since the net production of plant community is large in scale and it has bountiful south subtropical plant species. No rare and endangered animals under national protection are found in the project site.

ES1.4 Environmental impact prediction result

ES1.4.1 Atmospheric environmental impact prediction

Air pollutants generated by Huizhou Waste-to-Energy Plant after completion will have small impact on atmospheric environment, lead to less change in air quality in the site, compliant with requirement of ambient air function zone. Maximum annual ground level concentration increment of dioxin, one of the public's biggest concern, is 0.000766pg-TEQ/m^3, accounting for 0.13% of the standard. Under abnormal working condition, concentration of each pollutant increases significantly compared with that under normal working condition, while the accumulated concentration at each sensitive area is still compliant with the requirement of functional zone.

Prediction result and analysis of dioxin

①Annual mean concentration

Based on the prediction result, the increment of maximum annual ground concentration of dioxin is 0.000766 pg-TEQ /m^3, accounting for 0.13% of the standard value.

②Environmental impact analysis of sensitive areas

In general, the emission of dioxin has little impact on surrounding environment. The project is designed with an environmental protection distance of 300m from the plant boundary, and no environmentally sensitive areas such as residences, culture and education facilities and hospitals are constructed within the scope. Based on site survey, only a small mechanical grinding tool plant (no dormitory building) is found in the scope, no permanent populated settlements.

ES1.4.2 Surface water environment impact prediction

Leachate, wash water for garbage trucks and wastewater from workshop cleaning are treated by the leachate treatment system of Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City. The treated water are then subjected to treatment in reuse water treatment facility, delivered to water recycling system, and later used for circulating tower and slag comprehensive utilization and greening without discharge outside. Both the domestic sewage, effluent entering self-constructed domestic sewage treatment system will enter water reuse system; other wastewater, such as effluent from integrated automatic backwash water purifier, circulating water discharge and boiler will be directly directed to water reuse treatment system. Under normal condition, the waste incineration plant does not discharge wastewater, causing no unfavorable influence on surrounding surface water environment.

In addition, the project is provided with a 3,600m^3 fire fighting water pond and a leachate regulating tank with the same volume, capable of accommodating wastewater produced in nearly 16 days, including leachate in case of sewage treatment station accident.

ES1.4.3 Underground water environment impact prediction

Under normal working condition, the wastewater from waste storage, treatment, temporary piling in the solid waste site and project wastewater will not cause adverse impact on underground water environment.

By taking timely proper prevention and control actions in case of wastewater/leachate leakage, it will have less adverse impact on surrounding environment and no influence on the underground water environment in surrounding sensitive areas.

ES1.4.4 Acoustic environment impact prediction

Under normal working condition, noise at each plant boundary, after taking noise reduction actions will reach Class II standard in Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-2008) and, under abnormal working condition, noise at each plant boundary can also meet corresponding standard.

ES1.4.5 Solid waste environment impact prediction

Slag produced by the project is used comprehensively in the plant and, after separating 1% metal, adding 10% cement and 0.1% additives, they are used for brick-making.

Fly ash will be solidified and subject to leaching toxicity test. Those compliant with applicable standards will be transported to landfill to be buried in different sections and those not compliant will be safely disposed by a licensed company.

ES1.5 Rationality and legality analysis for project site selection

The project is located at Lanzilong, Tiantou Village, Shatian Town, Huiyang District, Huizhou City. The construction’s main work complies with relevant requirements in Guangdong Twelfth Five-year Plan of Solid Waste Pollution Prevention and Control (2011- 2015), Guangdong Twelfth Five-year Plan of Facility Construction for Hazard-Free Disposal of Municipal Solid Waste, the Twelfth Five-year Plan for National Economic and Social Development of Huizhou City, Environmental Protection Planning of Huizhou (2007-2020), Special Planning for Environmental Sanitation of Huizhou (2008－2020), General Land Use Planning of Huiyang District, Huiyang City (2010-2020) and Notice on Further Enhancement of Evaluation Management of Environmental Impact by Biomass Power Generation Projects (H.F.[2008]No.82), and also with relevant laws and regulations on the air and water pollution prevention and control.

On the condition that the construction unit takes and implements pollution prevention and control measures and conducts standard management of the plant, EIA (environmental impact assessment) results demonstrate that Lanzilong can be selected as the construction site in terms of environment protection.

ES1.6 Environmental Management and Monitoring Plan

To effectively protect the environment and avoid pollution and accidents, the plant has established a management organization in charge of environmental protection and full-time environmental management personnel that mainly takes charge of environmental management work during project construction and operation period, including testing, daily supervision, handling of environmental pollution accidents as well as coordination and solving relation-related issues with the environmental protection department and the public in the surrounding area.

ES1.6.1 Air pollution prevention and control measures

ES1.6.1.1 Smoke pollution prevention and control measures

To assure the compliance of exhaust from waste incineration plant, flue gas cleaning system is designed as "In-boiler SNCR[1] denitration + half-dry reaction tower +activated carbon adsorption＋bag filter", and the exhaust chimney is 80m high.

After taking those measures, pollutants in flue gas can reach specified standard.

ES1.6.1.2 Odor pollution prevention and control measures

Odor is mainly from waste dumping platform, while the odor from incineration flue gas has less impact and slag will release less odor after high-temperature incineration.

Since the primary air supply for incinerator, under normal working condition, will utilize the air in waste storage pit to form negative pressure in the pit and waste odor will be directed via draught fan to waste incinerator for incineration, it has less impact on surrounding environment. The waste dumping platform is designed with automatic door which will, during waste dumping, automatically open and, after dumping, automatically close, keeping most of odor inside waste storeroom.

Since waste odor will have significant adverse impact on the environment in case of boiler

[1] SNCR is based on SCR technology but more efficient on removing Nitrogen oxides.

shutdown, overhaul or negative pressure device failure, it is required to shut down waste dumping door in time, turn on forced ventilation system for accident response, sprinkle deodorant and, the waste should not be discharged unless subject to treatment of activated carbon to reduce environmental impact.

The highest possibility of negative pressure failure occurs during trial operation, therefore it is required to assure the effectiveness of forced ventilation system for accident response, which would be easily neglected by the plant and must be included in the monitoring system and it should be provided with relevant on-the-job training.

ES1.6.2 Water pollution prevention and control measures

Water pollution prevention and control measures include:

(1) Factory production equipment, auxiliary facilities and utilities facilities, in terms of layout, should be classified according to the possibility of leakage of pollutants into general pollution control area, the key pollution control area and non pollution area. General pollution control area includes life service area, complex building, incineration and flue gas purification, such as turbine room; Key pollution control area includes workshops involved with pollution such as the cesspit, discharge platform, fly ash, solidification station, ash comprehensive treatment station, and sewage treatment station.

(2) Control ground water pollution from the source

In order to protect groundwater environment, we take measures to control ground water pollution from the source.

We carry out cleaner production and cyclic economy, and reduce pollutant emission. Prevent and reduce pollutant leakage from design, management of each process equipment and material transportation line; reasonable layout, reduce ways to leak pollutant.

(3) Take anti-seepage measures over the plant and equipment

Anti-seepage treatment is a significant environment protection measure to prevent groundwater pollution and the last defense line for eliminating ground water pollution. According to hydrogeology in project area and project features, the following pollution prevention measures and anti-seepage requirement.

This project area is divided into non-polluted area and polluted area, while polluted area is classified into ordinary, priority and special ones. Non-polluted area can’t have anti-seepage treatment, and polluted area should take anti-seepage measures of different grades according to different partition requirement to make sure its reliability and effectiveness. Anti-seepage design for ordinary polluted area should comply with Standard for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599—2001), and anti-seepage design for priority and special polluted area should meet with Standard for Pollution Control on Hazardous Waste Landfill.

ES1.6.3 Noise pollution prevention and control measures

Noise pollution prevention and control measures include:

(1) Select technically advanced low-noise mechanical equipments, provide equipment noise limit in purchase contract and control noise from the source.

(2) Control the noise from the sources, take noise reduction measures for high noise equipment, such as high pressure steam emergency vents, fan inlet and outlet, safety valve and ignition vent of waste heat boiler, main steam exhaust headers are provided with muffler; Generators and water pumps and other equipments are also provided with noise isolation cover; inlet and outlet of the fan and water pump are equipped with rubber joint vibration damper; Infrastructure such as water pump is equipped with vibration damping pad.

(3) Improve automatic control level, assure unmanned management for parameter detection and automatic operation of high-noise equipments like fans, water pumps. During maintenance, it is required to provide relevant specification on working time so as to reduce noise hazard.

(4) Enhance greening efforts in the plant, completely utilize the sound-proof function of buildings in the plant, reduce noise with greening belt and alleviate noise impact on the environment.

(5) For vehicle noises, it is required to enhance vehicle management such as restricting whistling and vehicle speed so as to reduce traffic noise.

(6) It is recommended to conduct transport operation in daytime. Daytime operation should only cause noise interference on residents within the range of 5-10m away from arterial traffic lines. A waste transport road is designed to construct to connect with Lian'an road and the plant. The transport road should be kept a certain distance away from residence area, so as to minimize the noise impact on surrounding sensitive areas.

ES1.6.4 Solid waste pollution prevention and control measures

Slag produced by the project is used comprehensively the plant and to be sold.

Fly ash is considered as hazardous wastes. It will be solidified and subject to leaching toxicity detection. Those compliant with Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008) will be transported to landfill to bury in different sections and those not compliant with GB16889-2008 will be safely disposed by Huizhou Dongjiang Veolia Environmental Services Ltd.

ES1.7 Environmental risks and control measures

A set of environmental, occupational and health risks have been identified and measures have been established to address them. These risks and measures mainly pertain to site selection and preventive measures for building safety, fire and explosion prevention measures and fire alarm system, control measures for flue gas purifying facilities, measures for handling emergency machine shutdown and accident during operation, including management of hazardous substances generated from plant operation.

(1) Based on the project features, major risk assessment contents include the flue gas cleaning treatment facility failure, over-standard discharge of hazardous substance such as flue gas and dioxin in smoke; environmental impact caused by odor pollution due to negative pressure failure; impact on underground water caused by impermeable layer fracture; fire and explosion caused by diesel fuelpipeline leakage. The impact of dioxin and odorous pollutants is the priority.

(2) Negative pressure device failure would lead to odor leakage and pollution, and residents living in the radius of 4km would smell odor if the accident is not properly handled, particularly residence area and schools near project site. In such case, it is required to shut down waste dumping door immediately, turn on forced ventilation accident response system, sprinkle deodorant and, the waste should not be dump unless subject to activated carbon absorption to reduce environmental impact.

(3) When flue gas cleaning system has accidental discharge, dioxin concentration in air at sensitive areas near project site is less than the acceptable 0.4pgTEQ/Nm^3, causing little impact.

(4) Each risk prevention and control measure will be taken for the project to minimize the risk possibility and, emergency plan is established for accident to minimize the possible impact. The risk possibility of the project is therefore within acceptable scope.

ES1.8 Information Disclosure, Consultation and Participation and Grievance Redress Mechanism

The project has provided the public with project-related information and pollution-related issues resulting from its construction and operation and their concerns have been taken into consideration. Information dissemination was undertaken through posted announcement in villages, The neareat villiage lanzilong's population is about 250 people; the main impact is air environment, according to the predicting results, the emission of the WTE project has a rather low impact on the air environment, the air quality did not change much in the assessing range, which meet the requirements of the air environment functional zone. With the normal work situation, people mostly care about the maximum value of the average ground level concentration, it is about 0.000643pg-TEQ/m3, and the prequency is 0.11%; all in all, with normal work conditions, the impact on the air environment is small. online (website) announcement, announcement in newspaper, field interview and survey questionnaires sent to the neighborhood of the project site, the waste collection and transportation route and the project service area. A symposium was held and information booklets have also been prepared. the construction unit issue 10000 booklets of "introduction of the lanzilong environmental park", mainly discuss the the common knowledge of the WTE project, and they are offered to the local surrounding residents and citizens in huiyang area. Based on the survey questionnaires that were sent to various stakeholders, the result showed that construction of the project is understood and supported by most of the residents in the surrounding area of the project on the premise that the project is constructed with high standard, environmental protection measures are seriously implemented, and management in operation period is enhanced.

The construction unit committed to take reasonable and effective environmental protection measures to ensure that pollutants discharged complies with relevant standards. During construction period, it will carry out strict management to ensure construction quality and ensure that various pollution control measures are operated properly and would introduce third-party supervision and social supervision during project operation period to enhance communication with the public. The project has also developed a grievance redress mechanism (GRM) to settle unforeseen issues and offer an effective and transparent channel for lodging and addressing complaints and grievances.

The public survey complies with Interim Regulation for Public Participation in the Environmental Impact Assessment (H.F. [2006] No. 28) and Notice on Printing and Distribution of Implementation Opinions of Guangdong Province on Public Participation in Environmental Management of Construction Project (Y.H. (2007) No. 99), and most of respondents are local permanent residents, they are well representative of the project site.

Initial survey result demonstrates that, among 12 groups surveyed,The 12 groups including huiyangjinju municipal nature protection control station, shatian town tiantou villiage neighborhood, Huizhou huiyang area shatian town local government, sanhe area community neighborhood in huiyang economic developing zone, yangna villiage neighborhood in Huizhou huiyang area, guwu villiage neighborhood, xiaowu village neiborhood, shatian town union primary school, xiaowu primary school, huizhou huiyang area qishan resort development company, danshui town primary school and shiwei village neighborhood. In the survey, 12 questionaires are handed out, the sanheshiwei village refused to communitcate, so 11 were returned, the recovery ratio is 92%. Among the returned questionaires, the huizhou huiyang area qishan resort development company rejected the WTE project mostly, after the second interview, they still keep reject attitude, the reason are as follow: 1. The BOT model is used in the project, the operational managenet is not guaranteed; 2. The environmental protectional procuderes need to be accomplished; 3. the communication between the government and the local residents, their suggestions and advised are provided; 4. The proposed location of the project is in the level 1 water source protection range and there are sick residential site surrounding the project location; 5. Suggest to re-choose the location. have to be enhanced ; The first survey results shows that, among the 11 groups,if the high-level of construction is applied, the environmental measures are provided, and the management in the operational period is reinforced, 73% of them expressed support to the project, 18% of them would accept it conditionally, 9% is not support.

In the survey of 412 individuals, if the high-level of construction is applied, the environmental measures are provided, and the management in the operational period is reinforced, 62% of them expressed support to the project, 13% is not support, 24% of them show indifference and 1% no response.

In another spontaneous questionaires survey organized by the huizhou huiyang area qishan resort development company, among 540 individuals , 97% is not supported and 2% not response and 1% is support. In order to address the people's concern and advertise the environmental knowledge, on April 3rd in 2013, the "huiyang environmental park WTE project introduction conference" is held by the construction unit in the international hotel on huiyang street, 2 waste treatment experts are invited to this meeting. The content of the meeting is published on the local newspapers.

According to public opinions and suggestions, construction unit is recommended to take rational and effective environmental protection measures to reduce pollutant emission. During construction phase, it is required to implement strict management, assure construction quality, smooth implementation of pollution control measures and pollutant discharge under certain standard; do a good job in risk prevention and emergency measures, establish a perfect early warning mechanism; Establish perfect environmental management and monitoring system, strengthen supervision and management of pollutants discharge. Take efforts to minimize project's influence on surrounding environment. In addition, it is required to conduct third party supervision and social supervision during the project operation stage, strengthening communication with the public.

The purpose of this project is to standardize waste disposal, reduce bad influence of waste on urban health and surrounding environment caused by unorganized disposal, so the project after being put into operation has a positive effect in reducing pollutant emissions in the area, also to improve the living environment in Huiyang and realize harmonious development. The project construction is a necessity, while due to its highly social concern, both construction unit and local administrative departments are recommended to make further communication with local residents, eliminate their worries, minimize the probable social unrest. In addition, construction units should, under the premise of strict compliance with environmental protection measures and requirements specified in this report, conduct third-party supervision and social supervision, strengthen publicity and communication with local related units and people, make them acquainted with the project, reduce unnecessary public concern and worry. The company should, in the process of operation, consider opinions of local residents and needs, in many respects, safeguard economic and environmental interests of the public to a reasonable extent. Meanwhile, it should give priority to local residents for employment and exist in harmony with local residents, gain more support to and understanding of the project from surrounding people with concrete actions and, continue to lay a solid foundation for the project.

Finally, since the project receives great social concern, the public participation believes that risk assessment on social stabilization should be conducted and, based on the result, proceed with project construction.

ES1.9 Conclusion

The construction of the project conforms to the national industrial policy and the selection of the project location complies with relevant local planning requirements. Mature and effective waste gas treatment processes will be employed by the project and the discharge standards will be met as long as various pollution control processes are properly implemented. As the project receives relatively high public attention, it is suggested that third-party monitoring and social supervision should be introduced, and the channel of information communication between the plant and the surrounding residents should be maintained to manage concerns of the public.

Chapter I Policy, Legal, and Administrative Framework

1.1 Assessment basis

1.1.1 Legal basis

(1) Environmental Protection Law of the People's Republic of China 【Dec. 1989】;

(2) Law of the People's Republic of China on Environment Impacts Assessment 【Oct. 28, 2002】;

(3) Law of the People's Republic of China on the Prevention and Control of Water Pollution 【Revised on Feb., 2008】;

(4) Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution 【Revised on Apr., 2000】;

(5) Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise【Oct. 1996】;

(6) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes 【Dec. 2004】;

(7) Water Law of the People's Republic of China 【Revised on Aug. 2002】;

(8) Land Administration Law of the People's Republic of China【Aug. 28, 2004】;

(9) Law of the People's Republic of China on Water and Soil Conservation 【Dec. 25, 2010】;

(10) Cleaner Production Promotion Law of the People's Republic of China【Feb. 29, 2012】;

(11) Circular Economy Promotion Law of the People's Republic of China【Aug. 29, 2008】;

(12) Renewable Energy Law of the People's Republic of China 【President Order No. 33】;

(13) Energy Saving Law of the People's Republic of China (Revised in 2007) 【President Order No.77】.

1.1.2 National legal basis

(1) Administrative Regulations for Environmental Protection in Construction Project 【State Council Order No. 253, Nov.1998】;

(2) Notice on Strengthening the Administration of Construction Project Environmental Protection【SEPA, ED (2001) No. 19】;

(3) Notice on Verifying Total Emission Amount Control of Major Pollutants of Construction Project【SEPA, Huanhan No. (2003) No. 25】;

(4) Grading Approval of Environmental Impact Assessment on Construction Project【SEPA, H.F. No. (2004) No. 164】;

(5) Decision of the State Council on Implementing the Scientific View of Development and Strengthening Environmental Protection (No.39 [2005] of the State Council);

(6) Circular on Strengthening Environmental Impact Assessment Management and Preventing Environmental Risk 【SEPA, H.F. [2005] No. 152】;

(7) Provisional Measures on Public Participation in Environmental Impact Assessment on Construction Project 【H.F. (2006) No. 28】;

(8) Conditions for Acceptance of Environomental Impact Assessment Report on Thermal Power Construction Projects【SEPA, Announcement [2006] No. 39】;

(9) Guiding opinions on gross distribution of SO^2【H.F. (2006) No. 182】;

(10) Suggestions on Reporting Municipal Solid Waste-to-Energy Projects 【EIA (2007) No. 673】;

(11) Categorized Administrative List of Environmental Impact Assessment for Construction Projects 【Issued by Ministry of Environmental Protection, (2008) No. 2】;

(12) Notice on Further Enhancement of Evaluation Management of Environmental Impact by Biomass Power Generation Projects 【(H.F.[2008]No.82), issued by MEP】;

(13) Regulation on the Grading Approval of Environmental Impact Assessment Documents for Construction Projects 【Issued by Ministry of Environmental Protection, (2009) No. 5】;

(14) Procedures on Managing Urban Environment and Public Sanitation 【Decree of the State Council, No. 101】;

(15) Administrative Measures for Urban Domestic Waste 【Decree of the Ministry of Construction, No. 27】;

(16) Report on Improvement Sanitation and Health and Disposal of Municipal Wastes 【No. 57 (1986) of the General Office of the State Council】;

(17) Proposals on Solving the Problem of Urban Refuse in China 【Guofa, (1992) No. 39】;

(18) Suggestions on further Comprehensive Utilization of Resources【Guofa, (1996) No. 36】;

(19) Catalogue of Resources for Comprehensive Utilization 【State Economic and Trade Commission, (1996) No. 809】;

(20) Administrative Measures for Domestic Wastes Manifests 【No. 5 Decree of SEPA, October, 1, 1999】;

(21) Technical Policy on MSW Management and Pollution Prevention 【Jiancheng (2000) No. 120】;

(22) Administrative Measures for the Determination of Electric Power Plants (Plant Units) of Resources Comprehensive Utilization (No.660 [2000] of the State Economic and Trade Commission);

(23) Technical Policy on Domestic Waste Pollution Prevention and Control 【H.F. [2001] No. 199】;

(24) Relevant Regulations on the Administration of Power Generation from Renewable Energy 【NDRC [2006] No. 13】;

(25) List of Domestic Wastes 【MEP, NDRC [2008] Decree No. 1】;

(26) Technical Guide for Municipal Solid Waste Treatment 【Jiancheng [2010] No. 61】;

(27) Notice of General Office of the State Council on Printing the Plan for Harmless Disposal Facilities Construction of Municipal Solid Waste in Nationwide in 12th Five-year Period 【Issued by General Office of the State Council [2012] No.23】;

(28) Guiding Rules for Identifying Solid Wastes (for Trial Implementation) 【Issued by State Administration of Environmental Protection, State Development and Reform Commission, Ministry of Commerce, General Administration of Customs, State Administration of Quality Supervision and Inspection and Quarantine [2006] No. 11】;

(29) General Emergency Plan for National Public Accidents 【January, 2006】;

(30) Catalogue of Environmental Protection Industry Equipment (Products) Encouraged by the State 【Revised in 2007】;

(31) Major Hazard Installations for Dangerous Chemicals (GB18218-2009) 【Implemented on December 1, 2009】;

(32) Circular on Strengthening Environmental Impact Assessment Management and Preventing Environmental Risk in Further【SEPA, H.F. [2012] No. 77】;

(33) Circular on Practically Strengthening Risk Prevention and Implementing Environmental Impact Assessment Management 【H.F. [2012] No. 98】;

(34) Catalogue for Guidance of Industrial Structure Adjustment (2011 Version) (Revised in 2013)【NDRC Decree No. 21】;

(35) Working Opinions on Further Strengthening the Disposal of Municipal Solid Wastes 【Guofa [2011] No. 9】;

(36) Catalog for the Guidance of the Industrial Development of Renewable Energy 【FGNY [2005] No.2517】;

(37) The Requirements for Preparing the Simplified Edition of the Environmental Impact Statement of Construction Projects, announcement issued by the Ministry of Environmental Protection, PRC, [2012] No. 51

(38) Circular of the Ministry of Environmental Protection on Printing the Preparation Guide for Total Pollution Emission Control Plan of Major Pollutants in the 12th Five-year Period (Huanban [2010] No. 97, June 28, 2010);

(39) National Planning for Prevention and Control of Groundwater Pollution (2011-2020) (Passed by executive meeting of the State Council on August 24, 2011);

(40) Approval of the State Council on the 12th Five-year Plan for Air Pollution Prevention and Control in Key Areas (Guohan [2012] No. 146);

(41) Circular on Printing and Distributing the Plan on the Pollution Prevention and Control of Hazardous Wastes in 12th Five-year Period (H.F. [2012] No. 123);

(42) Circular on Printing and Distributing the Plan on the Air Pollution Prevention and Control Key Areas in 12th Five-year Period (H.F. [2012] No. 130);

(43) Notice of NDRC on Printing and Distributing Interim Measures for Social Stability Risk Assessment of Major Fixed Assets Investment Projects (FGTZ [2012) No. 2492];

1.1.3 Local laws and regulations and normative documents

(1) Management Regulation of Guangdong Province on Environmental Protection Management for Construction Projects (the 4th revision at 35th conference of 11th Guangdong People's Congress Standing Committee, on July 26, 2012);

(2) Regulations of Guangdong Province on the Prevention and Control of Solid Wastes Pollution 【Implemented from May 1, 2004】;

(3) Regulations of Guangdong Province on Environmental Protection 【Implemented from January 1, 2005】;

(4) 12th Five-year Planning of Guangdong Province on Environmental Protection and Ecological Construction (YHH [2010] No. 284);

(5) Environmental Protection Plan of Guangdong Province 【2006~2020 年】;

(6) Twelfth Five-year Plan for National Economic and Social Development of Guangdong Province, issued by People's Government of Guangdong Province, April, 2011;

(7) Environmental Protection Planning of Guangdong Province (2007-2020); YF 【2006】 No.35;

(8) Regulations on Drinking Water Quality in Guangdong Province【Implemented on July 1, 2007】;

(9) Opinions for Public Participation in Implementation of Construction Project Environmental Management in Guangdong (YH (2007) No. 99), December 29, 2007;

(10) Supplementary Management Suggestions of Environmental Impact Assessment on Construction Project, Department of Environmental Protection of Guangdong Province, HPC [2011] No. 5;

(11) Circular of Guangdong Province on Printing and Distributing the Standard Setting of Pollution Source Drain Outlet 【YH (2008) No. 42】;

(12) Notice of Guangdong Environmental Protection Bureau on Implementing Screen System for Total Emission Amount of Major Pollutants from Construction Projects 【YH (2008) No. 69】;

(13) Notice of Guangdong Province on Printing and Distributing the Underground Water Function Regionalization, (YSZYH (2009) No. 19);

(14) Notice of Guangdong Province on Printing and Distributing the Underground Water Protection and Utilization Planning (YSZYH (2011) No. 377);

(15) Function Regionalization of Guangdong Province of Surface Water Environment 【January, 2011】;

(16) Notice of Strengthening Urban Environmental Health Works in Guangdong Province 【YJCZ (1992) No. 159】;

(17) Administrative Measures of Guangdong Province for Domestic Wastes Manifests 【1999】;

(18) Administrative Regulations of Guangdong Province on Urban Environment and Public Sanitation【May 1, 2000】;

(19) Notice of Forwarding Standards of SEPA on Standard for Pollution Control on the Municipal Solid Waste Incineration【YHK (2000) No. 13】

(20) Notice of People's Government of Guangdong Province on Forwarding the Working Opinions on Further Strengthening the Disposal of City Domestic Waste formulated by Ministry of Housing and Urban-Rural Development (MOHURD) and others (16 ministries), People's Government of Guangdong Province, YF[2011] No. 63;

(21) Management Regulations of Guangdong Province on Municipal Solid Wastes 【January, 2002】;

(22) Notice on Strengthening Solid Wastes Incineration【YFB, (2002) No. 33】;

(23) Solid Waste Pollution Prevention and Control Planning of Guangdong Province (2001 – 2010)【YH, (2003) No. 54】;

(24) Implementing Measures of Guangdong Province on Strictly Controlling the Administrative License of Waste Disposal【Order of the People's Government of Guangdong Province, No. 135, May 1, 2009】;

(25) Guangdong the Twelfth Five-year Plan of Facility Construction for Hazard-Free Disposal of Municipal Solid Waste (2011-2015);

(26) Notice of Guangdong Province on Printing and Distributing the 12th Five-year Plan of Rural Environmental Protection【YH (2012) No. 6】;

(27) Suggestions of Guangdong Price Bureau on Utilizing Price Leverage to Promote the Development of Municipal Solid Waste Incineration power Generation Industry （YJ【2010】 No. 195）;

(28) Measures of Guangdong Province on Prevention and Control of Air Pollution in the Pearl River Delta (YF Order No. 134, implemented from May 1, 2009);

(29) Notice of People's Government of Guangdong Province on Printing and Distributing the Regulation on the Grading Approval of Environmental Impact Assessment Documents for Construction Projects (YF [2012] No. 143);

(30) Notice of the Department of Guangdong Province of Environmental Protection on

Approval of Environomental Impact Assessment Document for Construction Projects (YH [2012] No.89);

(31) Notice of Guangdong Province on Printing and Distributing the Comprehensive Scheme on Energy Saving and Emission Reduction (YFB [2012] No. 14);

(32) Notice on Further Strengthening Efforts in Environmental Impact Assessment Public Participation and Administrative Information Disclosure【YH (2012) No. 883】;

(33) Annual Implementation Plan in 2013 of Guangdong Province for Prevention and Control of Air Pollution in the Pearl River Delta【YH (2013 No. 23】

(34) Notice of Department of Guangdong Province of Environmental Protection on Printing and Distributing the Nanyue Water Cleaning Action Plan (2013 – 2020) (YH (2013) No. 13);

(35) Interim Measures of Development and Reform Commission of Guangdong on Social Stability Risk Assessment for Major Projects (YFGZD [2012] No. 1095);

(36) Regulations of Huizhou on Environmental Protection, October 28, 2002;

(37) Notice on Printing and Distributing the Control Target of Total Emission Amount of Major Pollutants, HFB [2012] No.1;

(38) Urban Master Plan of Huizhou (2006- 2020)'

(39) Environmental Protection Planning of Huizhou (2007-2020);

(40) 12th Five-year Planning of Huizhou on Environmental Protection and Ecological Construction;

(41) Special Planning for Environmental Sanitation of Huizhou (2008—2020);

(42) General Land Use Planning of Huiyang District, Huiyang City (2010-2020

1.1.4 Relevant national technical specifications

(1) Technical Guidelines for Environmental Impact Assessment- General Program【HJ2.1-2011】;

(2) Technical Guidelines for Environmental Impact Assessment- Atmospheric Environment【HJ 2.2-2008】;

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

(4) Technical Guidelines for Environmental Impact Assessment- Acoustic environment【HJ2.4-2009】;

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

(6) Technical Guidelines for Environmental Impact Assessment- Underground Water Environment 【HJ610-2011】;

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

(8) Technical Guidelines for Environmental Impact Assessment on Projects【HJ 616-2011】;

(9) Technical specifications of environmental quality report compilation for Thermal Power Plant Construction Project 【HJ/T13-1996】;

(10) Technical Specification for underground Waterproofing【GB50108-2001(1)】;

(11) Technical Specifications for Environmental Monitoring of Underground Water 【HJ/T164-2004】;

(12) Specific Equipments for Municipal Environmental Sanitation Equipments- Cleaning, Collecting and transporting 【CJ/f29.1-91】;

(13) Construction Standard for Municipal Solid Waste Incineration Disposal Project 【JB (2001) No. 213】;

(14) Code for Planning of Urban Environmental Sanitation Facilities 【GB50337-2003】;

(15) Classification and Evaluation Standard of Municipal Solid Waste (attached with article description) (CJJ/T 102-2004);

(16) （16）Code for Municipal Solid Waste Sanitary Landfill Closure (attached with article description) (CJJ 112-2007);

(17) Technical Requirement for Environmental Monitor on Sanitary Land Fill Site (GB/T 18772-2008);

(18) Municipal Solid Waste Incinerator and Boiler【GB/T18750-2008】;

(19) Pollution Control Standard for Municipal Solid Waste Landfill (released) 【GB 16889-2008】;

(20) Technical Code for Projects of Municipal Waste Incineration (CJJ90-2009);

(21) Technical Specification for Operation Maintenance and Safety of Municipal Solid Waste Incineration Plant (attached with article description) (CJJ 128-2009);

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

(23) Technical Code for Leachate Treatment of Municipal Solid Waste (CJJ 150-2010);

(24) Standard for Assessment on Municipal Solid Waste Incineration Plants (CJJ/T 137-2010);

(25) Technical Requirements for Site Utilization after Stabilization in Municipal Solid Waste Landfill (GB/T 25179-2010);

(26) Technical Requirements for Integrated Treatment and Resource Utilization of Municipal Solid Waste (GB/T 25180-2010);

(27) Municipal Solid Waste Incineration Bottom Ash Aggregate (GB/T 25032-2010);

(28) Technical Requirements for Collection and Recycling of Bulky Waste (GB/T 25175-2010);

(29) Technical Specification for Operation and Maintenance of Municipal Solid Waste Landfill (attached with article description) (CJJ 93-2011)

(30) Classification of Municipal Solid Waste Generated Source and Discharge (CJ/T368-2011).

1.1.5 Other documentary basis

(1) Letter of Authorization for Environmental Impact Assessment, March 2013;

(2) Application Report on Lanzilong Integrated Waste Treatment Project Municipal Solid Waste Incineration Power Generation Project in Huiyang District, Huizhou City, GDE, March 2013;

(3) Basic analysis report on wastes of Huizhou, GIEC (Guangzhou Institute of Energy Conversion, February and May of 2013;

(4) Detailed Geotechnical Investigation Report of Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City, Shenzhen Gongkan Geotechnical Engineering Co., Ltd., March 2013;

1.1.6 Asian Development Bank (ADB) Environmental and Social Requirements

The Huzhou 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 can be mitigated. This IEE has been prepared under the provisions of the ADB's safeguard policy document[2] which requires a number of critical 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 environomental impact assessment has been prepared initially for PRC

[2] ADB. 2009. *Safeguard Policy Statement*. Manila.

approval processes and therefore is 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[3].

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.

1.2 Assessment standard

1.2.1 Assessment basis

(1) Air environment quality standard

According to atmospheric environment function zoning of Huizhou, the project assessment will be conducted in compliance with Class II standard in the Ambient Air Quality Standard (GB3095-2012); for sensitive areas within Jinju Natural Reserve in the south, Class I standard in the Ambient Air Quality Standard (GB3095-2012) is observed.

Evaluation criterion for NO_2, SO_2, PM_{10}, $PM_{2.5}$, Pb, Hg and Cd will be the Ambient Air Quality Standard (GB3095-2012); for Pb (daily average), Sanitary Standard for Lead and Its Inorganic Compounds in the Atmosphere (GB7355-1987) is adopted; for HCl and hydrogen sulfide evaluation, the maximum allowable concentration of hazardous substance in air in

[3] IFC/World Bank Group 2007, *Environmental, Health, and Safety (EHS) Guidelines*, Washington April 30, 2007.

residential area specified in Hygienic standards for the Design of Industrial Enterprises (TJ36-79) is taken as the reference standard; Indoor Air Quality Standard (GB/T18883-2002) is adopted for NH_3; the momentary maximum allowable concentration (0.7μg/m^3) specified in Hygienic Standard for Methyl Mercaptan in Atmosphere of Residential Area (GB18056-2000) is adopted for methyl mercaptan, Environmental Quality Standard of Japan is taken as reference standard for dioxin; the standard value at plant boundary specified in Emission Standards for Odorous Pollutants (GB14554-93) is adopted for odor concentration. See Table 1.4-2 for standard values.

Table 1.4-2 Applicable standards for ambient air quality assessment

Pollutants	Limit value of Class 1 standard			Limit value of Class 2 standard			Reference standard
	Hourly average	Daily average	Annual average	Hourly average	Daily average	Annual average	
NO_2	200	80	40	200	80	40	Ambient Air Quality Standard (GB3095-2012)
SO_2	150	50	20	500	150	60	
PM_{10}	—	50	40	—	150	70	
$PM_{2.5}$	—	35	15	—	75	35	
Pb	—	—	0.5	—	—	0.5	
Cd	—	0.014※	0.005	—	0.014※	0.005	
Hg	—	0.14※	0.05	—	0.14※	0.05	
Pb	—	1.5	—	—	1.5	—	Sanitary Standard for Lead and Its Inorganic Compounds in the Atmosphere (GB7355-1987)
HCl	50(one time)	15	—	50(one time)	15	—	Hygienic Standards for the Design of Industrial Enterprises (TJ36-79)
Hydrogen sulfide	10(one time)	—	—	10(one time)	—	—	
Ammonia	200			200			Indoor Air Quality Standard (GB/T18883-2002)
Methyl mercaptan	0.7 (one time)	—	—	0.7 (one time)	—	—	Hygienic Standard for Methyl Mercaptan in Atmosphere of Residential Area (GB18056-2000)
dioxin	—	—	0.6pg-TEQ/m^3	—	—	0.6pg-TEQ/m^3	Japanese Environment Quality Standards
Odor concentration	20 (Non-dimensional)	—	—	20 (Non-dimensional)	—	—	Standard value at plant boundary specified in Emission Standards for Odorous Pollutants (GB14554-93)

※ Based on annual average concentration. The area is divided into different zones, class 1 environmental zone implemented Class 1 standard and class 2 environmental zone implemented Class 2 standard.

(2) Environmental quality standards for surface water

Under normal condition (non-rainy season), industrial and domestic wastewater will be directed to self-constructed sewage plant for centralized treatment, recycled and not discharge outside. Nearby rivers include Danshui River, Huangshatian River and Shanxi River: Shanxi merges into Huangshatian which flows into Danshui.

In rainy season, since reclaimed water will not be recycled in whole, they will be discharged to Shantian Sewage Treatment Plant via municipal sewage pipe network and, after advanced treatment, feeds into Shatian River. The discharge outlet of sewage plant is located at the section of Shatian River (about 3.5km away from Shatian Reservoir), downstream of Shatian Reservoir.

According to the Function Regionalization of Guangdong Province of Surface Water Environment 【YFH [2011], No. 29】, the reach of Danshui River, from boundary of Huiyang to Yonghu Town, covering 29.5km, is planned for industry and agriculture; upstream of the river is called Longgang River, with poor water quality, classified as V, IV in 2015 and III in 2020. No functional zoning is carried out for Huangshatian River and Shanxi River. As specified in **"IV. Achievement and Requirement for Function Regionalization"**: For water environment quality control target of each unlisted upstream and tributary, the environmental quality control target of mainstream should be considered as the minimum requirement and, in principle, the difference between the branch and main stream it feeds into should be no more than one grade." In addition, based on the Environmental Protection Planning of Huizhou (2007-2020), the reach of Danshui River is classified as Category V, and no functional zoning is planned for both Huangshatian River and Shanxi River. According to the Huiyang Bureau of Environment Protection, the surface water is classified as Class III. Construction unit has requested Huiyang Bureau of Environmental Protection to approve the functional zoning of surface water that, the above surface water should be subject to Class III. In conclusion, the above three rivers are all subject to Class III standard specified in the Environmental Quality Standards for Surface Water.

According to the Function Regionalization of Guangdong Province of Surface Water Environment 【YFH, [2011] No. 29】, Shatian Reservoir is designed for "agricultural development" purpose, with water quality goal being Class II, no functional zoning. In addition, the reservoir has been designated by Huizhou as Water Protection Area of Class I. With exception to the reservoir, others are all subject to Class III standard.

Table 1.4-3 Water quality assessment standard (Unit: mg/L, with exception to pH and fecal coliform)

No.	Item	Class II	Class III
2	pH value (Non-dimensional)	6～9	
3	Chemical oxygen demand≤	15	20
4	BOD_5≤	3	4
5	Dissolved oxygen≥	6	5
6	Ammonia nitrogen≤	0.5	1.0

7	Sulfide≤	0.1	0.2
8	Total phosphorus (based on P) ≤	0.1(Lake, reservoir 0.025)	0.2(Lake, reservoir 0.05)
9	Fluoride (Based on F) ≤	1.0	1.0
10	Chrome (hexavalent) ≤	0.05	0.05
11	Volatile phenol≤	0.002	0.005
12	Petroleum≤	0.05	0.05
13	Arsenic≤	0.05	0.05
14	Lead≤	0.01	0.05
15	Mercury≤	0.00005	0.0001
16	Cadmium≤	0.005	0.005
17	Copper≤	1.0	1.0
18	Coliform bacteria (/L) ≤	2000	10000
19	Anionic surfactant≤	0.2	0.2
20	SS*≤	150	150

Note: SS evaluation criterion is referenced to the recommended value specified in Technical Specifications of Environmental Quality Report Compilation issued by SEPA.

(3) Environmental quality standard for underground water

According to the definition of regional underground water functional zoning in Underground Water Function Regionalization of Guangdong Province (Department of Guangdong Province of Water Conservancy), the shallow ground water quality protection target in the assessment area should comply with Class III standard specified in the Environmental Quality Standard for Underground Water (GB/T14848-93).

Table 1.4-4 Quality standards for underground water

No.	Item	Class II	Class III
1	pH	6.5～8.5	6.5～8.5
2	Total hardness (based on $CaCO_3$)（mg/L）	<300	<450
3	Permanganate index（mg/L）	<2.0	<3.0
4	Ammonia nitrogen（mg/L）	<0.02	<0.2
5	Nitrate (based on N)（mg/L）	<5.0	<20
6	Nitrite (based on N)(mg/L）	<0.01	<0.02
7	Sulfate(mg/L）	<150	<250
8	Chloride（mg/L）	<150	<250
9	Zinc（mg/L）	<0.5	<1.0
10	Copper（mg/L）	<0.05	<1.0
11	Lead（mg/L）	<0.01	<0.05
12	Hexavalent chromium（mg/L）	<0.01	<0.05
13	Cadmium（mg/L）	<0.001	<0.01
14	Mercury（mg/L）	<0.0005	<0.001
15	Ferrum（mg/L）	<0.2	<0.3

No.	Item	Class II	Class III
16	Manganese（mg/L）	<0.05	<0.1
17	Arsenic（mg/L）	<0.01	<0.05
18	Total coliform bacteria（mg/L）	≤3.0	<3.0
19	Volatile phenol (based on phenol)（mg/L）	≤0.001	≤0.001

(4) Acoustic environment quality standard

According to Environmental Protection Planning of Huizhou (2007-2020), dwelling environment should meet Class I standard. As to the acoustic environment functional zoning of the project site, plant boundary and nearby residential area, the construction unit has asked the Department of Huiyang of Environmental Protection for suggestions, detailed as below:

Noise at plant boundary will be subject to Class II standard specified in the Emission standard for Industrial Enterprises Noise at Boundary (GB12348-2008) and sensitive areas such as residential areas near the plant, the noise will be subject to Class I standard specified in the Environmental Quality Standard for Noise (GB3096-2008).

(5) Environmental Quality Standard for Soils

The evaluation standard for soil environmental quality will be subject to Class II standard specified in the Environmental Quality Standard for Soils (GB15618-1995). See Table 1.4-5 for each standard value.

There is no national environmental quality standard for dioxin in soil, therefore it is referenced to the concentration reference value specified by Netherland, namely the value specified in 1987: 100ngTEQ/kg for residential and agricultural lands and 10ngTEQ/kg for milk cow pasture.

Table 1.4-5 Environmental Quality Standard Value for Soils

(Unit: mg/kg, with exception to pH and dioxin)

Grade	Class II		
Soil pH value	<6.5	6.5～7.5	>7.5
Cadmium <	0.30	0.30	0.60
Mercury <	0.30	0.50	1.0
Arsenic paddy field<	30	25	20
Arsenic dry land<	40	30	25
Copper farmland<	50	100	100
Copper orchard <	150	200	200
Lead <	250	300	350
Chromium paddy field <	250	300	350
Chromium dry field<	150	200	250

Zinc <	200	250	300
Nickel <	40	50	60
dioxin *	Refer to Dutch standards, residential lands, farmland＜100ng-TEQ/kg		

Note: See reference value specified by Netherlands for dioxin concentration in soil.

(6) Occupational Exposure Limits for Hazardous Agents in the Workplace (GBZ2-2007);

Table below is from《work place harm factors of occupational exposure limit》（GBZ2-2002）;

Heat stress work place limit

Labor strength degree	Open air tempreture in summer(℃)	
	＜30℃	≥30℃
≤15	31	32
～20	30	31
～25	29	30
≥25	28	29

(7) Classification for Hazards of Occupational Exposure to Toxicant (GBZ230- 2010)

Select from《occupational exposure poison damage classification》（GBZ230- 2010）。

Indicator		level			
		I	II	III	IV
Acute toxcity	Inhale LD50, mg/m^3	<200	200-	2000-	>20000
	Contact LD, mg/kg	<100	100-	500-	>2500
	Eat LD50, mg/kg	<25	25-	500-	>5000
Acute toxicity prevalence		severe	fine	occasional	none
Chronic toxicity prevalence		high(>5%)	Disease ratio of <5% and symptoms >20%	symptoms >10%	none
Chronic toxicity result		Fail to cure when stop contact	Curable when stop contact mostly	Curable, no severe impact	Curable, No impact
carcinogenicity		To human body	To human body	To animal	none

1.2.2 Discharge standard of pollutants

(1) Air pollutant emission standard

① Incineration flue gas

The HuizhouWaste-to-Energy Plant in Huiyang District, Huizhou City is subject to EU 2000 release standard in terms of smoke pollutants, detailed in Table 1.4-7. The standard provides higher requirement than national standard (GB18485-2001) and international exposure draft.

Table 1.4-7 Applicable standard for releasing flue gas from waste incineration (mg/m^3)

Pollutants	Unit	（GB18485-2001）Standard for Pollution Control on the Municipal Solid Waste Incineration	Standard for Pollution Control on the Municipal Solid Waste Incineration exposure draft (2010)	EU 2000 (30min~8h)
Smoke (measured average value)	mg/Nm^3	80	20	10
HCl (hourly average value)	mg/Nm^3	75	60	10
SO_2 (hourly average value)	mg/Nm^3	260	100	50
NOx (hourly average value)	mg/Nm^3	400	250	200
CO	mg/Nm^3	150	100	50
Hg (measured average value)	mg/Nm^3	0.2	0.05	0.05
Cd	mg/Nm^3	0.1	0.0 5(cadmium +thallium)	0.05 (cadmium +thallium)
Pb	mg/Nm^3	1.6	1.0 (lead+ others)	0.5 (lead+ others)
Dioxin (measured average value)	$ngTEQ/Nm^3$	0.1	0.1	0.1

Note: 1) Each standard limit value in the table is based on dry flue gas containing 11% of O_2 under standard condition;

2) The maximum blackness time of flue gas within any 1h should not exceed 5min accumulatively.

② Odor

Standard value of odor by fugitive emission at plant boundary should be subject to the Emission Standards for Odorous Pollutants (GB14554-93). Pollution factors for odor in the project mainly include hydrogen sulfide, ammonia gas and odor concentration. See Table 1.4-8 for standard value.

Table 1.4-8 Standard value of odorous pollutants at plant boundary Unit: mg/m^3

No	Control items	Class II (Newly built, expanded and reconstructed)
1	Hydrogen sulfide	0.06

2	Ammonia gas	1.5
3	Odor concentration (Non-dimensional)	20

(2) Discharge standard for water pollutants

According to engineering analysis, the waste leachate, production and domestic wastewater generated by the project will be treated by leachate treatment system of the "Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City", the effluent after treatment will reach the Class I standard (2nd Period) of Urban Non-drinking Water Quality for Reuse of Recycled Urban Wastewater (GB/T18920-2002), the Industrial Water Quality for Reuse of Recycled Urban Wastewater (GB/T19923-2005), Discharge Limits of Water Pollutants (DB4426-2001) and the Class I standard of Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008) (subject to the strictest one).

Effluent after treatment should, after reuse of recycled water, reach relevant regulatory requirements in the Industrial Water Quality for Reuse of Recycled Urban Wastewater (GB/T19923-2005) and then discharged to reuse water system. Generally, the factory will not discharge any wastewater.

See Table 1.4-9 for standard discharge value of effluent from landfill leachate treatment station and reclaimed water treatment devices.

Table 1.4-9 Standard discharge value of effluent from landfill leachate treatment station and reclaimed water treatment devices (Unit: mg/L, with exception to pH)

No.	Item	Urban Non-drinking Water Quality for Reuse of Recycled Urban Wastewater（GB/T18920-2002）	Industrial Water Quality for Reuse of Recycled Urban Wastewater(GB/T19923-2005）	Class I standard (2nd Period) of Discharge Limits of Water Pollutants (DB4426-2001)	Pollution Control Standard for Municipal Solid Waste Landfill GB16889-2008）	Applicable standard (subject to the strictest one)
1	COD	—	60	40	100	40
2	BOD_5	20	10	20	30	10
3	NH_3-N	20	10	10	25	10
4	SS	—	30	20	30	20
5	Chroma	30	30	40	40	30
6	Petroleum	—	1	5	—	1
7	Total phosphorus	—	1	0.5	3	0.5
8	Total mercury	—		0.05	0.001	0.001

No.	Item	Urban Non-drinking Water Quality for Reuse of Recycled Urban Wastewater（GB/T18920-2002）	Industrial Water Quality for Reuse of Recycled Urban Wastewater(GB/T19923-2005）	Class I standard (2nd Period) of Discharge Limits of Water Pollutants (DB4426-2001)	Pollution Control Standard for Municipal Solid Waste Landfill GB16889-2008）	Applicable standard (subject to the strictest one)
9	Total cadmium	—		0.1	0.01	0.01
10	Total chrome	—		1.5	0.1	0.1
11	Hexavalent chromium	—		0.5	0.05	0.05
12	Total arsenic	—		0.5	0.1	0.1
13	Total lead	—		1.0	0.1	0.1
14	Number of fecal coliforms	3	2000	—	10000	3

(3) Noise emission standard

Noise at site boundary during construction period should be subject to the Emission Standard of Environment Noise for Boundary of Construction Site; during operation period, the noise at plant boundary should be subject to the Notice on Environmental Impact Assessment Executive Standard for Application Report on Huizhou Waste-to-Energy Plant in Huiyang District, Huizhou City, and the noise at boundary of municipal solid waste incineration power generation plant should be subject to Class II standard specified in the Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-2008), detailed in Table 1.4-10 and 1.4-11.

Table 1.4-10 Standard noise limit at boundary of construction site

Unit: dB (A)

Daytime	Night
70	55

Table 1.4-11 Standard noise limit at plant boundary during operation period

Unit: dB (A)

Type of functional zone	Daytime	Night
2	60	50

(4) Solid waste control standard

The project complies with the standards below:

① Standard for Pollution Control on the Municipal Solid Waste Incineration

(GB18485-2001);

This standard included the requirements of the site location, technology, waste, operation, emission and monitoring. And it sets up the flue gas emission limit such as dioxin, heavy metal, SO2 and HCl for the WTE project.

② Standards for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001);

This standard included the requirements of the industry solid waste storage, site location, design and operation.

③ Standard for Pollution Control on the Municipal Solid Waste Storage (GB18597-2001); This standard included the requirements of the municipal solid waste storage, site location, design and operation.

④ Standard for Pollution Control on Hazardous Waste Storage (GB18596－2001); This standard included the requirements of the Hazardous Waste storage, site location, design and operation.

⑤ Pollution Control Standard for Municipal Solid Waste Landfill; This standard included the requirements of the site location, technology, waste, operation, emission and monitoring. And it sets up the flue gas emission limit such as dioxin, heavy metal, SO2 and HCl for the landfill

1.2.3 Identification of environmental impact factors and screening of evaluation factors

See Table 1.7-1 for identification of environmental impact during construction; and see Table 1.7-2 for identification of environmental impact during operation and evaluation factor screening.

Table 1.7-1 Identification matrix of environmental impact during construction

Potential Impact	Transport of building materials	Field construction	Domestic and construction wastewater
soil	●	★	none
surface water	none	•	none
groundwater	none	none	none
air	●	●	none
noise	●	●	none
social	●	●	none

Note: Symbol ★/● in the table means long/short-term adverse impact.

Table 1.7-2 Identification of environmental impact during operation and evaluation factor screening

Project composition	Equipment (facility)	Environmental impact factor	Evaluation factor
Main work	Incinerator and boiler waste tank	Emission of flue gas, odorous pollutants	Environment protection distance of SO_2, NO_2 and TSP, PM_{10}, dioxins, HCl, Pb, Hg, Cd, odorous pollutants and surrounding sensitive areas
		Equipment running noise	Noise (A sound level)
	Turbine and cooling system	Turbine running	Noise
		Cooling tower sprinkling	Noise
		Cooling fan running in air cooling system	Noise
	Generator	Equipment running noise	Noise
Environmental protection engineering	Wastewater treatment station (rely on leachate treatment station of landfill)	Industrial wastewater and waste leachate	pH, COD, BOD, SS, NH3-N and petroleum
		Domestic sewage	COD、BOD、SS、NH_3-N
	Solid waste treatment	Impact of fly ash and slag on surrounding environment	Fly ash and slag

Assessment factors for the project include:

(1) Atmospheric environment

Current situation assessment factors: SO_2, NO_2, PM_{10}, dioxins, HCl, Hg, Cd, Pb, TSP, H_2S, NH_3 and odor concentration.

Prediction assessment factors: SO_2, NO_2, PM_{10}, HCl, dioxin, Hg, Cd, Pb and H_2S, NH_3.

Total quantity control factors: SO_2 and NO_x.

(2) Surface water environment

Current situation assessment factors for water quality: pH, DO, SS and COD_{Cr}, BOD_5, petroleum, ammonia nitrogen, total phosphorus, mercury, cadmium, lead and fecal coliform.

(3) Underground water environment

Current situation assessment factors: pH value, turbidity, total hardness, permanganate index, sulfate, volatile phenol, ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, total coliforms, cadmium, hexavalent chromium, mercury, arsenic, lead, cyanide, copper, nickel and zinc.

Prediction assessment factor: COD.

(4) Acoustic environment

The present and predicative assessment factor is equivalent continuous sound level Leq (A).

(5) Ecological environment

Ecology assessment factors: know the plant and animal sources in the project site.

(6) Soil and plant environment

Soil assessment factors: Cu, Zn, Pb, As, Cd, Hg, pH and dioxins.

Heavy metal assessment factors for plant sample: Cu, Zn, Pb, As, Cd, Hg, pH and dioxins.

(7) Environmental risk assessment

Atmospheric environment risk assessment factors: dioxin, heavy metals, odor.

Chapter II Project overview and engineering analysis

2.1 Project background

With the high-speed development of national economy and the improvement of people's living standard, municipal solid waste problem has become increasingly prominent, and the increasing domestic waste has been a great public hazard to daily life of residents, also a serious threat to human living space.

The project is located at LanzilongVillage, Shatian Town, Huiyang District, Huizhou City, Guangdong Province. Huiyang, the county was established as a city on May 1994 and become a district of Huizhou City on June 2003. At present, the district includes 2 subdistrict offices, Danshui and Qiuchang, 6 towns (Xinxu, Zhenlong, Shatian, Yonghu, Liangjin and Pingtan) and Huiyang Economic Development Zone, 102 administrative villages, covering 915.54 km^2. By 2010, the district has a permanent resident population of 572,000 and compared with 2000, increased by 102,000, up by 21.67%, an average annual growth rate of 1.98%. Along with increasing population, municipal solid wastes in the district have also skyrocketed.

Municipal solid wastes in Huiyang are mainly sanitarily landfilled. The only refuse landfill is Shanziding Municipal Solid Waste Landfill, which has run more than two decades since 1990, exceeded its service period. Due to poor planning in early construction, the landfill has issues in pollution and safety hazards to some extent because of its imperfect seepage proofing, sewage collection and treatment system. Meanwhile, along with economic development in Huiyang, increasing external population and the continuous improvement of municipal solid waste collection and transportation system, both the waste quantity and transport quantity have been far beyond expectation, up to 800t/d and in such a case, Shanziding Municipal Solid Waste Landfill has failed to meet the demand to dispose the increasing wastes.

To cope with the municipal solid wastes in Huiyang District and Daya Bay Economic and Technological Development zone, Huiyang Department of Sanitation has, by tendering and bidding through BOT, commissioned Huizhou Dynagreen Environmental Protection Co., Ltd. to construct the Huizhou Waste-to-Energy Plant in Huiyang District.

The Huizhou Waste-to-Energy Plant in Huiyang District is designed with daily average treatment of municipal solid wastes (3*400) 1,200t, annual treatment of wastes 438,000t, equipped with 3x400t/d mechanical grate boilers and 2 straight condensing turbine generator sets (1*15MW+1*9MW). It is composed of the waste receiving and unloading system, waste incineration disposal system, the combustion air system, flue gas treatment system and steam turbine system, in addition to ash system, compressed air system, electrical system, instrumentation and control system, chemical water purification system, water supply system, sewage system, environmental protection and plant production workshop and office and other auxiliary engineering systems.

The project is classified as the one encouraged by the state for comprehensive utilization of "three wastes" (waste gas, wastewater and industrial residue) and disposal treatment engineering. As specified in the Environmental Protection Law of PRC, Environmental Impact Assessment Law of PRC, Administrative Regulations for Environmental Protection in Construction Project (Decree No. 253 of the State Council) and Management Regulation of Guangdong Province on Environmental Protection Management for Construction Projects: "Environmental impact report system shall apply to all construction projects that may cause environmental impact during construction or after putting into operation ".

For this purpose, Huizhou Dynagreen Environmental Protection Co., Ltd. commissioned South China Institute of Environmental Sciences, MEP to conduct environmental impact assessment on the Huizhou Waste-to-Energy Plant in Huiyang District. The institute has, based on material investigation, site survey and current situation monitoring, prepared the Environmental Impact Report (EIR) on Huizhou Waste-to-Energy Plant in Huiyang District in accordance with national administrative laws and regulations and technical specifications relating to environmental impact assessment. This initial environmental examination (IEE) is prepared to comply with the requirements of ADB's Safeguard Policy Statement (2009).

2.2 Project overview

2.2.1 Project name, site and nature

(1) Project name: Huizhou Waste-to-Energy Plant

(2) Construction unit: Huizhou Dynagreen Environmental Protection Co., Ltd.

(3) Construction site: Lanzilong, Shatian Town, Huiyang District, Huizhou.

(4) Nature: new construction.

(5) Project investment: total investment: RMB 598,639,900 yuan.

2.2.2 Scale of construction and service scope

(1) Scale of construction

Daily average treatment of municipal solid wastes 1,200t, annual treatment of wastes 438,000t, equipped with 3x400t/d mechanical grate boilers and 2 straight condensing turbine generator sets (1*15MW+1*9MW).

(2) Service scope

The planned project service area includes Huiyang District and Daya Bay Economic Development Zone.

(3) Annual working hours and staffing

(4) Each workshop runs on three-shift system, and operators will work in four shifts. The factory has 80 workers, with annual working hours more than 8,000h. The project is to be put into service in 2015.

(5) Characterization of the waste

The waste characteristics analyses are carried out by qualified Guangzhou Institute of Energy. The result shows that the waste heat value of the area is between 4614.37~4892.87 kJ/kg, which is slightly lower than normal but comply with the incinerator design heat value.

2.3 Major construction contents

2.3.1 Project composition

The waste incineration power project is mainly composed of the following systems: the waste receiving, storage and transport system, waste-heat utilization system, flue gas treatment system, ash collection and treatment system, boiler feed water treatment system, induced air and ventilation system, leachate treatment system, and other auxiliary engineering constructions.

See Table 3.2-1 for major engineering composition.

Table 3.2-1 Project composition

<table>
<tr><td colspan="2">Project name</td><td colspan="3">Huizhou Waste-to-Energy Plant in Huiyang District, Huizhou</td></tr>
<tr><td colspan="2">Construction unit</td><td colspan="3">Huizhou Dynagreen Environmental Protection Co., Ltd.</td></tr>
<tr><td colspan="2">Total investment</td><td colspan="3">RMB 598,639,900 yuan</td></tr>
<tr><td colspan="2">Construction site</td><td colspan="3">Lanzilong, Shatian Town, Huiyang District, Huizhou</td></tr>
<tr><td colspan="2">Nature</td><td>New construction</td><td>Scale</td><td>Daily average treatment 1200t/d</td></tr>
<tr><td colspan="2">Planned operation time</td><td colspan="3">March 2015</td></tr>
<tr><td rowspan="4">Main work</td><td>Item</td><td colspan="2">Capacity per unit and number of units</td><td>Total capacity</td></tr>
<tr><td>Boiler</td><td colspan="2">3×400t/d mechanical fire grate incinerator</td><td>1200t/d</td></tr>
<tr><td>Turbine</td><td colspan="2">1*15MW+1*9MW</td><td>24MW</td></tr>
<tr><td>Generator</td><td colspan="2">1*15MW+1*9MW</td><td>24MW</td></tr>
<tr><td rowspan="2">Auxiliary construction</td><td>Waste transport</td><td colspan="3">Wastes are collected and received by environmental sanitation departments of Huiyang District and Daya Bay Economic Zone.</td></tr>
<tr><td>Water supply system</td><td colspan="3">Water in the plant includes industrial water and domestic water. Industrial water comes from the reclaimed water from Huiyang domestic sewage treatment plant, and the domestic water and boiler supply water comes from municipal tap water. Daily water consumption is about $4648m^3/d$, including production water consumption $4632m^3/d$ and domestic water consumption about $16m^3/d$.</td></tr>
</table>

	Waste storage pit	The plant covers floor space of $57x22.4m^2$, capable of storing 6900t of wastes for about 6 days of waste incineration need.
	Ash warehouse	The plant is equipped with an ash warehouse with capacity of $150m^3$, capable of accommodating storage capacity of about 3 days.
	Slag storage	The plant is equipped with a slag pit, covering 4m×43.6m, 4m in depth, capable of accommodating slag of about 2 days.
Environmental protection project	Flue gas cleaning	Technological process "In-boiler SNCR denitration + half-dry reaction tower +activated carbon adsorption＋bag filter" is adopted, in line with EU 2000.
	Fugitive deodorization system	Enclosed garbage trucks are used; extract gas from waste pit and take them as combustion air, so as to form negative pressure within pit and prevent odor leakage; The waste dumping platform is designed with automatic door which will, during waste dumping, automatically open and, after dumping, automatically close; the discharge hall door is provided with air curtain. During boiler shutdown or overhaul, the waste pit should discharge gas after deodorization treatment, with 1-1.5 times of ventilation per hour. Activated carbon is used for purification devices.
	Sewage treatment	1. The leachate, cleaning waste water generated by the project will be sent to the leachate disposal system. After the treatment, the output water is called middle water (those water are used for industry, not for domestic) the middle water will be sent back to our recycle stream for further use. 2. The domestic water generated by the workers will be sent to the sewage treatment system of the company. After treatment, it is also sent back to the recycle stream. 3. All the other waste water qualified the middle water standards will be sent directly to the recycle stream.
	Fly ash treatment	Fly ash is considered as hazardous waste. It will be solidified and subject to leaching toxicity test. Fly ash compliant with GB16889-2008 will be transported to landfill to bury in different sections and those not compliant with GB16889-2008 will be safely disposed by Huizhou Dongjiang Veolia Environmental Services Ltd.
	Slag treatment	Slag produced by the project is used comprehensively in the plant and used for brick-making.

	Underground water pollution prevention and control measures	Factory production equipment, auxiliary facilities and utilities facilities, in terms of layout, should be classified according to the possibility of leakage of pollutants into general pollution control area, the key pollution control area and non pollution area. General pollution control area includes life service area, complex building, incineration and flue gas purification, such as turbine room; Key pollution control area includes workshops involved with pollution such as the cesspit, discharge platform, fly ash, solidification station, ash comprehensive treatment station, and sewage treatment station.
Living facility		Complex building

2.3.2 General layout

The general layout mainly considers the requirement of technological process, the reasonable use of land, combines with the existing site natural conditions, make transportation routes and lines smooth, and coordinates with the original building and structures, and satisfies the production and fire safety requirements. Based on the design idea, main building is built in the center of the campus. From northeast to southwest, in order, there are waste unloading hall, boiler room, flue gas treatment, waste storage pit, chimneys. Turbine room, control room, transformer room are arranged in the east of the plant. Approach bridge is at the northwest side of main factory building. Comprehensive water pump house and cooling tower sits at the southwest side of the main building; the landfill leachate treatment station lies in the west of the main building.

In combination with production technology, transportation, flood control and drainage, construction general layout design, as well as lighting and ventilation requirements, and in light of adaptation to local conditions, saving of construction investment and convenient construction, gentle slope type of vertical arrangement should be accepted and the ground elevation of major process workshops and auxiliary workshop is 104m.

See Attachment 6 for general layout drawing, and see Table 3.3-1 for each building structures. Both leachate treatment station and weighbridge room, which are owned by the landfill, are not listed in the table. The marsh gas power generation plant in the general layout is a part of long-term planning and will be subject to environmental impact assessment separately.

Table 3.3-1 List of building structures

No.	Subitem	Fire risk classification	Fire resistance rating	Number of floor	Floor space	Building area/ plot ratio	Building height
					(㎡)	(㎡)	(m)
1	Main workshop (including discharge hall, waste storage pit, boiler and flue gas treatment room)	IV	II	5	10902.5	19630.2	~50
2	Chimney						~80
3	Slope		II	/	900		7
4	Integrated water pump house	V	II	1	1195	459	6.2
5	Cooling tower	V	II	/	1078		10.2
6	Guard room and archway		II	2	60	120	4.3
7	Fly ash solidification workshop	V	II	1	1650	1650	/
8	Booster station	V	II	1	25	625	6.3
9	Hot water station	V	II	1	432.2	432.2	6.3
10	Maintenance center and vehicle cleaning center	V	II	1	1632.5	1632.5	6.3
11	Complex building		II	4	1232.5	2465	12
12	Office building		II	3	1937.8	3875.6	12
13	Low-carbon building		II	3	428	428	9
14	Metal sorting workshop	V	II	1	1500	1500	6.3
15	Slag brick-making plant	V	II	1	1000	1000	6.3
16	Comprehensive utilization center of slag resource		II	1	1500	1500	6.3
17	Research and development & training center		II	1	2740.3	2350	7.2
18	Dormitory building		II	1	1044.6	2650	6.3
	Total				31958.4		

NOTE: In order to keep the buildings safe, the proper fire prevention measues must be adopted. The Fire resistance rating represents the fire resistance level. Generally, the fire resistance ranks into 4 class, from high to low.

2.4 Engineering analysis

The technological process of the plant includes waste receiving, incineration and waste heat utilization, flue gas purification, leachate treatment system, ash collection and processing.

(1) Fuel reception, storage and transport system

Garbage truck enters into plant and, after being weighed by weighbridge, drives to waste discharge hall and dumps wastes to the pit.

Discharge hall: ground elevation 7.0m, ceiling elevation 16.5m, width 22m, length 69m, capable of providing a radius of 2~3 times the largest truck's turning circle. Discharge platform unloading hall is fully enclosed, doors and windows are designed to be airtight, prevent gas from leaking out, and channels are designed to connect with other areas of the factory. Discharge hall is designed with sewage ditches to gather waste leachate from transport vehicles and lead them to leachate collecting tank, pumped to leachate treatment system at landfill.

Dump door: to prevent spread of noise, odor and dust to outside from waste storage pit, the dump door has airtight design, resistance to abrasion and striking. Doors, 6 in total, are also designed to open and close by automatic control.

Waste storage pit: it is designed to have reinforced concrete structure, semi-underground, covering 57x22.4m^2, capable of storing 6900t of wastes, for incineration of about 6 days. Air inside the pit is extracted by primary fan to incinerator so as to control odor emission and accumulation of methane gas and keep the pit under negative pressure. Suction opening is located on the top of pit, the extracted air is used as combustion air for incinerator, and the collected leachate is directed to leachate collecting tank and then pumped to leachate treatment system at landfill.

Because of high moisture content, water would seep from the trash during storage, so the landfill design must be appropriate to guide waste leachate. The bottom should have seepage-proof design, 2% longitudinal slope, and the bottom of front wall of pit should be equipped with stainless steel grids so as to drain waste leachate to collecting tank. The tank is designed with effective volume of 400m^3, capable of accommodating leachate of 3 days.

To protect concrete wall against leachate corrosion, waste storage pit, leachate collecting grooves and tank should be subject to heavy-duty anti-corrosion treatment. In addition, both leachate collecting grooves and tank are installed with air suction device to keep out odor during maintenance.

Camera is equipped at proper position of pit to facilitate monitoring pit operation and sending signal to the central control room.

The project is provided with batching and blending system. Wastes entering the factory will be subject to leachate dehydration, grabbing and mixing and upending, so as to assure complete mixing of different wastes, stable heat value inside boiler, and allow a slower advancing speed of wastes in the incinerator and longer combustion time, therefore it provides a certain period to adapt to waste heat fluctuation and for operators to make adjustment.

(2) Auxiliary ignition and gas system

Ignition system is composed of gas system, boiler burner, ignition device, flame detector and corresponding controller and safety protection devices.

Gas system is formed by diesel fuel and pressure transformation station. Pipelines are connected to the place near boiler burner.

(3) Technological process of combustion system and waste heat power generation

Wastes entering storage pit will be kept about 2-5 days and, after bleeding moisture, delivered by waste grab bucket at the top of storage pit to the feed hopper of incinerator and to fire grate for combustion.

Combustion air necessary for waste incineration may be classified into the primary air and secondary air by its different function. Primary air is extracted from waste storage pit so as to keep the pit under negative pressure and prevent odor leakage. The primary air, after fan pressurization, flows through the boiler tail steam-air pre-heater and is heated up to about 80℃, into the bottom of incinerator fire grate. Secondary air is fed by the secondary air fan, from automatic workshop. Secondary air will, after secondary fan pressurization, be directly delivered to combustion chamber via secondary air inlet, to supplement necessary air and conduct combustion adjustment.

Fuel gas is required to facilitate combustion while boiler is ignited and after meeting self-combustion conditions, fuel gas supply will be stopped. Fuel gas flows to gas burner via pipelines and through pressure transformation station.

Flue gas from waste incineration, after passing through the tail heating surface of boiler (superheater, boiler steam generating bank, economizer and air pre-heater) , is reduced to 200℃ and then flows to flue gas cleaning system. Each incinerator is provided with one set of flue gas cleaning device, 3 in total.

The heat generated by waste incineration will reach 4.0MPa after absorbed by heat recovery boiler. A 450℃ superheated steam is provided to turbine generator set for power generation. The operation of the plant will use approximately 15% of the generated electricity and the remaining power generated will be sent to the power grid. The annual total power generated by the Huizhou project is 85000 MW.

Dead steam from turbine, after being condensed by condenser and heated by multistage surface heat exchanger, will enter deaerator and, along with makeup water subject to desalination, be delivered to the heat recovery boiler drum. Cooling water from condenser can be recycled, and underground water is provided for production purpose.

Product link analysis:

Wastes are delivered to storage pit by vehicles and, after holding for a period, generate leachate W1, about 15% of the total waste treatment capacity, namely 180t/d. After wastes enter incinerator, G1 flue gas subject to denitration is sprinkled into urea boiler and, after passing through flue gas cleaning system, discharged by 80m chimney.

The project is provided with 3×400t/d mechanical fire grate incinerator, separate flue gas treatment system, three-tube sleeve type chimney with inner diameter of 1.8m. Flue gas after treatment is discharged by chimney.

Fly ash generated by bag filter in flue gas cleaning system, ash discharged by rear smoke channel and by quench tower are classified as the S1 fly ash generated by incineration and, after adding 29% of cement, 2% coupling agent, can be solidified into S2 fly ash.

Slag discharged by incinerator is classified as S3 slag and used for brick-making.

The boiler's water demineralization and softening equipment provides soft water for boiler steam, and the reverse osmosis process of chemical water equipment generates W3 water concentrates and acid-base W2 residual liquid.

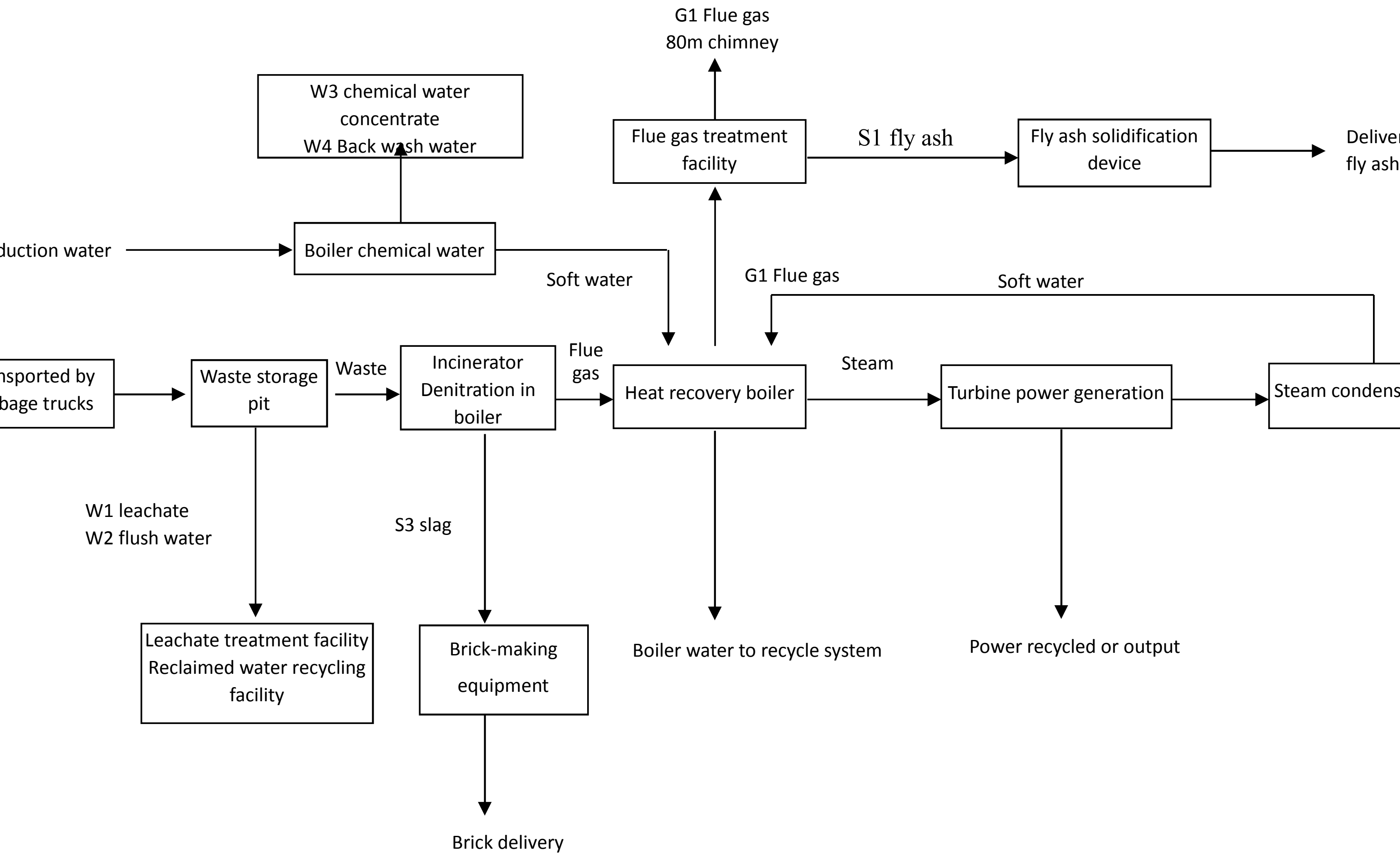


Figure 4.6-1 Concise technological process chart

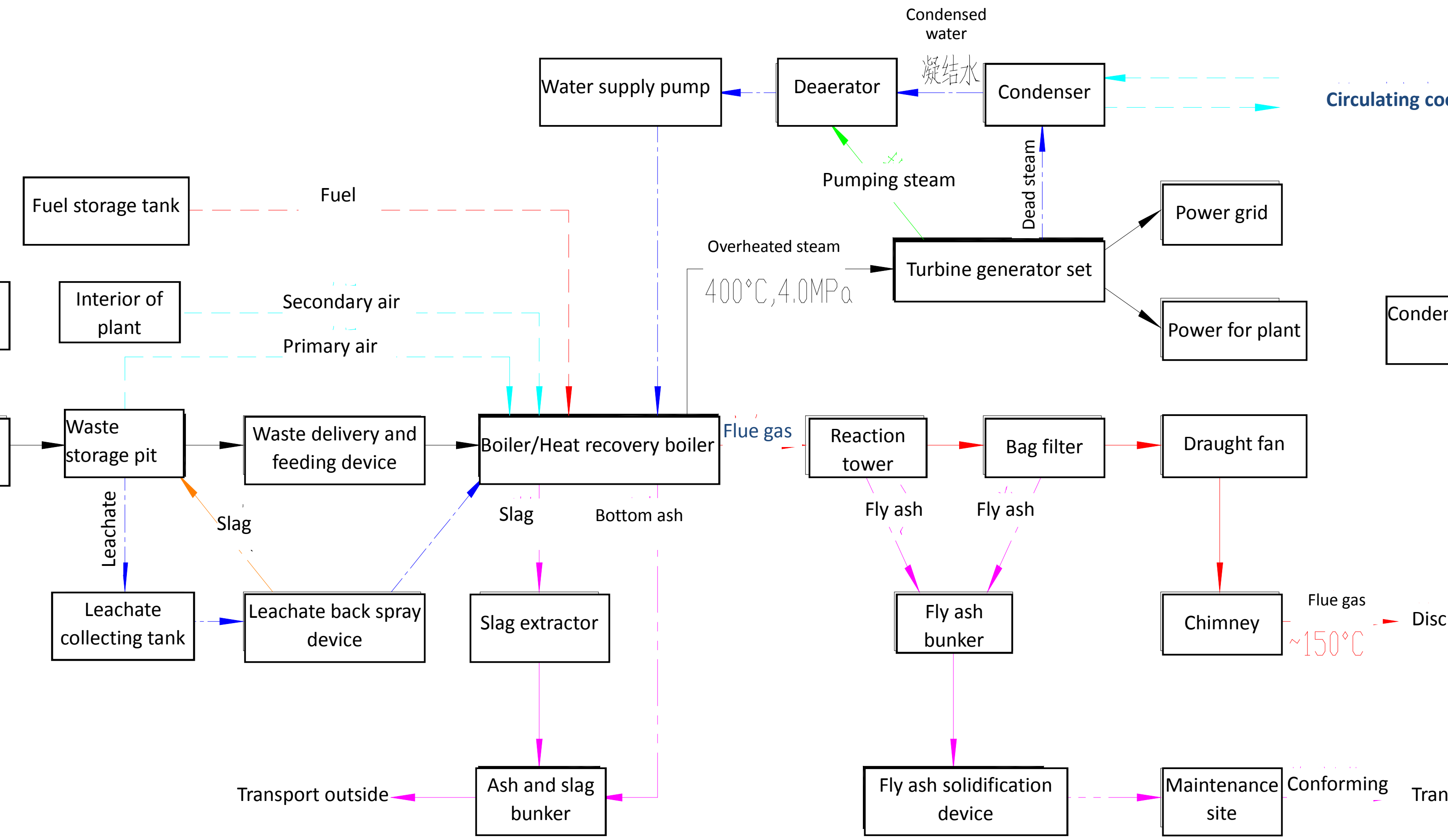


Figure 4.6-2 Technological process flow diagram

(2) Technological process of comprehensive ash and slag treatment and products

① Slag for brick-making

Mechanical slag removal is adopted for the incinerator plant to allow bottom ash from boiler to cool down in water tank of submerged scraper conveyor and, after moving out, is directly discharged to slag pit. After being picked by grab crane, slag is transported directly by slag vehicles to brick-making system.

After mixing cement, slag and sands with a certain percentage by adding water, the mixture is press-formed; after forming, the mixture is placed inside the curing room about 16-20h (depending on temperature), and is formed into bricks.

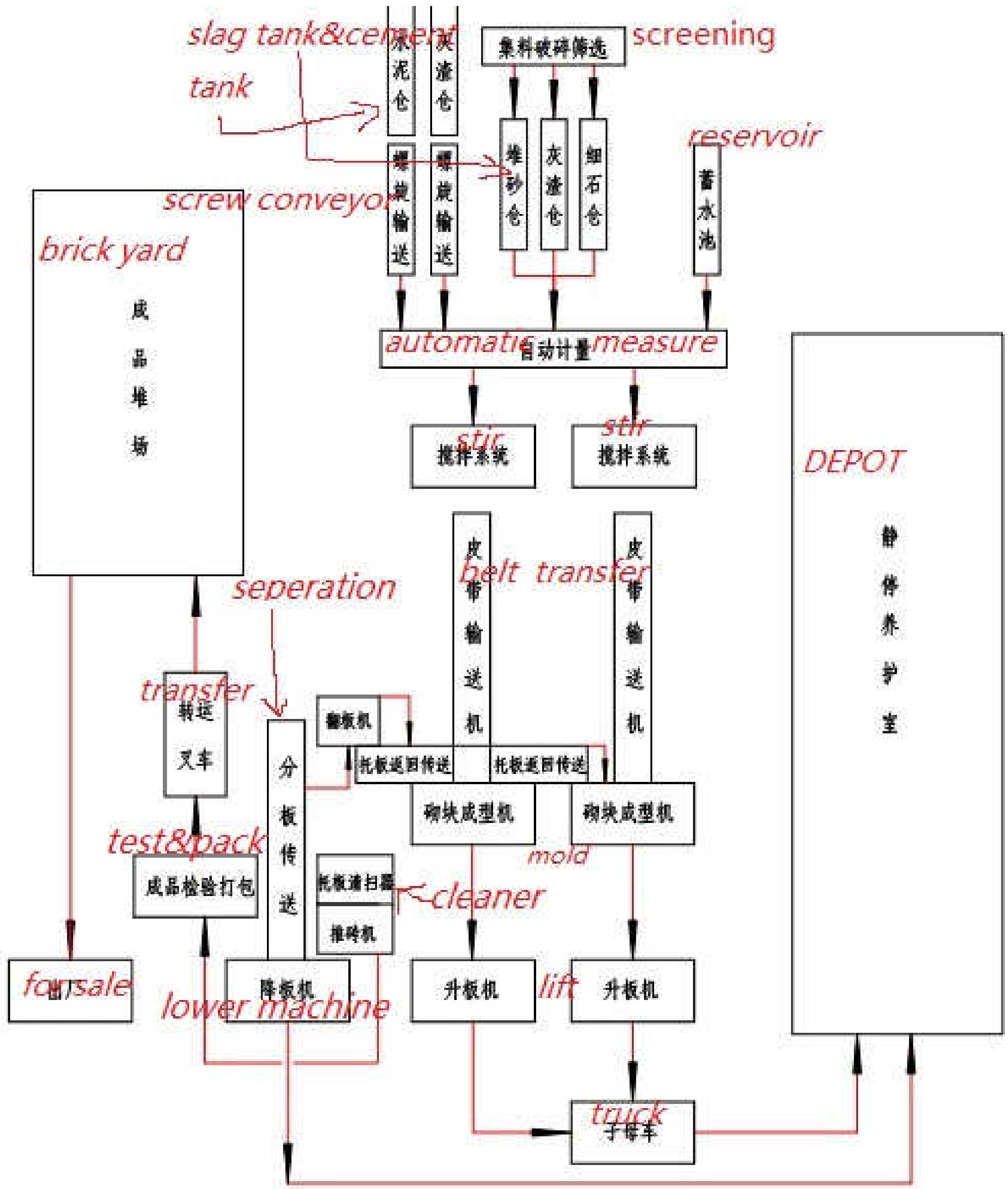


Figure 4.6-3 Technological process of slag brick-making system

Pollution-causing link: brick-making system has 1% of metal separation rate, and the metal is sold as scrap metal; spiral transport of cements is conducted in an enclosed system, and since slag has quite high moisture content, rarely causing fugitive dust during baking process, and compared with slag brick-making plant of similar projects, the whole process will generate less pollutants with exception to some metals separation and small amount of fugitive dust.

Figure 4.6-4 Brick-making site of similar projects

②Fly ash solidification

Composition of fly ash: including ash discharged from rear smoke channel of boiler, from semi-dry absorption tower and dust remover. For removal of ash from boiler tail, embedded scraper conveyor is used to discharge ash to the tail of incinerator and the ash is discharged to slag pit along with bottom slag; fly ash from semi-dry absorption tower and bag precipitator ash hopper is delivered by pneumatic conveying system into curing workshop located within the plant for curing processing.

Both cement and coagulant are delivered to cement bin by means of pneumatic transmission. Fly ash and reactants stored in ash bin are mixed with cement and coagulants according to a certain proportion and delivered to mixing hopper via ash discharge valve and, after mixing in the vibration mixing hopper, transported via feed valve to forming machine. During forming, ash is added with water gradually for molding and curing.

Fly ash solidification room can be divided into ash storage area, cement storage area, mixing area and storage area for cement solidification blocks.

Bulk fly ash and cement will be delivered by special vehicles to the workshop and separately storage in each corresponding area. For cement solidification, fly ash, by products and cement will be transported by small carts to the place near mixer. Fly ash and cement are manually mixed with the ratio of 4: 1 after adding proper quantity of chelating agents. Local ventilation is designed on the top of material hopper. Mixture is delivered by lift to material hopper of mixer, adding water from water tank, mixing 10s, and cement solidification blocks will automatically flow out, which are transported by loader to the specific storage area.

See following Figure 4.6-3 for cement solidification process. See Figure 4.6-4 for layout of fly ash solidification workshop.

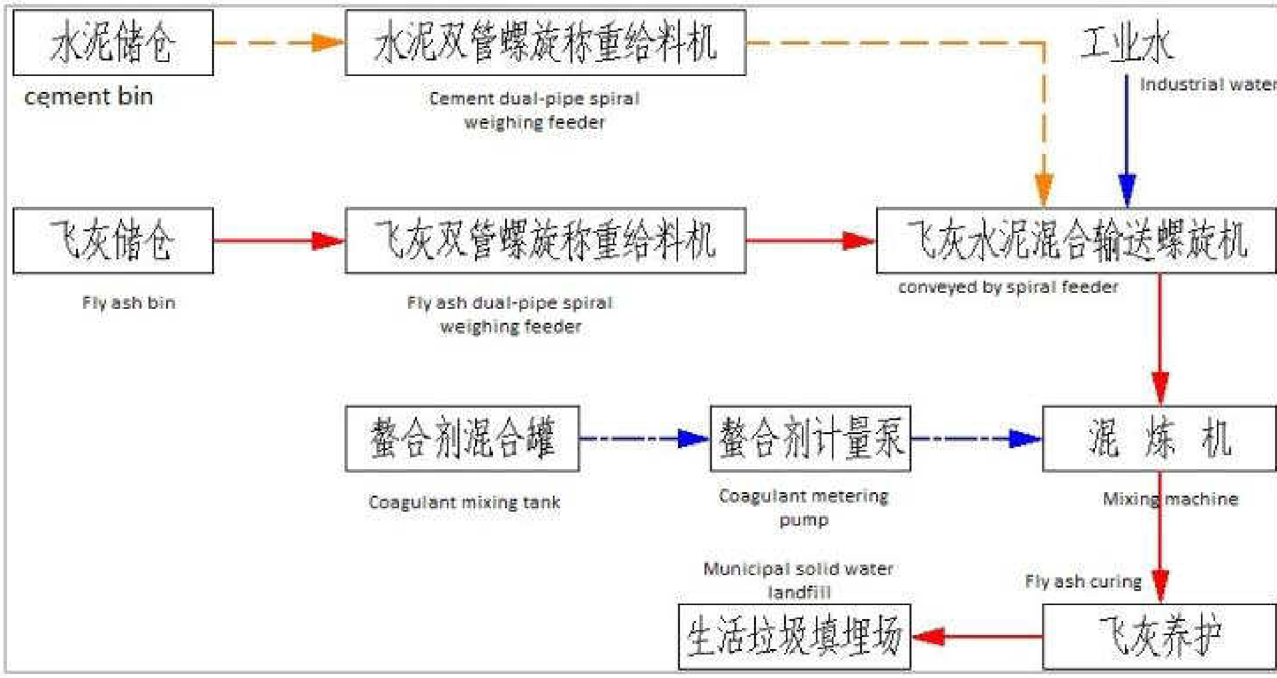


Figure 4.6-3 Cement solidification process

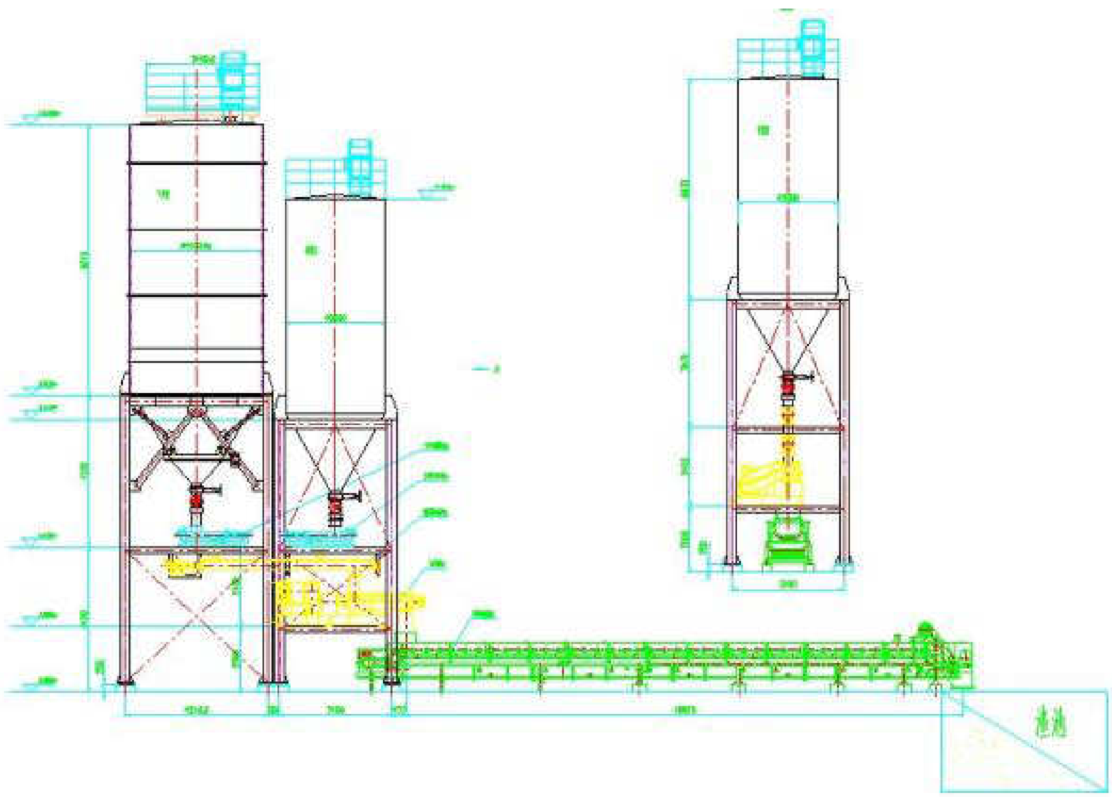


Figure 4.6-4 Layout of fly ash solidification workshop.

Chapter III Site selection

3.1 Comparison analysis of project site selection

3.1.1 Requirement for site selection

As indicated in the Notice of Strengthening Management of Environmental Impact Assessment for Biomass Power Generation Projects, issued by Ministry of Environmental Protection, NDRC and National Energy Administration, HF [2008] No. 82, requirements for Waste-to-Energy Project site selection are described as below :

(1) The site must comply with the overall planning, land use planning and special environmental health planning (or planning for municipal solid waste disposal) of the city;

(2) Site selection must comply with relevant requirements specified in Code for Planning of Urban Environmental Sanitation Facilities (GB50337-2003), the municipal solid waste incineration plant should be located at or beyond the edge of urban planning construction area.

(3) Site selection must comply with relevant requirements specified in Technical Specifications for Municipal Solid Waste Incineration (CJJ90-2002):

a. Site should meet the geological conditions for construction and hydrogeologic conditions, not be located at areas with risks of faults, landslides, mudslides, swamps, quicksand and the mining subsidence area;

b. The site should be free from floods, tidewater or water logging, and provided with reliable flood control and drainage measures;

c. Good traffic condition must be available between the site and service area;

d. Confirm the site for disposal of slag and fly ash while selecting plant site;

e. Availability of necessary water supply source for production and living requirement and sewage discharge facilities;

f. Availability of necessary power connection which should be easily accessible to local power grid.

(4) Requirement for site selection specified in Technical Guide for Domestic Refuse Disposal (JC) [2010] 61:

The site should comply with relevant national and industrial standards.

(5) Other regulations: in addition to regions prescribed by national and local regulations, standards and policies that are forbidden to be project site with pollution, the following

regions should generally also not be the project site for municipal solid waste incineration power generation:

a. Urban built-up area;

b. Regions that fail to meet environmental quality requirements and have no effective correction measures;

c. Regions that may cause environmental protection target in sensitive area to fail to meet relevant standard requirements.

3.1.2 Comparison analysis of multiple plant sites

According to development planning, and based on site survey by Huiyang District government, planning bureau, land and resources bureau, department of environmental protection and the construction bureau of Huiyang district, three sites are available, detailed in Figure 2.1-1 and Attachment 7.

Site 1: Shuikou Village, Shatian Town

Site features are described as below:

(1) Transport and distance to urban area: about 1km away from Danshui, 5km from Shantian Town, a 4m wide dirt road is available, about 2.5km away from existing roads of Shatian. It has quite long transport distance, while within reasonable scope and less impact on urban area.

(2) Environmental protection: located in a mountainous area, surrounded by mountains, only gullies available, less cultivated lands nearby, but Huangsha Reservoir is directly located downstream.

(3) Site construction: suitable for landfill construction, provided with large capacity, less requirement for engineering facilities and work amount, covering about 500mu, expected a service period of 30 years. While, on the other hand, it is required to conduct land requisition for office purpose and other auxiliary facilities, both the large investment in water and power supply would impose great difficulty to the site construction.

(4) Land acquisition: the site is not located within the scope of lands planned for waste disposal, it is a mountainous region with only a small amount of fruit trees and young crops. It costs less land reimbursement and may be requisitioned in phases.

Site 2: Lanzilong, Tiantou Village, Shatian Town

Site features are described as below:

(1) Transport and distance to urban area: about 12km away from Danshui, a 6m wide dirt

road is available, about 2km away from existing roads of Shatian. It has quite long transport distance, while within reasonable scope and less impact on urban area.

(2) Environmental protection: located in a mountainous area, surrounded by mountains, only gullies available, less cultivated lands nearby, but small reservoirs are directly located downstream.

(3) Site construction: Site is surrounded by mountains all around, but with narrow valley, steep slope on either side, therefore the construction is difficult, not easy for landfill. It covers 600 mu, with expected service period of 30 to 50 years. Water and electricity investment is quite large.

(4) Land acquisition: the site is the lands planned for waste disposal, covering 600mu, it is a mountainous region with only a small amount of fruit trees and young crops. It costs less land reimbursement and may be requisitioned in phases.

Site 3: Honghua Mountain, Danshui Longwei Village

(1) Transport and distance to urban area: about 200m at the north side of planned North Ring Road (near Huiyang Detention Center), 8km from Danshui downtown, about 500m away from Shanziding Waste Treatment Plant. It has a quite short transport distance, while near downtown and would result in impact on urban area.

(2) Environmental protection: Surrounded on three sides by mountains, the site faces the Danshui river with a distance of about 300 meters, and about 500 meters away from village and adjacent to a detention house, basically no farmland in nearby regions.

(3) Site construction: the site is surrounded on three sides by mountains, but the valley is relatively smooth and broad, therefore it would need low costs in site construction, suitable for comprehensive planning, the comprehensive treatment site can be designed with service period of up to 50 years, since it is provided with convenient water and electricity facilities, less investment would be required, and about 800 mu will be requisitioned.

(4) Land acquisition: the site is the lands planned for waste disposal, covering 6800mu, it is a mountainous region with only many fruit trees and young crops. It costs much land reimbursement and may be requisitioned in phases.

Figure 2.1-1 Site selection comparison diagram (from up to down: site 1, site 2 and site 3)

See following table for basic information of each site available.

Table 2.1 1 Comparison table of each site available

Site condition	Site 1 - Shuikou Village, Shatian Town	Site 2 - Lanzilong, Shatian Town	Site 3- Honghua Mountain, Danshui Town
Site condition and type of land utilization	Mountainous area, forest land	Mountainous area, forest land	Mountainous area, forest land, near Shanziding Waste Treatment Plant
Is there any natural reserve area, scenic sport or domestic drinking water source in the region?	No	No	No
Does the site comply with engineering geological condition and hydrological condition for engineering construction?	Yes	Yes	Yes
Is it at risk of floods, tidewater or water-logging?	No	No	No
Water supply	Municipal tap water and reclaimed water	Municipal tap water and reclaimed water	Municipal tap water and reclaimed water
Distance to downtown	Far	Far	Near
Environmental function division	Water functional area will be classified as Class III area,	Water functional area will be classified as Class III area,	Water functional area will be classified as Class III area,

	atmospheric area will be classified as Class II area.	atmospheric area will be classified as Class II area.	atmospheric area will be classified as Class II area.
Environmental status	Atmospheric environment, surface water and groundwater status are generally ideal	Atmospheric environment, surface water and groundwater status are generally ideal	Severe waste gas pollution
Distribution of sensitive areas	Many sensitive areas around the site, no removal is required within protection distance.	Many sensitive areas around the site, no removal is required within protection distance.	Many sensitive areas around the site, no removal is required within protection distance.
Transport condition	Convenient transport condition, with the farthest transport distance	Convenient transport condition, with farther transport distance	Convenient transport condition, with the shortest transport distance
Surrounding residential area	More than 300m	340m	More than 300m
Number of affected households / people	93 households、290	75 households、250	no data
Impact on urban area	Small	Small	Large
Planned area (mu)	500	600	800
Land requisition	Very difficult	Quite difficult	Very difficult
Any farmland	No	No	No
Investment in water and power construction	Large	Large	Small
Human health impact	Small	Small	Large
Land use planning	Not belong to specific planned land for environmental protection and health project	Specific planned land for environmental protection and health project	Specific planned land for environmental protection and health project

In conclusion, in terms of technical condition and engineering economic condition, Lanzilong is located at mountainous area, away from urban area, with good environmental condition, convenient transport condition and proper transport distance and, in addition, the construction site area meets project needs, with good geological condition and simple stratum. Based on comparison and analysis, Lanzilong is selected as the construction site for waste incineration plant.

Chapter IV Survey and evaluation of status quo of environment quality

4.1 Monitoring and evaluation of current surface water environmental quality

4.1.1 Current situation evaluation of surface water

Contents in the section are referenced from Environmental Impact Assessment Report on Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City (the 1st stage) (draft for approval, August 2013, Guangzhou Research Institute of Environmental Protection).

4.1.1.1 Evaluation standard

According to the Function Regionalization of Guangdong Province of Surface Water Environment 【YFH [2011], No. 29】, the reach of Danshui River, from boundary of Huiyang to Yonghu Town, covering 29.5km, is planned for industry and agriculture; upstream of the river is called Longgang River, with poor water quality, classified as V, IV in 2015 and III in 2020. No functional zoning is carried out for Huangshatian River and Shanxi River. As specified in "IV. Achievement and Requirement for Function Regionalization": For water environment quality control target of each unlisted upstream and tributary, the environmental quality control target of mainstream should be considered as the minimum requirement and, in principle, the difference between the branch and main stream it feeds into should be no more than one grade." Therefore, both Huangshatian River and Shanxi River should be managed according to Class III standard specified in the Environmental Quality Standards for Surface Water (GB3838-2002).

Shatian Reservoir is a local drinking water source, no functional zoning is assigned in Shatian River. In this report with exception of the Shatian Reservoir which is subject to Class II standard, others bodies of water are all subject to Class III standard.

4.1.1.2 Monitoring factors

According to regional water environment quality requirements and features of pollution discharge in the project area, surface water quality monitoring factors include a total of 21 items, such as pH value, temperature, chromaticity, suspended solids, dissolved oxygen, chemical oxygen demand (COD), permanganate index, BOD_5, ammonia nitrogen, nitrate nitrogen, total phosphorus, oil, sulphide, volatile phenol, fecal coliform, cadmium, hexavalent chromium, chromium, lead, arsenic and mercury.

4.1.1.3 Setting of monitoring section

A total of 6 monitoring sections (points) have been decided for surface water monitoring, among which, section 1# is located at a brook before the plant, about 500m upstream of the site; section 2# is located at Huangshatian Reservoir, about 500m at the downstream of the reservoir; section 3# is located at Huangshatian Reservoir, 500m the upstream of intersection between Shanxi River and Danshui River; section 5# is located at Shatian River; and section 6# at Shantian Reservoir.

River	Monitoring section number	Specific position of monitoring section	Function
Brook before plant	W1	500m upstream of construction site	Background section
Huangshatian Reservoir	W2	About 500m at the downstream of Huangshatian Reservoir	Control section
	W3	500m upstream of intersection between Shanxi River and Danshui River	Control section
Danshui River	W4	Intersection between Shanxi River and Danshui River	Control section
Shantian River	W5	Danshui River	Control section
Shantian Reservoir	W6	Shantian Reservoir	Control section

Figure 6.1-1 Diagram of surface water monitoring sections

4.1.1.4 Monitoring time

Surface water monitoring is conducted on March 18 to 20, 2013, a period of 3 days, sampling once a day.

Water quality monitoring data of section 5# Shatian River and 6# Shatian Reservoir are gathered from regular monitoring data of Huiyang Environmental Monitoring Station on March 5, 2013.

4.1.1.5 Monitoring and analysis method

Water quality analysis method for surface water shall be subject to the standard method specified in Monitoring Analysis Method of Water and Wastewater and the Standard Analysis Method of Surface Water Ambient Quality. See Table 4.1-2 for water quality analysis method and its lowest limit of detection.

Table 4.1-2 Water quality analysis method and its lowest limit of detection

No	Item	Analysis method	Lowest limit of detection
1	Water temperature	Thermometer measurement	/
2	pH value	Glass electrode method	/
3	Chromaticity	Platinum-cobalt method	/
4	Dissolved oxygen	Electrochemical probe method	/
5	Nitrate nitrogen	Ion chromatography	0.04 mg/L
6	Fecal coliform	Multitube fermentation method	/
7	Suspended solids	Gravimetric method	4 mg/L
8	Arsenic	Atomic fluorescence spectrophotometry	0.0004 mg/L
9	Mercury	Atomic fluorescence spectrophotometry	0.00004 mg/L
10	Total chromium	Diphenylcarbohydrazide spectrophotometry	0.004 mg/L
11	Sulfide	Methylene blue spectrophotometry	0.005 mg/L
12	BOD_5	Dilution and inoculation method	2 mg/L
13	Permanganate index	Determination of water quality permanganate index	0.5mg/L
14	Lead	Graphite furnace atomic absorption	0.0002 mg/L
15	Cadmium	Graphite furnace atomic absorption	0.00002 mg/L
16	Total phosphorus	Molybdic acid amide spectrophotometry	0.01 mg/L
17	Chemical oxygen demand	Fast Airtight Catalytic Method	5 mg/L
18	Volatile penol	4- AAP spectrophotometric method	0.002 mg/L
19	Ammonia nitrogen	Spectrophotometric method with salicylic acid	0.01 mg/L
20	Hexavalent	Diphenylcarbohydrazide	0.004 mg/L

	chromium	spectrophotometry	
21	Petroleum	Infrared spectrophotometry	g/L

4.1.1.6 Current situation evaluation method for water quality

(1) Current situation evaluation method for surface water quality

Single-item pollution index is used for current water quality evaluation, with its calculation formula described as below:

Single-item water quality standard index:

$$S_{i,j} = \frac{c_{i,j}}{c_{si}}$$

Where, Si, j—standard index of single-item water quality parameter i at the jth point;

c_i , j—Concentration of single-item water quality parameter i at monitoring point j.

C_s , j—water quality standard concentration of water quality parameter i.

pH standard index

$$S_{pH,j} = \frac{7.0 - pH_j}{7.0 - pH_{sd}} \qquad pHj \le 7.0 \qquad (6\text{-}5)$$

$$S_{pH,j} = \frac{pH_j - 7.0}{pH_{ud} - 7.0} \qquad pHj > 7.0 \qquad (6\text{-}6)$$

S_{pH}，j- pH standard parameter;

p_{Hj}—pH value at point j;

pH_{sd}—specified pH value lower limit

pH_{ud}-- specified pH value upper limit

DO standard index:

$$S_{DO,j} = \frac{|DO_f - DO_j|}{|DO_f - DO_s|} \qquad \text{When } DOj \ge DOs$$

$$S_{DO,j} = 10 - 9\frac{DO_j}{DO_s} \qquad \text{When } DOj < DOs$$

Where: DOf = 468 / (31.6 + T) (mg/L), T is water temperature (℃);

$S_{DO,j}$—— standard value of dissolved oxygen at sampling point j;

DO_j—— concentration of dissolved oxygen at sampling point j, (mg/L);

DOs—— evaluation criterion of dissolved oxygen, (mg/L)

Single-item pollution index >1, indicating that water quality parameter exceeds the specified standard, cannot meet the requirement.

4.1.1.7 Monitoring result and analysis

See Table 4.1-3 and Table 4.1-4 for surface water quality monitoring result and evaluation index respectively.

Table 4.1-3 Surface water quality monitoring result (Unit: mg/L, with exception to pH, fecal coliform)

Monitoring time	Monitoring point	Water Temp. ℃	pH	COD	BOD_5	Permanganate Index	DO	SS	Ammonia nitrogen	Total phosphorus	Chromaticity	Mercury
3.18	1#, 500m upstream of construction site	24.2	7.02	49	11	7.8	6.23	13	0.17	0.10	60	0.00004L
3.19		24.1	7.04	58	13	7.6	6.24	14	0.26	0.11	60	0.00004L
3.20		24.3	7.05	61	13	7.7	6.19	11	0.18	0.12	60	0.00004L
3.18	2#, About 500m at the downstream of Huangshatian Reservoir	22.3	6.52	119	26	22.5	3.12	26	5.51	4.03	80	0.00004L
3.19		22.5	6.59	124	27	22.6	3.19	23	4.94	3.91	80	0.00004L
3.20		22.1	6.49	121	27	22.9	3.2	24	6.00	4.12	80	0.00004L
3.18	3#, 500m the upstream of intersection between Shanxi River and Danshui River	21.9	6.68	36	8	6.9	1.23	8	0.26	0.1	40	0.00004L
3.19		22.0	6.67	33	7	7.1	1.3	9	0.21	0.11	40	0.00004L
3.20		22.3	6.65	37	8	6.9	1.29	9	0.24	0.12	40	0.00004L
3.18	4#, intersection between Shanxi River and Danshui River	24.0	6.70	28	6	6.5	4.03	17	3.01	0.18	10	0.00004L
3.19		24.1	6.69	26	6	6.6	3.97	16	2.88	0.19	10	0.00004L
3.20		24.0	6.73	25	6	6.4	3.95	15	2.79	0.21	10	0.00004L
3.5	5#, Danshui River	19.2	6.32	44	15.0	3.9	5.5	--	3.428	0.40	--	0.00004L
3.5	6#, Shantian Reservoir	19.7	7.42	8	0.5L	2.2	7.8	23	0.257	0.01	--	0.00004L
Class III standard value		--	6~9	≤20	≤4	≤6	≥5	≤150	≤1.0	≤0.2	--	≤0.0001
Class II standard value (lake and reservoir)		--	6~9	≤15	≤3	≤4	≥6	≤150	≤0.5	≤0.025	--	≤0.00005

Table 4.1-4 Surface water environmental quality monitoring result (Unit: mg/L, with exception to pH, fecal coliform)

Monitoring time	Monitoring point	Arsenic	Lead	Cadmium	Sulfide	Fecal coliform	Petroleum	Total chromic	Volatile phenol	Hexavalent chromium	Nitrate nitrogen
3.18	1# 500m upstream of construction site	0.0019	0.0002L	0.00002L	0.009	2000	0.02L	0.004L	0.002L	0.004L	0.24
3.19		0.0018	0.0002L	0.00002L	0.013	4000	0.02L	0.004L	0.002L	0.004L	0.24
3.20		0.002	0.0002L	0.00002L	0.011	4000	0.02L	0.004L	0.002L	0.004L	0.24
3.18	2#, About 500m at the downstream of Huangshatian Reservoir	0.0004L	0.0005	0.00002L	0.188	2.4×105	0.02L	0.004L	0.004	0.004L	0.12
3.19		0.0004L	0.0004	0.00002L	0.200	2.8×105	0.02L	0.004L	0.002L	0.004L	0.1
3.20		0.0004L	0.0006	0.00002L	0.193	2.4×105	0.02L	0.004L	0.003	0.004L	0.1
3.18	3#, of the upstream of intersection between Shanxi River and Danshui River	0.002	0.0017	0.00002L	0.011	2000	0.02L	0.004L	0.002L	0.004L	0.55
3.19		0.0019	0.0015	0.00002L	0.016	4000	0.02L	0.004L	0.002L	0.004L	0.52
3.20		0.002	0.0019	0.00002L	0.009	4000	0.02L	0.004L	0.002L	0.004L	0.51
3.18	4#, intersection between Shanxi River and Danshui River	0.002	0.0002L	0.00005	0.007	3.5×104	0.02L	0.004L	0.002L	0.004L	4.13
3.19		0.002	0.0002L	0.00004	0.011	2.4×104	0.02L	0.004L	0.002L	0.004L	4.07
3.20		0.0019	0.0002L	0.00006	0.009	3.5×104	0.02L	0.004L	0.002L	0.004L	4.06
3.5	5#, Danshui River	0.0019	0.0002L	0.00002L	0.02L	3.4×104	0.02L	--	0.002L	0.004L	--
3.5	6#, Shantian Reservoir	0.0019	0.0002L	0.00002L	0.02L	50	0.02L	--	0.002L	0.004L	0.08L
Class III standard value		≤0.05	≤0.05	≤0.005	≤0.2	≤10000	≤0.05	--	≤0.005	≤0.05	≤10
Class II standard value (lake and reservoir)		≤0.05	≤0.01	≤0.005	≤0.1	≤2000	≤0.05	--	≤0.002	≤0.05	≤10

Table 4.1-5 Surface water quality evaluation index

Monitoring time	Monitoring point	Water temperature ℃	pH	COD	BOD_5	Permanganate Index	DO	SS	Ammonia nitrogen	Total phosphorus
3.18	1# 500m upstream of construction site	0.01	2.45	2.75	1.30	0.67	0.09	0.17	0.50	Undetected
3.19		0.02	2.90	3.25	1.27	0.67	0.09	0.26	0.55	Undetected
3.20		0.03	3.05	3.25	1.28	0.68	0.07	0.18	0.60	Undetected
3.18	2#, About 500m at the downstream of Huangshatian Reservoir	0.48	5.95	6.50	3.75	4.38	0.17	5.51	20.15	Undetected
3.19		0.41	6.20	6.75	3.77	4.26	0.15	4.94	19.55	Undetected
3.20		0.51	6.05	6.75	3.82	4.24	0.16	6.00	20.60	Undetected
3.18	3#, 500m upstream of intersection between Shanxi River and Danshui River	0.32	1.80	2.00	1.15	7.79	0.05	0.26	0.50	Undetected
3.19		0.33	1.65	1.75	1.18	7.66	0.06	0.21	0.55	Undetected
3.20		0.35	1.85	2.00	1.15	7.68	0.06	0.24	0.60	Undetected
3.18	4#, intersection between Shanxi River and Danshui River	0.30	1.40	1.50	1.08	2.75	0.11	3.01	0.90	Undetected
3.19		0.31	1.30	1.50	1.10	2.85	0.11	2.88	0.95	Undetected
3.20		0.27	1.25	1.50	1.07	2.89	0.10	2.79	1.05	Undetected
3.5	5#, Danshui River	0.34	2.2	3.75	0.65	0.85	--	3.43	2.0	Undetected
3.5	6#, Shantian Reservoir	0.21	0.53	Undetected	0.55	0.42	0.15	0.52	0.40	Undetected
Class III standard value		6~9	≤20	≤4	≤6	≥5	≤150	≤1.0	≤0.2	≤0.0001
Class II standard value (lake and reservoir)		6~9	≤15	≤3	≤4	≥6	≤150	≤0.5	≤0.025	≤0.00005

Table 4.1-6 Evaluation index for surface water environmental quality

Monitoring time	Monitoring point	Arsenic	Lead	Cadmium	Sulfide	Fecal coliform	Petroleum	Total chromic	Volatile phenol	Hexavalent chromium
3.18	1# 500m upstream of construction site	0.04	Undetected	Undetected	0.05	0.2	Undetected	Undetected	Undetected	0.02
3.19		0.04	Undetected	Undetected	0.07	0.4	Undetected		Undetected	0.02
3.20		0.04	Undetected	Undetected	0.06	0.4	Undetected	Undetected	Undetected	0.02
3.18	2#, About 500m at the downstream of Huangshatian Reservoir	Undetected	0.01	Undetected	0.94	24	Undetected	0.80	Undetected	0.01
3.19		Undetected	0.01	Undetected	1.00	28	Undetected	Undetected	Undetected	0.01
3.20		Undetected	0.01	Undetected	0.97	24	Undetected	0.60	Undetected	0.01
3.18	3#, 500m upstream of intersection between Shanxi River and Danshui River	0.04	0.03	Undetected	0.06	0.2	Undetected	Undetected	Undetected	0.06
3.19		0.04	0.03	Undetected	0.08	0.4	Undetected	Undetected	Undetected	0.05
3.20		0.04	0.04	Undetected	0.05	0.4	Undetected	Undetected	Undetected	0.05
3.18	4#, intersection between Shanxi River and Danshui River	0.04	Undetected	0.01	0.04	3.5	Undetected	Undetected	Undetected	0.41
3.19		0.04	Undetected	0.01	0.06	2.4	Undetected	Undetected	Undetected	0.41
3.20		0.04	Undetected	0.01	0.05	3.5	Undetected	Undetected	Undetected	0.41
3.5	5#, Danshui River	0.04	Undetected	Undetected	Undetected	3.4	Undetected	Undetected	Undetected	--
3.5	6#, Shantian Reservoir	0.04	Undetected	Undetected	Undetected	0.025	Undetected	Undetected	Undetected	Undetected
Class III standard value		≤0.05	≤0.05	≤0.005	≤0.2	≤10000	≤0.05	≤0.005	≤0.05	≤10
Class II standard value (lake and reservoir)		≤0.05	≤0.01	≤0.005	≤0.1	≤2000	≤0.05	≤0.002	≤0.05	≤10

For water quality monitoring and statistical results, single-item water quality parameter method is used for water environmental quality evaluation. Based on comprehensive analysis of monitoring data, Table 4.1-3 and Table 4.1-4 show that:

pH value in each section ranges 6.49～7.0, compliant with evaluation standard requirements, and other monitoring indexes are described as below:

Section 1#, 500m upstream of construction site

COD monitoring value ranges 49～61mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 3.25, significantly beyond the standard limit.

BOD_5 monitoring value ranges 11～13mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 3.05, significantly beyond the standard limit.

Potassium permanganate index monitoring value ranges 7.6～7.8mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 1.30, significantly beyond the standard limit.

DO monitoring value ranges 6.19~6.24mg/L; sampling monitoring data in 3 days comply with evaluation standard requirements and, among which, the highest evaluation index is 0.68.

SS monitoring value ranges 11~13mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.09.

Ammonia nitrogen monitoring value ranges 0.17~0.26mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0. 26.

Total phosphorus monitoring value ranges 0.10～0.12mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.60.

Average chromaticity monitoring value is 60.

Arsenic monitoring value ranges 0.0018～0.0020mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.04.

Sulfide monitoring value ranges 0.009～0.013mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.07.

Fecal coliform monitoring value ranges 2000～4000; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.04.

Nitrate nitrogen monitoring value is averaged 0.24mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.02.

Mercury, lead, cadmium, petroleum, total chromium, volatile phenol and hexavalent chromium are not detected.

Section 2#, About 500m at the downstream of Huangshatian Reservoir

COD monitoring value ranges 119～124mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 6.20, significantly beyond the standard limit.

BOD_5 monitoring value ranges 26～27mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 6.75, significantly beyond the standard limit.

Potassium permanganate index monitoring value ranges 22.5～22.9mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 3.82, significantly beyond the standard limit.

DO monitoring value ranges 3.12~3.2mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 4.38, significantly beyond the standard limit.

SS monitoring value ranges 23~26mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.17.

Ammonia nitrogen monitoring value ranges 4.94~6.00mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 6.00, significantly beyond the standard limit.

Total phosphorus monitoring value ranges 3.91～4.12mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 20.60, significantly beyond the standard limit.

Average chromaticity monitoring value is 80.

Lead monitoring value ranges 0.0004～0.0006mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.01.

Sulfide monitoring value ranges 0.188～0.200mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 1.00.

Fecal coliform monitoring value ranges 240000～280000; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 28, significantly beyond the standard limit.

Volatile phenol monitoring value ranges from undetected to 0.004mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, the evaluation index is 0.80.

Nitrate nitrogen monitoring value ranges 0.1～0.12mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, the evaluation index is 0.01.

Arsenic, mercury, cadmium, petroleum, total chromium and hexavalent chromium are not detected.

Section 3#, 500m the upstream of intersection between Shanxi River and Danshui River

COD monitoring value ranges 33～37mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 1.85, significantly beyond the standard limit.

BOD_5 monitoring value ranges 7～8mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 2.00, significantly beyond the standard limit.

Potassium permanganate index monitoring value ranges 6.9～7.1mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 1.18 significantly beyond the standard limit.

DO monitoring value ranges1.23~1.3mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 7.79, significantly beyond the standard limit.

SS monitoring value ranges 8~9mg/L; sampling monitoring data in 3 days comply with evaluation standard requirements and, among which, the highest evaluation index is 0.06.

Ammonia nitrogen monitoring value ranges 0.21~0.26mg/L; sampling monitoring data in 3 days comply with evaluation standard requirements and, among which, the highest evaluation index is 0.26.

Total phosphorus monitoring value ranges 0.10～0.12mg/L; sampling monitoring data in 3 days comply with evaluation standard requirements and, among which, the highest evaluation index is 0.60.

Average chromaticity monitoring value is 40.

Arsenic monitoring value ranges 0.0018～0.0020mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.04.

Lead monitoring value ranges 0.0015～0.0019mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.04.

Sulfide monitoring value ranges 0.009～0.016mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.08.

Fecal coliform monitoring value ranges 2000～4000; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.04.

Nitrate nitrogen monitoring value ranges 0.51～0.55mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, the evaluation index is 0.06.

Mercury, cadmium, oil, total chromium and volatile phenol and hexavalent chromium are not detected.

Section 4#, intersection between Shanxi River and Danshui River

COD monitoring value ranges 25～28mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 1.40, significantly beyond the standard limit.

BOD_5 monitoring value is averaged at 6mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 1.5, significantly beyond the standard limit.

Potassium permanganate index monitoring value ranges 6.4～6.6mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 1.10 significantly beyond the standard limit.

DO monitoring value ranges 3.95~4.03mg/L; sampling monitoring data in 3 days have exceeded evaluation standard requirements and, among which, the highest evaluation index is 2.89, significantly beyond the standard limit.

SS monitoring value ranges 15~17mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0. 11.

Ammonia nitrogen monitoring value ranges 2.79~3.01mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 3.01, significantly beyond the standard limit.

Total phosphorus monitoring value ranges 0.18～0.21mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 1.05.

Average chromaticity monitoring value is 10.

Arsenic monitoring value ranges 0.0019～0.0020mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.04.

Cadmium monitoring value ranges 0.00004～0.00006mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.01.

Sulfide monitoring value ranges 0.007～0.011mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, among which, the highest evaluation index is 0.06.

Fecal coliform monitoring value ranges 24000～35000; sampling monitoring data in 3 days comply with evaluation standard requirements and, among which, the highest evaluation index is 3.5, significantly beyond the standard limit.

Nitrate nitrogen monitoring value ranges 4.06～4.13mg/L; sampling monitoring data in 3 days complies with evaluation standard requirements and, the evaluation index is 0.41.

Mercury, lead, petroleum, total chromium and volatile phenol and hexavalent chromium are not detected.

Section 5#, Danshui River

COD monitoring value is 44mg/L, significantly beyond evaluation standard, with evaluation index being 2.2, significantly beyond standard limit.

BOD_5 monitoring value is 15mg/L, beyond evaluation standard, with evaluation index being 3.75, significantly beyond standard limit.

Potassium permanganate index monitoring value is 3.9mg/L, compliant with the evaluation standard, with evaluation index being 0.65.

DO monitoring value is 5.5mg/L, compliant with the evaluation standard, with evaluation index being 0.85.

Ammonia nitrogen monitoring value is 3.428mg/L, beyond evaluation standard, with evaluation index being 3.43, significantly beyond standard limit.

Total phosphorus monitoring value is 0.40mg/L, beyond evaluation standard, with evaluation index being 2.0.

Arsenic monitoring value is 0.0019mg/L, compliant with the evaluation standard, with evaluation index being 0.04.

Fecal coliform monitoring value is 34000, beyond evaluation standard, with evaluation index being 3.5, significantly beyond standard limit.

Mercury, lead, cadmium, sulfide, petroleum, volatile phenol and hexavalent chromium are not detected.

Section 6#, Shantian Reservoir

COD monitoring value is 8mg/L, compliant with the evaluation standard, with evaluation index being 0.53.

Potassium permanganate index monitoring value is 2.2mg/L, compliant with the evaluation standard, with evaluation index being 0.55.

DO monitoring value is 7.8mg/L, compliant with the evaluation standard, with evaluation index being 0.42.

Ammonia nitrogen monitoring value is 0.257mg/L, compliant with the evaluation standard, with evaluation index being 0.5.

Total phosphorus monitoring value is 0.01mg/L, compliant with the evaluation standard, with evaluation index being 0.4.

Arsenic monitoring value is 0.0019mg/L, compliant with the evaluation standard, with evaluation index being 0.04.

Fecal coliform monitoring value is 50, compliant with the evaluation standard, with evaluation index being 0.025.

BOD_5, mercury, lead, cadmium, sulfide, petroleum, volatile phenol, hexavalent chromium and nitrate nitrogen are not detected.

COD, BOD_5, potassium permanganate and fecal coliform indexes in some sections beyond standard limit are mainly caused the pollution due to sewage discharge. In addition, fecal coliform in some sections beyond standard limit is possibly related to the fugitive stacking of municipal solid wastes in the region.

4.1.2 Current situation evaluation for sediment

Based on the environmental impact assessment features of municipal solid waste incineration power generation plant, sediment monitoring was carried out on April 27, 2013 on Huangsha Reservoir and Danshui River, undertaken by South China Institute of Environmental Sciences.

(1) Monitoring item and sampling requirement

Investigation involves heavy metal contents in sediment and its toxicity identification. Heavy metal analysis items include: pH, Pb, Cr (hexavalent), Cd, Hg and As; leachate analysis items include: Pb, Cr (hexavalent), Cd, Hg and As, conduct monitoring in one consecutive day and sampling once.

(2) Monitoring point distribution

Monitoring points are located at Huangsha Reservoir and Danshui River.

(3) Analysis method

Take samples and analyze samples according to standard analysis method and regulations specified in Environmental Monitoring Specification.

(4) Statistics of monitoring results

Table 4.1-7 Monitoring results of leachate toxicity identification

Inspection item	Monitoring result		Concentration limit value of hazard ingredients in leaching toxicity	Unit
	Huangsha Reservoir	Danshui River		
Lead	0.03L	0.05	5	mg/L
Chromium (hexavalent)	0.03L	0.03L	5	mg/L
Cadmium	0.005L	0.061	1	mg/L
Arsenic	0.002	0.011	5	mg/L
Mercury	0.01*10-3L	0.01*10-3L	0.1	mg/L

Note: L means undetected, and the value is the detection limit of the item, the same below.

Table 4.1-8 Monitoring results of sediment

Test item	Monitoring result		Standard value of soil environmental quality (Class II)	Unit
	Huangsha Reservoir	Danshui River		
pH	6.65	6.28		Non-dimensional
Lead	24.1	64.2	＜250	mg/kg
Cadmium	0.2L	0.2L	＜0.30	mg/kg
Chromium	13	191	＜250	mg/kg
Mercury	0.032	0.084	＜0.30	mg/kg
Arsenic	11.5	17.5	＜30	mg/kg

(6) Analysis and evaluation of monitoring result

As shown in Table 4.1-7, the concentration of heavy metal in leachate of sediment from both Huangsha Reservoir and Danshui River are far less than the limit value specified in Identification Standards for Hazardous Wastes (GB 5085.3—2007), free from toxicity.

As shown in Table 4.1-8, the concentration of heavy metal in the sediment from both Huangsha Reservoir and Danshui River are far less than Class II limit value specified in the Environmental Quality Standard for Soils (GB 15618—1995).

4.1.3 Conclusion

Based on monitoring data and data analysis, it is demonstrated that, with exception to water quality of Shantian Reservoir in the region, other water quality is poor.

Among indexes, COD, BOD_5 and potassium permanganate index in section 1#~4# all exceed the evaluation standard requirement. As to heavy metal index, it has not been detected in each section and, even any was found, the detection limit is quite low, compliant with environmental quality standard.

Among other indexes, monitoring values of total phosphorus and fecal coliform indicators in section 2#, 4# and 5# are beyond standard limit, particularly that in section 2#, more than 20 times of standard value. While, DO indicator in section 1#, 5# and 6# is compliant with standard requirement, with the remaining sections over standard value.

Sediment from both Huangsha Reservoir and Danshui River are free from toxicity, and the heavy metal concentration is far less than the Class II limit value specified in the Environmental Quality Standard for Soils (GB 15618—1995).

In general, the water environmental quality in the region is quite poor and, the water in section 2# has the severest pollution.

4.2 Current situation evaluation for atmospheric environment

In accordance with the requirements on environmental quality evaluation for municipal solid waste power generation projects in the Technological Guide on Environmental Impact Evaluation-Atmospheric Environment and the Notice of Strengthening Management of Environmental Impact Assessment for Biomass Power Generation Projects, Environmental Impact Assessment Report on Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City (the 1st stage) (draft for approval, August 2013, Guangzhou Research Institute of Environmental Protection) is collected, and quality factors are supplemented for municipal solid waste incineration power generation plant.

4.2.1 Monitoring points and items

Atmospheric monitoring data were collected from Environmental Impact Assessment Report on Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City (the 1st stage) on March 19 to 29, 2013. A total of 6 monitoring points have been set up, including monitoring factors: regular pollutants and odor factors.

From April 21 to 27, 2013, additional monitoring on characterization factors of the incineration project have been performed and on the basis of landfill monitoring points, optimized adjustment was made for incineration plant, including 6 ambient air quality monitoring points; monitoring factors are mainly the characterization factors not taken into account during landfill environmental impact assessment monitoring. In addition, meteorological conditions were also recorded during monitoring period, including temperature, humidity, air pressure, wind speed and direction.

4.2.2 Sampling time and frequency

4.2.2.1 Monitoring data and frequency relating to landfill

Atmospheric monitoring for landfill is carried out by Huizhou Station of Environmental Protection Monitoring and Shenzhen Hubao Technology Co., Ltd.

Huizhou Station of Environmental Protection Monitoring carried out ambient air quality monitoring during March 19 to 25, 2013 for hydrogen sulfide, ammonia, SO2, NO2, TSP and PM10, in 7 consecutive days; and Shenzhen Hubao Technology Co., Ltd. carried out ambient air quality monitoring during March 23 to 29, 2013 for CO, CH_3SH and odor, in 7 consecutive days.

4.2.2.1 Supplementary monitoring time and frequency

Supplementary monitoring for current ambient air quality was carried out by South China Institute of Environmental Sciences during March 21 to 27, 2013. Monitoring frequency is described as below:

(1) Hourly concentration, in 7 consecutive days: SO_2, NO_2 and CO, at 02:00, 08:00, 14:00 and 20: :00 Beijing time , 60min for each sampling;

(2) Hourly concentration, in 7 consecutive days: H_2S, NH_3, CH_3SH and odor, at 02:00, 08:00, 14:00 and 20: :00 Beijing time , 60min for each sampling;

(3) Daily concentration: SO_2, NO_2, CO, TSP, PM_{10}, in 7 consecutive days, once a day, 24h for each; HCl, Hg, Pb, Cd, in 3 consecutive days, once a day, 24h for each;

(4) Dioxin: in consecutive 48h, taken as one sample.

Figure 4.2-1 Diagram of atmospheric environment monitoring points

Table 4.2-1 Distribution of atmospheric environment monitoring points

tion of monitoring t	Direction	Distance to chimney	Monitoring factors		Fun aml
			Landfill EIA monitoring factor	Supplementary monitoring factors	
zilong	Southeast	650	—	HCl、Hg、Pb、Cd、 (dioxin)、H2S、NH3、CH3SH、 (Odor concentration)	Cla
ngsha Village	Northwest	1500	—	HCl、Hg、Pb、Cd、(dioxin)	Cla
tang'ao (Dalong)	Southwest	2400	SO2、NO2、CO、TSP、PM10、H2S、NH3、CH3SH、(Odor concentration)	HCl、Hg、Pb、Cd、 (dioxin)	Cla
n Natural Reserve	Southeast	2800	—	SO2、NO2、PM10、HCl、Hg、Pb、Cd	Cla
tou Village	Southeast	1500	—	HCl、Hg、Pb、Cd	Cla
owu Village (Xiaowu nary School)	Northeast	3000	SO2、NO2、CO、TSP、PM10、H2S、NH3、CH3SH、(Odor concentration)	HCl、Hg、Pb、Cd	Cla
ned construction site ndfill	Northeast	640	SO2、NO2、CO、TSP、PM10、H2S、NH3、CH3SH、(Odor concentration)	—	Cla
nglonggang	South-east	1300	SO2、NO2、CO、TSP、PM10、H2S、NH3、CH3SH、(Odor concentration)	—	Cla
ntry Garden	North	3200	SO2、NO2、CO、TSP、PM10、H2S、NH3、CH3SH、(Odor concentration)	—	Cla
nzai	Northwest	3400	SO2、NO2、CO、TSP、PM10、H2S、NH3、CH3SH(Odor concentration)	—	Cla

4.2.3 Monitoring analysis method

Monitoring analysis method should be subject to Ambient Air Quality Standard (GB 3095-2012) and relevant regulations in the Analysis Method of Monitoring on Air and Waste Gas, Technical Specifications for Environmental Monitoring (Atmosphere), detailed in Table 4.2-2.

Table 4.2-2 Atmospheric monitoring and analytical method

Item	Analytical method	Detection limit （mg/m^3）
SO_2	Formaldehyde absorption – rosaniline spectrophotometry	0.009
NO_2	Saltzma method	0.005
HCl	Ion chromatography	0.003
CO	Non-Disperse Infrared	0.3
PM_{10}	Gravimetric method	0.001
TSP	Gravimetric method	0.001
H_2S	Gas chromatographic method	0.001
Ammonia	Pypocholoride - Spectrophotometric method with salicylic acid	0.03
CH_3SH	Gas chromatographic method	0.000027
Odor concentration	Three-point comparison odor bag	(non-dimensional)
Pb	Graphite furnace atomic absorption spectrophotometry	0.0001
Hg	Atomic fluorescence spectrum	0.01ug/m^3
Cd	No-flame atomic absorption spectrophotometry	0.0001
Dioxin	EPA1613B (method)	0.05pg/μL

4.2.4 Monitoring result and analysis

4.2.4.1 Current situation monitoring for landfill

See Table 4.2-3 for meteorological condition during monitoring period and as shown in the table, wind speed is quite low, dominated by south wind.

Table 4.2-3 Meteorological condition during monitoring period

Monitoring date M/D	Sampling time	Meteorological factors				
		Temperature(℃)	Humidity %	Air pressure(KPa)	Wind speed m/s	Wind direction (16 directions)
3/19	2:00-3:00	22.7	80.3	99.45	0.5	SE
	8:00-9:00	22.9	80.9	99.72	0.8	SE
	14:00-15:00	25.5	69.8	99.45	1.5	SW
	20:00-21:00	22.9	82.9	99.62	1.5	SW
3/20	2:00-3:00	22	86.6	99.5	0.6	SW
	8:00-9:00	23.1	83.7	99.87	0.8	SE
	14:00-15:00	22.8	64.4	99.7	1.2	S

	20:00-21:00	20.5	82.6	99.5	0.8	S
3/21	2:00-3:00	20	83.7	99.8	0.8	SE
	8:00-9:00	21.5	70.1	100.02	1.6	SE
	14:00-15:00	21.0	74.6	99.82	2.0	SW
	20:00-21:00	20.1	76.1	99.89	2.3	S
3/22	2:00-3:00	19.6	79.4	99.8	1.0	S
	8:00-9:00	20.2	79.7	100.06	1.6	S
	14:00-15:00	27.7	51.3	99.66	2.5	SW
	20:00-21:00	24.4	65.8	99.72	2.2	SW
3/23	2:00-3:00	20.1	86	99.69	1.7	S
	8:00-9:00	21.3	81.5	99.9	1.3	SE
	14:00-15:00	27.7	55.7	99.46	1.3	S
	20:00-21:00	23.8	70.5	99.59	1.2	S
3/24	2:00-3:00	21.4	81.9	99.51	1.1	SE
	8:00-9:00	21.5	81.8	99.76	0.5	E
	14:00-15:00	25.8	64.8	99.45	1.6	W
	20:00-21:00	24.8	71.8	99.54	1.6	E
3/25	2:00-3:00	21.6	80.3	99.59	1.0	E
	8:00-9:00	22.2	79.4	99.72	0.4	SE
	14:00-15:00	27.5	55.4	99.42	2.4	W
	20:00-21:00	25.2	66.7	99.53	0.5	S

See Table 4.2-4 up to Table 4.2-14 for ambient air quality monitoring results.

Table 4.2-4 Monitoring results of hourly mean concentration of SO_2 Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3# Hantanao	8# Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/19	0.009~0.024	0.009~0.021	0.008~0.024	0.016~0.025	0.011~0.025	0.009~0.023
3/20	0.009~0.023	0.011~0.024	0.009~0.022	0.009~0.025	0.009~0.023	0.009~0.025
3/21	0.01~0.022	0.009~0.022	0.009~0.024	0.008~0.024	0.01~0.025	0.009~0.023
3/22	0.013~0.02	0.009~0.02	0.01~0.022	0.009~0.023	0.011~0.02	0.009~0.02
3/23	0.008~0.019	0.011~0.02	0.009~0.018	0.009~0.023	0.009~0.017	0.011~0.018
3/24	0.01~0.022	0.011~0.022	0.01~0.021	0.011~0.019	0.009~0.017	0.01~0.02
3/25	0.007~0.018	0.009~0.022	0.011~0.024	0.01~0.023	0.01~0.02	0.011~0.022
Quality Standard （mg/m^3）	0.50					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-5 Monitoring results of hourly mean concentration of NO_2 Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3#Hantanao	8#Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/19	0.023~0.033	0.026~0.03	0.027~0.034	0.023~0.034	0.027~0.032	0.025~0.033
3/20	0.025~0.031	0.025~0.029	0.023~0.029	0.023~0.03	0.025~0.03	0.017~0.026
3/21	0.022~0.038	0.02~0.029	0.022~0.032	0.02~0.033	0.022~0.032	0.025~0.031

Monitoring date	Construction site of 7# landfill	3#Hantanao	8#Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/22	0.025~0.032	0.024~0.032	0.025~0.034	0.025~0.032	0.025~0.033	0.023~0.032
3/23	0.025~0.035	0.024~0.029	0.028~0.033	0.025~0.034	0.026~0.034	0.025~0.033
3/24	0.025~0.032	0.025~0.034	0.028~0.033	0.028~0.034	0.025~0.033	0.025~0.032
3/25	0.02~0.034	0.025~0.031	0.023~0.033	0.025~0.031	0.026~0.034	0.025~0.031
Quality Standard（mg/m^3）	0.20					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-6 Monitoring results of hourly mean concentration of CO Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3#Hantanao	8# Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	1 10# Ailinzai
3/19	1.5~3	2~3.8	1.8~3.4	2.2~4.5	1~2.5	2~3.8
3/20	1.4~2.5	1.5~3.6	1.9~3.8	1.8~3.5	1~2.2	1.8~3.4
3/21	1.8~3.1	1.8~3.9	2~4.2	2.4~4.9	1.2~2.8	1.8~3.6
3/22	1.6~2.9	1.9~3.6	1.9~4.1	2.4~4.9	1.5~2.8	1.8~4
3/23	1.2~2.9	1.8~3.5	1.6~3.8	2.1~4.4	0.9~2.4	1.8~3.5
3/24	1.4~2.9	1.9~4	2~4.2	2.4~5	1.4~3	2.2~4
3/25	1.2~3.1	2.1~4	1.4~3.9	2.4~4.8	1.2~2.9	1.8~3.6
Quality Standard mg/m^3）	10					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-7 Monitoring results of momentary concentration of H_2S Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3# Hantanao	8#Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/19	0.005~0.006	0.004~0.006	0.004~0.007	0.005~0.007	0.005~0.006	0.005~0.006
3/20	0.004~0.006	0.004~0.005	0.004~0.007	0.005~0.007	0.004~0.006	0.004~0.006
3/21	0.004~0.008	0.004~0.006	0.004~0.007	0.005~0.007	0.005~0.007	0.004~0.006
Quality Standard（mg/m^3	0.01					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-8 Monitoring results of momentary concentration of NH_3 Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3#Hantanao	8#Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/19	0.092~0.107	0.087~0.113	0.086~0.126	0.104~0.116	0.095~0.118	0.099~0.123
3/20	0.107~0.145	0.119~0.143	0.102~0.131	0.107~0.118	0.102~0.147	0.109~0.125

3/21	0.116~0.145	0.114~0.144	0.114~0.134	0.109~0.134	0.116~0.142	0.106~0.134
Quality Standard （mg/m^3）	0.20					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-9 Monitoring results of hourly mean concentration of odor Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3# Hantanao	8# Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/23	＜10~14	＜10~25	＜10~17	＜10~17	＜10	＜10~21
3/24	＜10~13	＜10~25	＜10~17	＜10~14	＜10	＜10~20
3/25	＜10~11	＜10~23	＜10~13	＜10~17	＜10	＜10~21
Quality Standard	20(Non-dimensional)					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-10 Monitoring results of hourly mean concentration of methyl mercaptan Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3# Hantanao	8# Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/23	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5
3/24	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5
3/25	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5	2.7×10-5
Quality Standard （mg/m^3	0.0007					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-11 Monitoring results of daily mean concentration of SO_2 Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3# Hantanao	8# Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/19	0.011	0.012	0.011	0.012	0.013	0.012
3/20	0.011	0.012	0.013	0.012	0.012	0.011
3/21	0.013	0.011	0.011	0.012	0.012	0.011
3/22	0.012	0.012	0.011	0.011	0.012	0.010
3/23	0.012	0.012	0.012	0.010	0.011	0.011
3/24	0.012	0.012	0.011	0.011	0.011	0.012
3/25	0.012	0.012	0.012	0.012	0.012	0.011
Range of concentration	0.011~0.013	0.011~0.012	0.011~0.013	0.010~0.012	0.011~0.013	0.010~0.012
Quality Standard （mg/m^3）	0.15					

Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-12 Monitoring results of daily mean concentration of NO_2 Unit: mg/m^3

Monitoring date	Construction site of 7# landfill	3# Hantanao	8#Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/19	0.023	0.024	0.024	0.025	0.026	0.027
3/20	0.027	0.025	0.026	0.027	0.025	0.025
3/21	0.025	0.027	0.026	0.025	0.027	0.026
3/22	0.027	0.025	0.027	0.027	0.026	0.025
3/23	0.029	0.026	0.028	0.028	0.028	0.027
3/24	0.030	0.028	0.029	0.030	0.027	0.027
3/25	0.028	0.028	0.028	0.028	0.028	0.027
Range of concentration	0.023~0.030	0.024~0.028	0.024~0.029	0.025~0.030	0.025~0.028	0.025~0.027
Quality Standard （mg/m^3）	0.08					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-13 Monitoring results of daily mean concentration of PM_{10} Unit: mg/m3

Monitoring date	Construction site of 7# landfill	3#Hantanao	8#Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10# Ailinzai
3/19	0.074	0.073	0.072	0.065	0.072	0.069
3/20	0.071	0.072	0.07	0.067	0.071	0.069
3/21	0.071	0.071	0.071	0.066	0.071	0.067
3/22	0.071	0.07	0.072	0.065	0.072	0.069
3/23	0.073	0.071	0.074	0.066	0.072	0.067
3/24	0.071	0.069	0.071	0.068	0.073	0.07
3/25	0.072	0.07	0.072	0.069	0.072	0.071
Range of concentration	0.071~0.074	0.069~0.073	0.07~0.074	0.065~0.069	0.071~0.073	0.067~0.071
Quality Standard （mg/m3）	0.15					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.2-14 Monitoring results of daily mean concentration of TSP Unit: mg/m3

Monitoring date	Construction site of 7# landfill	3#Hantanao	8#Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10#Ailinzai
3/19	0.118	0.118	0.118	0.105	0.117	0.12
3/20	0.115	0.113	0.112	0.107	0.117	0.118
3/21	0.114	0.113	0.11	0.104	0.12	0.119
3/22	0.115	0.111	0.113	0.107	0.12	0.117

Monitoring date	Construction site of 7# landfill	3#Hantanao	8#Changlong gang	6# Xiaowu Village	9# Huiyang Country Garden	10#Ailinzai
3/23	0.113	0.109	0.113	0.105	0.118	0.118
3/24	0.117	0.113	0.114	0.107	0.118	0.117
3/25	0.115	0.112	0.111	0.106	0.117	0.116
Range of concentration	0.113~0.118	0.109~0.118	0.11~0.118	0.104~0.107	0.117~0.12	0.116~0.12
Quality Standard （mg/m3）	0.30					
Compliance	Yes	Yes	Yes	Yes	Yes	Yes

①SO_2

As shown in Table 4.2-4, the hourly mean concentration range of SO_2 in 6 ambient air monitoring points is 0.008~0.025 mg/m^3, it is in compliance with the applicable national standards, maximum concentration value 0.025mg/m^3, accounting for 5.0% of standard value (0.50mg/m^3), up to the standard limit value of Class II specified in Ambient Air Quality Standard (GB3095-2012).

As shown in Table 4.2-11, the daily mean concentration range of SO_2 in 6 ambient air monitoring points is 0.010~0.013 mg/m^3, it is in compliance with the applicable national standards, maximum concentration value 0.0135mg/m^3, accounting for 86.7% of standard value (0.15mg/m^3), up to the standard limit value of Class II specified in Ambient Air Quality Standard (GB3095-2012).

②NO_2

As shown in Table 4.2-5, the hourly mean concentration range of NO_2 in 6 ambient air monitoring points is 0.017~0.038 mg/m^3, it is in compliance with the applicable national standards, maximum concentration value 0.038mg/m^3, accounting for 15.8% of standard value (0.24mg/m^3), up to the standard limit value of Class II specified in Ambient Air Quality Standard (GB3095-2012).

As shown in Table 4.2-12, the daily mean concentration range of NO_2 in 6 ambient air monitoring points is 0.023~0.030 mg/m^3, it is in compliance with the applicable national standards, maximum concentration value 0.030mg/m^3, accounting for 37.5% of standard value (0.08mg/m^3), up to the standard limit value of Class II specified in Ambient Air Quality Standard (GB3095-2012).

③CO

As shown in Table 4.2-6, the hourly mean concentration range of CO in 6 ambient air monitoring points is 0.9~4.9 mg/m^3, maximum concentration value 4.9mg/m^3, accounting for 49.0% of standard value (10mg/m^3), up to the standard limit value of Class II specified in Ambient Air Quality Standard (GB3095-2012).

④H_2S

As shown in Table 4.2-7, the hourly mean concentration range of H_2S in 6 ambient air monitoring points is 0.004~0.008mg/m^3, maximum concentration value 0.008mg/m3, accounting for 80.0% of standard value (0.01mg/m^3), up to the standard limit value of the maximum allowable concentration of hazardous substances in air in residential area as specified in (TJ36-79).

⑤NH_3

As shown in Table 4.2-8, the hourly mean concentration range of NH_3 in 6 ambient air monitoring points is 0.086~0.147mg/m^3, maximum concentration value 0.147mg/m^3, accounting for 73.5% of standard value (0.20mg/m^3), up to the standard limit value of the maximum allowable concentration of hazardous substances in air in residential area as specified in (TJ36-79).

⑥Odor concentration

As shown in Table 4.2-9, odor concentration range in 6 monitoring points is <10~25 and, with exception to Country Garden, odor is detected in other monitoring points. Among which, some monitoring points have monitoring value beyond the limit value of Class II standard (20) specified in Emission Standards for Odorous Pollutants (GB14554-93).

⑦Methyl mercaptan

As shown in Table 4.2-10, no methyl mercaptan was detected in 6 monitoring points, up to the standard limit value specified in Hygienic Standard for Methylmercaptan in Atmosphere of Residential Area (GB18056-2000).

⑧PM_{10}

As shown in Table 4.2-13, the daily mean concentration range of PM_{10} in 6 ambient air monitoring points is 0.065~0.074 mg/m^3, it is in compliance with the applicable national standards, maximum concentration value 0.074mg/m^3, accounting for 49.3% of standard value (0.15mg/m^3), up to the standard limit value of Class II specified in Ambient Air Quality Standard (GB3095-2012).

⑨TSP

As shown in Table 4.2-14, the daily mean concentration range of PM_{10} in 6 ambient air monitoring points is 0.104~0.12 mg/m3, it is in compliance with the applicable national standards, maximum concentration value 0.12mg/m^3, accounting for 80.0% of standard value (0.15mg/m^3), up to the standard limit value of Class II specified in Ambient Air Quality Standard (GB3095-2012).

4.2.4.2 Supplementary monitoring of ambient air quality

See Table 4.2-15 for meteorological condition during supplementary monitoring period and as shown in the table, wind speed is quite low, dominated by eastward wind. The ambient air monitoring based on the monitoring data of the landfill project environmental assessment, due to those 2 projects are at the same location, besides that, as for the requested monitoring for the WTE plant, the supplementary monitoring is implemented.

Table 4.2-15 Meteorological condition during supplementary monitoring period

Monitoring date M/D	Sampling time	Meteorological elements				
		Weather	Temperature(℃)	Air pressure(KPa)	Wind direction	Wind speed (m/s)
4/21	2:00-3:00	Sunny	27	100.6	Eastward	0.7
	8:00-9:00	Sunny	25	100.8	Eastward	0.5
	14:00-15:00	Sunny	23	100.6	Eastward	1.2
	20:00-21:00	Overcast to cloudy	19	101.1	Eastward	1.0
4/22	2:00-3:00	Overcast to cloudy	22	101.0	Eastward	1.8
	8:00-9:00	Sunny	26	100.6	Eastward	2.3
	14:00-15:00	Sunny	23	100.8	Eastward	1.6
	20:00-21:00	Overcast to cloudy	20	101.2	Eastward	1.8
4/23	2:00-3:00	Overcast to cloudy	20	101.2	Eastward	1.8
	8:00-9:00	Sunny	26	100.3	Eastward	2.2
	14:00-15:00	Sunny	23	100.8	Eastward	2.0
	20:00-21:00	Sunny	19	101.3	Eastward	1.6
4/24	2:00-3:00	Sunny	24	101.0	Eastward	1.2
	8:00-9:00	Sunny	28	100.5	Eastward	0.8
	14:00-15:00	Sunny	24	100.8	Eastward	1.5
	20:00-21:00	Overcast to drizzle	22	101.2	Eastward	1.8
4/25	2:00-3:00	Sunny	23	100.8	Eastward	2.2
	8:00-9:00	Sunny	26	100.4	Eastward	1.5
	14:00-15:00	Overcast to drizzle	24	100.6	Eastward	3.2
	20:00-21:00	Heavy rain	22	101.0	Northeast	2.5

4/26	2:00-3:00	Sunny	18	101.2	Eastward	0.7
	8:00-9:00	Sunny	26	101.2	Eastward	0.5
	14:00-15:00	Overcast to cloudy	22	101.2	Eastward	1.3
	20:00-21:00	Overcast to cloudy	20	101.2	Northeast	1.8
4/27	2:00-3:00	Sunny	22	100.7	Northeast	2.6
	8:00-9:00	Sunny	26	100.7	Northeast	3.1
	14:00-15:00	Sunny	23	100.8	Eastward	1.4
	20:00-21:00	Sunny	21	100.9	Northeast	2.4

Monitoring results are described below:

① SO_2, NO_2 and PM_{10}

As shown in the table, the maximum hourly and daily concentration of NO_2 in Jinju Natural Reserve accounts for 25.00% and 32.50% of standard value for Class I Zone respectively; the maximum hourly and daily concentration of SO_2 accounts for 6.67% and 6.00% of standard value for Class I Zone respectively; the maximum daily concentration of PM_{10} accounts for 98.0% of standard value for Class I Zone, The higher the ratio of concentration of PM_{10} to the standard value is mostly directly related to bare soil near monitoring point, deemed as natural fugitive dust.

Table 4.2-16 Monitoring result statistical and evaluation form of hourly mean concentration of SO_2 and NO_2 (mg/m^3)

Monitoring date	NO_2	SO_2
	Jinju Natural Reserve	Jinju Natural Reserve
4/21	0.003L~0.014	0.007L~0.009
4/22	0.007~0.031	0.007L~0.01
4/23	0.011~0.044	0.007L
4/24	0.016~0.032	0.007L
4/25	0.008~0.050	0.007L
4/26	0.020~0.049	0.007L
4/27	0.006~0.035	0.007L
Concentration range	0.003L~0.050	0.007L~0.01
Percentage of maximum concentration accounting for standard value (%)	25.00	6.67
Over-standard rate (%)	0	0

Note: "L" means undetected, and the value is the detection limit of the item, with its ratio to standard limit substituted by a half of detection limit, the same below.

Table 4.2-17 Monitoring result statistical and evaluation form of daily mean concentration of SO_2, NO_2 and PM_{10} (mg/m^3)

Monitoring date	NO_2	SO_2	PM_{10}
	Jinju Natural Reserve	Jinju Natural Reserve	Jinju Natural Reserve
4/21	0.008	0.003	0.043

4/22	0.013	0.003L	0.049
4/23	0.018	0.003L	0.048
4/24	0.024	0.003L	0.049
4/25	0.026	0.003L	0.039
4/26	0.023	0.003L	0.044
4/27	0.018	0.003L	0.049
Concentration range	0.008~0.026	0.003L~0.003	0.039~0.049
Percentage of maximum concentration accounting for standard value (%)	32.50	6.00	98.00
Over-standard rate (%)	0	0	0

② Concentration of H_2S, NH_3, methyl mercaptan and odor

As shown in the table, current concentration of odorous pollutants near Lanzilong is quite low, and H_2S, methyl mercaptan and odor were not detected, while the hourly maximum concentration ratio of NH3 to standard value was 69.50%.

Table 4.2-18 Monitoring result statistical and evaluation form of hourly mean concentration of H_2S, NH_3, methyl mercaptan and odor (mg/m^3)

Monitoring date	H_2S	NH_3	Methyl mercaptan	Odor concentration
	Lanzilong	Lanzilong	Lanzilong	Lanzilong
4/24	0.001L	0.023~0.130	0.2L	10L
4/25	0.001L	0.036~0.119	0.2L	10L
4/26	0.001L	0.015~0.084	0.2L	10L
Percentage of maximum concentration accounting for standard value (%)	5.00	69.50	14.29	25.00
Over-standard rate (%)	0	0	0	0

③HCl

As shown in the table, the hourly maximum concentration ratio of HCl in the region is 60.0% to standard value, in Tiantou Village, followed by Xiaowu Village, and the daily concentration ratio of HCl is 46.67% to standard value. The ratio of HCl concentration to standard value in other monitoring points is relatively low, and not detected in several points.

Table 4.2-19 Monitoring result statistical and evaluation form of daily mean concentration of HCl (mg/m^3)

Monitoring date	Lanzilong	Huangsha Village	Hantang'ao	Jinju Natural Reserve	Tiantou Village	Xiawu Village
4/24	0.003L	0.004	0.003	0.003L	0.009	0.003L
4/25	0.003L	0.003L	0.003	0.003L	0.007	0.004
4/26	0.004	0.003	0.003L	0.005	0.005	0.007
Ratio of maximum concentration to standard value (%)	26.67	26.67	20	33.33	60.0	46.67
Over-standard rate (%)	0	0	0	0	0	0

④Hg

As shown in the table, Hg concentration in the regions is quite low, and not detected in 6 monitoring points.

Table 4.2-20 Monitoring result statistical and evaluation form of daily mean concentration of Hg (mg/m^3)

Monitoring date	Lanzilong	Huangsha Village	Hantang'ao	Jinju Natural Reserve	Tiantou Village	Xiawu Village
4/24	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L
4/25	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L
4/26	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L	0.01*10-3 L
Ratio of maximum concentration to standard value (%)	3.57	3.57	3.57	3.57	3.57	3.57
Over-standard rate (%)	0	0	0	0	0	0

⑤Pb

As shown in the table, Pb concentration in the regions is quite low, the ratio of maximum daily Pb concentration to standard value is only 3.35% in Lanzilong.

Table 4.2-21 Monitoring result statistical and evaluation form of daily mean concentration of Pb (mg/m^3)

Monitoring date	Lanzilong	Huangsha Village	Hantang'ao	Jinju Natural Reserve	Tiantou Village	Xiawu Village
4/24	50.2*10-3	33.5*10-3	44.3*10-3	28.0*10-3	40.7*10-3	29.7*10-3
4/25	33.5*10-3	33.5*10-3	32.3*10-3	32.8*10-3	37.6*10-3	39.9*10-3
4/26	19.3*10-3	16.8*10-3	29.4*10-3	15.9*10-3	20.7*10-3	15.2*10-3

Ratio of maximum concentration to standard value (%)	3.35	2.24	2.95	2.19	2.71	2.66
Over-standard rate (%)	0	0	0	0	0	0

⑥Cd

As shown in the table, Cd concentration in the regions is quite low, the ratio of maximum daily Cd concentration to standard value is only 10.93% in Xiaowu Village.

Table 4.2-22 Monitoring result statistical and evaluation form of daily mean concentration of Cd (mg/m^3)

Monitoring date	Lanzilong	Huangsha Village	Hantang'ao	Jinju Natural Reserve	Tiantou Village	Xiawu Village
4/24	0.90*10-3	0.78*10-3	0.68*10-3	0.93*10-3	0.81*10-3	0.64*10-3
4/25	0.74*10-3	0.60*10-3	1.22*10-3	0.59*10-3	0.73*10-3	1.53*10-3
4/26	0.12*10-3	0.51*10-3	0.16*10-3	0.06*10-3	0.29*10-3	0.28*10-3
Ratio of maximum concentration to standard value (%)	6.43	5.57	8.71	6.64	5.79	10.93
Over-standard rate (%)	0	0	0	0	0	0

⑦ Dioxin

As shown in the table, daily mean concentration ratio of dioxin in Huangsha Village, Lanzilong and Hantang'ao to standard value is 26.92%, 26.18% and 46.91% respectively.

Table 4.2-22 Monitoring result statistical and evaluation form of daily mean concentration of dioxin (mg/m^3)

Monitoring date	Lanzilong	Huangsha Village	Hantang'ao
April 24	0.157	0.162	0.281
Percentage of maximum concentration accounting for standard value (%)	26.18	26.92	46.91
Over-standard rate (%)	0	0	0

Note: in a conservative view, 0.6 pg-TEQ/m3 is taken as the daily mean concentration of dioxin, namely the mean concentration standard in Japan.

4.2.5 Summary

Ambient air quality monitoring and evaluation results show that, with exception to some measurement points (Hantangao and Ailingzai) where odor exceeds standard limit, other concentration monitoring result of atmospheric pollutants have not yet exceeded standard limit and it is compliant with relevant environmental quality standard.

Concentration of atmospheric pollutants in Jinju Natural Reserve, the Category I Area, is compliant with environmental quality standard. The higher the ratio of concentration of PM_{10} to the standard value is mostly directly related to bare soil near monitoring point, which is deemed as natural fugitive dust.

In general, some regions in the project evaluation scope have odor pollution and, beyond that, regional ambient air quality is good.

4.3 Current situation evaluation for acoustic environment

4.3.1 Distribution of monitoring points

A total of 5 monitoring points have been set for acoustic environment monitoring: 1# east boundary, 2# south boundary, 3# west boundary, 4# north boundary and 5# Lanzilong (see Figure 4.3-1).

4.3.2 Noise measurement method and noise assessment

In accordance with relevant regulations specified in the Technological Guide on Environmental Impact Evaluation (HJ2.4-2009), Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-2008) and Environmental Quality Standard for Noise (GB3096-2008), noise measurement was carried out in days free from rain, snow, lightning and wind speed less than 5m/s. A microphone is set up outdoor with a distance of about 1m, 1.2m above the ground. Equivalent consecutive sound level A is selected as the acoustic environment quality measurement quantity.

4.3.3 Evaluation standard

Noise assessment was carried out in accordance with the Class I standard for living environment specified in the Environmental Protection Planning of Huizhou (2007-2020). For sensitive areas such as the village (Lanzilong) near construction site, it should be carried out subject to Class I standard in the Environmental Quality Standard for Noise (GB3096-2008) and the noise in project site and at plant boundary will be subject to Class II standard specified in the Environmental Quality Standard for Noise (GB3096-2008).

Unit: dB(A)

Acoustic environment functional regionalization	Scope of applicable zone	Daytime	Night
Category 1	Residential area	55	45
Category 2	Area mixing with residence, commerce and industry.	60	50

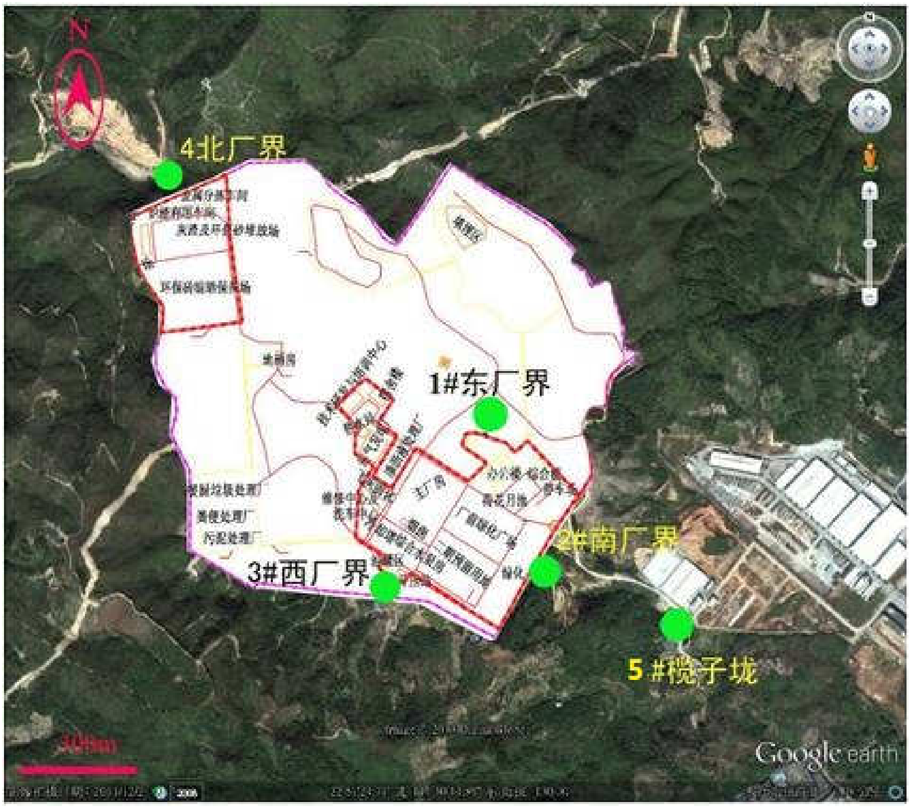


Figure 4.3-1 Distribution of noise monitoring points

4.3.4 Monitoring results

See Table 4.3-2 for noise monitoring results.

Table 4.3-2 Current acoustic environment quality

Monitoring point number and position		April 23				April 24			
No.	Position	Day time	Compliance	Night	Compliance	Day time	Compliance	Night	Compliance
1	East boundary	44.8	Yes	45.9	Yes	46.2	Yes	48.7	Yes
2	South boundary	40.0	Yes	48.7	Yes	43.4	Yes	46.3	Yes
3	West boundary	42.2	Yes	47.4	Yes	41.7	Yes	44.6	Yes
4	North boundary	41.0	Yes	45.8	Yes	45.1	Yes	48.4	Yes
5	Lanzilong, Tiantou Village	47.2	No	44.3	Yes	52.9	Yes	47.1	No
Applicable standard	Category 1 zone: Day time: 55, night: 45; Category 2 zone: Day time: 60, night: 50								

4.3.5 Current situation evaluation for noise

As shown in Table 4.3-2, the ambient noise at boundary of planned construction site is 40.00～46.2(A) (daytime) and 44.3～48.7dB(A) (night), indicating an ideal acoustic environment. Ambient noise during daytime and night at Lanzilong, Tiantou Village, the nearest sensitive area to project site, is 52.9dB(A) and 47.1dB(A) respectively. The maximum value in night is beyond Class I evaluation standard requirement and, according to feedback from site monitor, it is due to bugs chirping at night that leads to over-limit.

Ambient noise quality in the region is in general good, free from significant noise pollution.

4.4 Current status survey and evaluation for underground water environment

Underground water status survey is conducted based on the Underground Water Evaluation Report for Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City prepared by Shenzhen Gongkan Geotechnical Engineering Co., Ltd. A total of 37 columnar samples were taken. See Table 4.4-1 for drill hole positions.

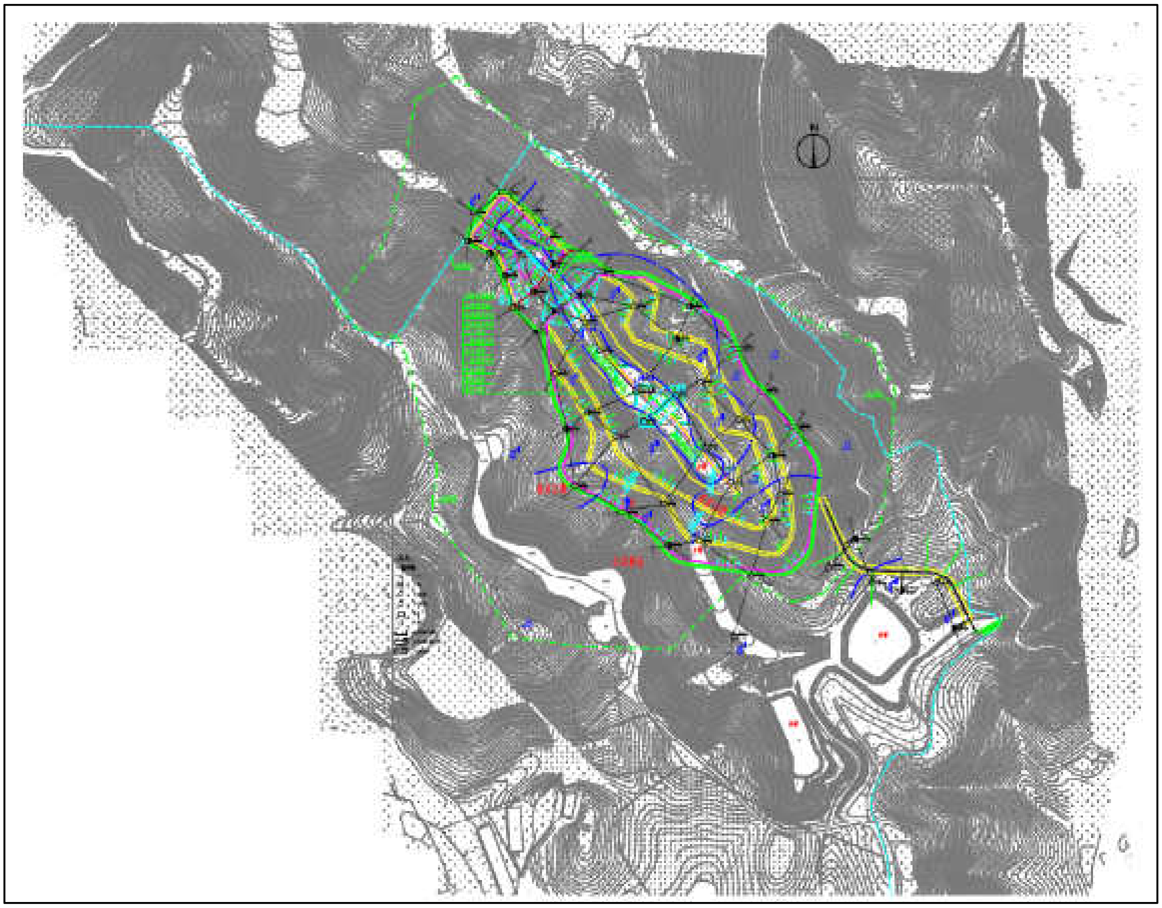
Table 4.4-1 Drill hole positions

No.	Exploratory point	Type of exploratory point[a]	Drilling depth (m)	Ground elevation(m)	Coordinate	
					X(m)	Y(m)
1	ZK2	Normal hole	7.8	56.77	501077.684	2529168.480
2	ZK3	Control hole	13.5	74.01	501073.273	2529141.591
3	ZK4	Control hole	12.2	74.33	501094.699	2529127.541
4	ZK5	Normal hole	5.8	60.86	501107.255	2529146.528
5	ZK9	Control hole	10.4	71.37	501109.005	2529106.726
6	ZK11	Control hole	16.9	72.97	501136.825	2529091.250
7	ZK12	Control hole	20.2	58.64	501158.928	2529120.815
8	ZK15	Control hole	29.6	60.44	501181.297	2529087.643
9	ZK16	Control hole	15.4	70.35	501154.964	2529073.003
10	ZK17	Control hole	11.8	82.74	501138.194	2529051.957
11	ZK18	Normal hole	8.9	88.27	501156.354	2529011.817
12	ZK19	Pump water test hole	22.6	59.63	501185.646	2529063.858
13	ZK20	Normal hole	13.6	71.27	501233.173	2529077.285
14	ZK21	Control hole	22.8	97.69	501288.028	2529077.532
15	ZK22	Control hole	39.6	88.52	501275.220	2529044.448
16	ZK24	Control hole	10.6	84.82	501189.775	2528974.623
17	ZK25	Control hole	11.7	98.2	501168.167	2528957.765
18	ZK27	Normal hole	7.9	82.31	501216.455	2528949.953
19	ZK28	Pump water test hole	19.9	66.14	501282.289	2528984.993
20	ZK29	Normal hole	14.3	73.98	501297.407	2529003.173
21	ZK32	Normal hole	12.5	84.21	501334.528	2528966.447
22	ZK33	Pump water test hole	20.5	66.42	501302.502	2528941.080
23	ZK34	Normal hole	6.7	94.47	501261.725	2528884.063
24	ZK36	Control hole	10.5	98.22	501267.439	2528844.944

No.	Exploratory point	Type of exploratory point[a]	Drilling depth (m)	Ground elevation(m)	Coordinate	
					X(m)	Y(m)
25	ZK37	Normal hole	6	88.99	501296.678	2528849.649
26	ZK38	Normal hole	10.7	67.76	501327.268	2528906.607
27	ZK39	Control hole	11.2	87.86	501367.425	2528932.847
28	ZK41	Normal hole	16.9	87.71	501375.396	2528896.130
29	ZK42	Normal hole	11.8	78.12	501361.801	2528868.432
30	ZK43	Pump water test hole	10.9	94.32	501330.143	2528758.183
31	ZK44	Water injection test hole	16.9	105.89	501346.366	2528816.514
32	ZK45	Water injection test hole	17.8	115.54	501422.154	2528825.491
33	ZK46	Control hole	9.2	123.47	501447.845	2528851.276
34	ZK47	Normal hole	6.2	107.13	501463.643	2528807.262
35	ZK48	Normal hole	6.6	108.92	501526.515	2528807.444
36	ZK49	Control hole	6.4	107.97	501542.941	2528765.106
37	ZK48-1	Control hole	6.5	107.47	501492.252	2528800.432

[a] Control hole- depth is 1m; normal hole-depth is 5m

Geological and hydrological condition analysis is provided for the site based on drilling results.



Map of the drill holes positions

4.4.1 Geological environmental condition

4.4.1.1 Geographic and geomorphic conditions

Geomorphic type of planned construction site is plateau and low-hill, landfill is located in the V shaped valley, east of the site while leachate treatment plant at the southwest side. The site has many and complex geomorphic forms, with an altitude of about 54.5～168.8m. Leachate treatment plant is on gentle slope, most of which are designed as temporary buildings for chicken farm. *Litchi sp.* or other greening tree species are planted around the site. The terrain gradually lowers from southwest to northeast. Ponds are distributed in the center or north low-lying areas. Beside ponds are vegetable fields and, in dry season, left barren without cultivation and, become vegetable fields after swarmed by water in rainy season. Treatment plant is separated from landfill by a watershed, which is high and precipitous and also the highest point inside the site.

A long and narrow V-shaped valley lies in the east of landfill, runs from south to west, with undeveloped modern gullies along both sides. Watersheds at both sides and gully bottom are 101.3～166.9m and 54.5～65.5m in altitude respectively. Mountain slopes on both sides, 25°～40°, are basically symmetric with each other. The east slope is quite precipitous, in some parts up to 55°. Both slopes are covered with vegetation, mainly camphor tree or osmanthus flowers and litchi of young ages. Gully bottom is mostly gentle and flat, about 28m wide (at most), regionally quite narrow in the north side, only several meters, about 450m in length.

4.4.1.2 Regional geological features

The project site is located at the continental margin of China southeast seas, in the arcuate tectonic belt formed by Lianhua Mountain fault zone and east-west direction Gaoyao- Huilai fault zone, with undeveloped fold structure.

The main fault, Lianhua Mountain fault zone, in north-east direction, is a multi-stage multi-component composite tectonic belt, with main structural features including the dynamic thermal metamorphic zone, ductile shear zone and brittle fracture zone. No fault structure with perceptible activities since Holocene has been found in the region, nor any abnormal tectonic activity was found. The recent stability of earth crust is relatively good.

Based on historical data on earthquake from Huizhou Science Commission, no record of destructive earthquake above magnitude 6 on Richter scale was found, generally below magnitude 4, frequently magnitude 1-2, weak in earthquake magnitude.

4.4.1.3 Landform

Geomorphic type of planned construction site is plateau and low-hill, and a U-shaped valley lies in the middle of the site. Due to long-time intense erosion, it has high and precipitous slopes and complex landforms. The natural slopes on both sides of mountain are generally 30～45°, regionally above 60°. Watershed has steep sides and regular shape. Terrain in the site varies greatly and, the elevation of 49 drilling holes in the site ranges from 56.77 to 123.47m, with maximum altitude difference of 66.7m.

4.4.1.4 Formation lithology

As shown by drilling results, strata from top to bottom: artificial filling stratum (Qml), alluvial-pluvial deposit (Q4al+pl) of quaternary system, diluvium (Qdl), eluvial (Qel), underlying bedrock is Middle Jurassic sandstone (J2). Description of lithologic character is provided below:

①Artificial filling stratum (Q^{ml}) of quaternary system

Plain fill: Grayish brown, gray, slightly wet to wet, loose ~ slightly dense, is mainly composed of cohesive soil, mixed with a small amount of gravel, regionally with a small amount of stone fragments. Distribution range within the field is small, borehole ZK2, ZK37, ZK43, ZK47 ~ ZK49 have revealed that the layer has the thickness of 0.30 ~ 3.50 m. The layer was subject to standard penetration test seven times, measured blow counts of 6.0 ~ 15.0, averagely 10.0; blow counts after bar length correction is 5.9 ~ 14.5, averagely 9.8.

② Alluvial-pluvial deposit (Q^{4al+pl}) of quaternary system

Clay containing organic matters: dark gray, flexible, regionally with soft fluidity, containing organic matters and plant root systems, slightly odorous. It is regionally distributed in gully, and borehole ZK15 and ZK1 revealed that the layer has the thickness of 1.50～1.90m, with burial depth of 0.00～1.50m and crest elevation of 58.94～59.63m. The layer was subject to standard penetration test two times, measured blow counts of 3.0, and blow counts after bar length correction is 2.9.

③ Diluvium (Q^{dl}) of quaternary system

Silty clay: yellow, maroon, in hard plastic state, containing uneven sands and earthy blocks (that can be broken off with hands), regionally mixed with intensely weathered rocks (hard to break with hands), 2cm in diameter. Most parts of the site revealed that the layer has the thickness of 0.40～4.10m, with burial depth of 0.00～2.80m and crest elevation of 58.64～123.47m. The layer was subject to standard penetration test seven times, measured blow counts of 12.0～21.0, averagely 16.4; blow counts after bar length correction is 11.7～20.6, averagely 16.1.

④ Eluvial (Q^{el}) of quaternary system

Silty clay: brown red, grayish yellow, brown yellow, in hard plastic state, formed by weathered eluvial deposit of underlying sandstones, visible residual protolith structure, regionally mixed with hard soil blocks, disintegrated after immersion. It is distributed sporadically, and borehole ZK11, ZK16, ZK17 and ZK25 revealed that the layer has the thickness of 0.50～1.60m, averagely 0.93m, with burial depth of 1.30～1.90m and crest elevation of 68.45～96.30m. The layer was subject to standard penetration test two times, and blow counts after bar length correction is 17.0～21.0, averagely 19.0; blow counts after bar length correction is 16.7～20.3, averagely 18.5.

⑤ Middle Jurassic sandstone (J_2)

The underlying bedrock is Jurassic system sandstone, three (intense, moderate and slight) weathered zones are found and brief introduction of lithologic characteristics is provided below:

⑤-2 Intensely weathered sandstone: yellowish-brown, grey brown, intense rock weathering, well-developed fracture, rock core mixed with fragmental blocks, with diameter of 2～4cm, regionally with higher content of fragments, difficult to be broken by hands, some are moderately weathered blocks. A few amount of rock cores are in pillar shape, easily softened by water. The sandstone is found in most of boreholes in the site, with drilling depth of 0.50～31.30m, averagely 5.98m; burial depth 0.00～4.90m, crest elevation 56.14～114.54m. The layer was subject to standard penetration test 8 times, measured blow counts of 54.0～76.0, averagely 60.3; blow counts after bar length correction is 51.6～70.1, averagely 56.5.

⑤-3 Moderately weathered sandstone: slate-grey, grayish white, red brown, with developed fracture, fracture surface stained by iron, regionally mixed with tiny amount of chloritization, regionally mixed with mudstone and argillaceous sandstone. Rock cores are mostly in lumps or short & medium columnar, regionally (ZK44) mixed with earthy intense weathering. It has dull striking sounds, mostly RQD＜10. The rock is soft rock, in fragments, grade factors being Class V. Most of boreholes in the site reach to the layer of moderately weathered sandstone, with drilling depth of 0.20～9.60m, averagely 3.91m; top burial depth of 0.00～34.50m, with crest elevation of 35.84～119.38m.

⑤-4 Slightly weathered sandstone: slate-grey with a few slightly developed fractures. Rock cores are mostly in lumps or short & medium pillar. It has clear striking sounds, drilled by diamond drill, RQD⩽10. It is classified as soft to relatively hard rock, quite fragmented, with grade factors being Class IV. Some boreholes in the site reach this layer with drilling depth of 3.00～8.10m, top burial depth of 0.50～13.90m, with crest elevation of 60.36～118.47m.

4.4.1.5 Unfavorable geologic conditions and geological disaster

No geological disaster such as Karst collapse, landslide, dangerous rock, and cave-in have been found in the site, while with the construction of roads and earthwork, the existing side slope and rock-face would subject to significant change and it is required to prevent cave-in or collapse due to large-scale excavation.

4.4.2 Hydrogeological condition

4.4.2.1 Groundwater level

Since survey is carried out in dry season, no underground water was found after most of drilling operations. The stable water level in some low-lying area in gully was measured, with burial depth of 0.20～6.70m, elevation of 55.97～105.84m, averagely 78.19m. See Figures 6.4-1 (a and b) for contour of water table in the region.

Figure 6.4-1a (low flow period)

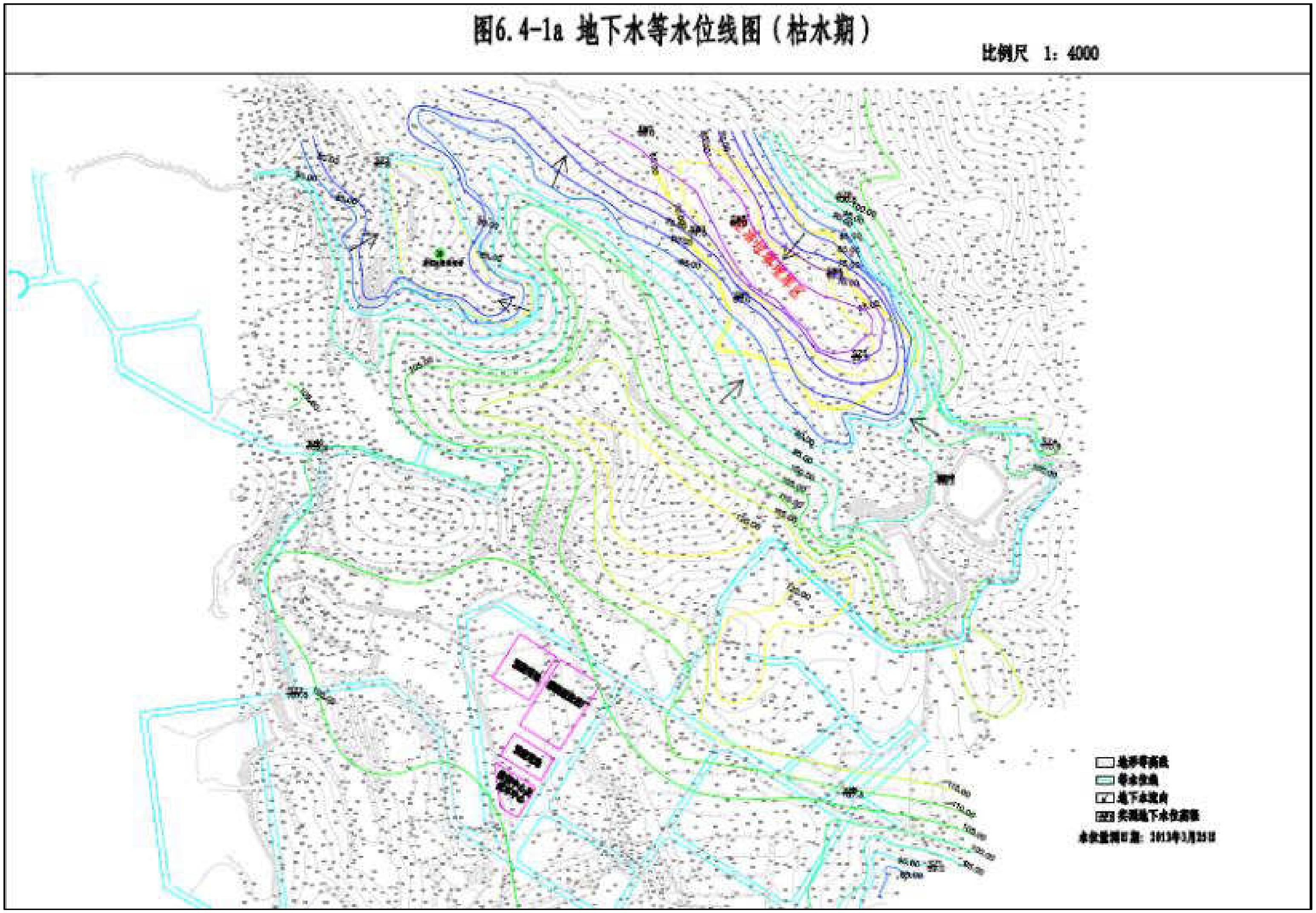
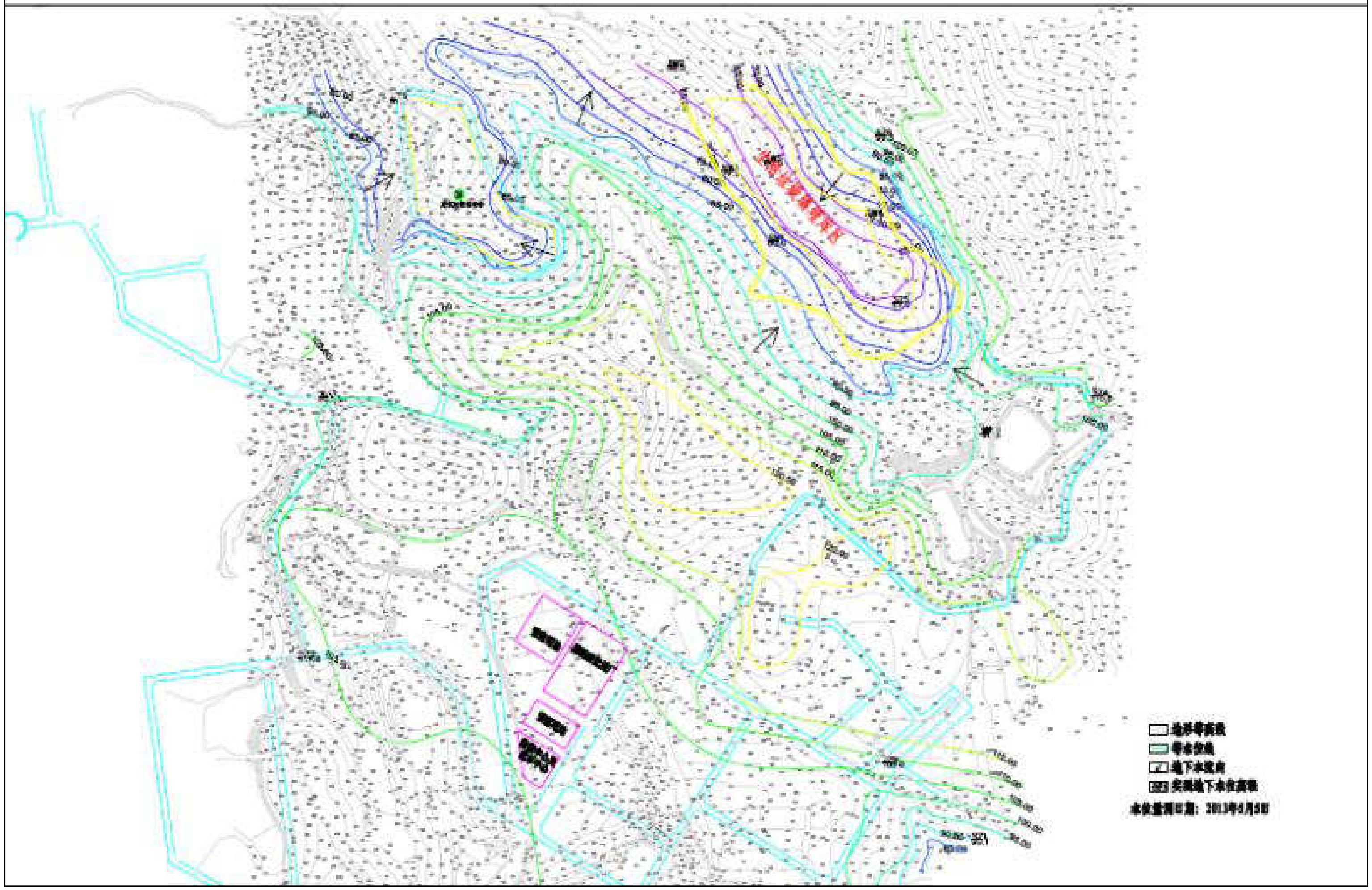


Figure 6.4-1b (high flow period)

图6.4-1b 地下水等水位线图（丰水期）

比例尺 1：4000



4.4.2.2 Features of groundwater recharge and runoff

Underground water in the region is mainly supplemented by atmospheric precipitation. The water shed at the east of landfill is also underground water shed and atmospheric precipitation infiltrated in the water shed are discharged from gullies on both sides (the east and the west). In addition, atmospheric precipitation infiltrated from the west side also supplies water to the site, and runoff is partially supplied to fish ponds and discharged in linear flow.

Landfill is separated by small water shed from treatment plant. Surface water runoff in the site flows generally from south to north, and a linear flow toward north can be found in the gully of landfill, which join with a small runoff at about 300m north of the site, and takes the direction toward west. Surface water in the plant area is mostly supplied to fish ponds, dominated by evaporation discharge. A linear flow in the north of site, joins with a surface runoff at about 300m, and finally to Huangsha Reservoir, north of the site.

The reservoir, with the nearest distance of about 600m from the project site, covers about 30,000m^2, with water level elevation of 31.4m. It suffers severe water pollution, enriched in green alga. The region is poor in permeability, locally replenished and discharged. Underground water is dynamically controlled by atmospheric precipitation.

4.4.2. 3 Hydrogeological characteristics

1. Aquifer in weathering sandstone of lower Jurassic system Lantang Gr ($J_1 ln$)

The rocks are light grey, gray, slate-grey quartz sandstone, partially mixed with bronzing mudstone and argillaceous sandstone, with thickness of 153-692m. The basement is covered by eluvium, diluvium, elurium and weathering zone in the upper layer, and the intensely weather zone is a permeable stratum with bedrock fissure water, while the upper layer of intensely weather zone is composed of earthy rocks and the lower are fragments, containing small quantity of cohesive soil. Pump water test results show the permeability coefficient being 0.625m/d.

2. Porous aquifer of quaternary (Q)

The aquifer is distributed sporadically in the survey area, with thickness of about 0.5～4.1m, mainly distributed at the area with filled soils, or in diluvial soils and sand soils, mostly perched water, wholly replenished by atmospheric precipitation or surface water body, significantly subject to seasonal influence. Water quantity is in general quite scare, particularly in dry season.

See Table 4.4-1 for aquifer group and water-abundance.

Table 4.4-1 Aquifer group and water-abundance

Aquifer group	Type of underground water	Water-abundance	Spring flow (L/s)	Specific yield of drill hole L/s·m
J_1ln Intensely weathered rock	Weathering fissure water of sedimentary rocks	Permeable stratum	No	0.0016
Quaternary system	Pore water of loose rocks	Weak	No	0.0250

4.4.3 Current status survey and evaluation for underground water

4.4.3.1 Distribution and process of underground water pollution sources

Most of the region is covered by fruit trees, the remaining area is used for chicken farm, pig farm, fish pond and waste yard. The site discharges wastewater and gas every day, one side of landfill has served as municipal solid waste yard for many years, the waste residue contains hazardous substances such as lead, nickel, nitrite nitrogen, ammonia nitrogen, cyanide and phenols. Waste gas and smoke lands on ground surface and permeates slowly into the ground along with atmospheric precipitation, in addition, sewage and farming would also cause underground water pollution mainly by human activities.

4.4.3.2 Distribution of monitoring points for investigation of underground water quality

As per guide rule and based on terrain in the site and underground hydrologic conditions, a total of 5 water quality monitoring points have been set. See Figure 6.4-3 for the Diagram of Underground Water Monitoring Points.

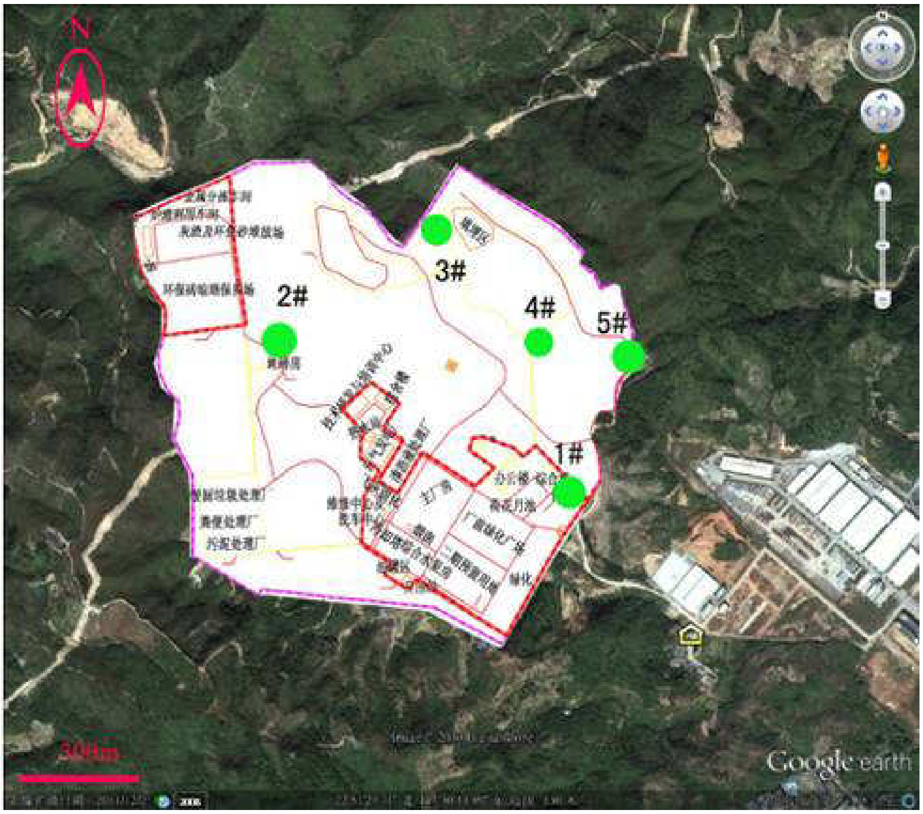


Figure 6.4-3 Diagram of Underground Water Monitoring Points

4.4.3.3 Applicable standard

In accordance with the Underground Water Function Regionalization of Guangdong Province (Water Resources Department of Guangdong Province, August 2009), the project site is classified as underground water conservation area of Huiyang, Huizhou, and as Class III water quality protection target, and subject to Class III in Quality Standard for Ground Water (GB/T14848-93).

4.4.3.4 Monitoring time and frequency

All water samples are taken once in dry season and wet season, during which the sampling time in dry season is March 21, 2013, and May 7, 2013 in wet season.

4.4.3.5 Monitoring program

Sampling analysis indicators mainly include: pH, total hardness, total soluble solids, volatile phenol, sulfate, chloride, nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, permanganate index, arsenic, mercury, hexavalent chromium, lead, fluoride, nickel, copper, zinc and cadmium.

4.4.3.6 Analysis and evaluation of monitoring results

See 4.4-2~4.4-3 for monitoring results.

Table 4.4-2 Underground water quality monitoring results during dry season Unit: mg/L

Monitoring	1#	2#	3#	4#	5#	Evaluation standard	Remarks
Turbidity	26	Undetected	219	57	478	≤3	Noncompliant
pH value	5.68	7.03	7.61	5.43	7.76	6.5～8.5	Compliant
Total hardness	24	150	34.1	35.1	40.5	≤450	Compliant
Permanganate index	0.9	1.2	7.8	1	2.9	≤3.0	Compliant
Cyanide	0.002	0.005	0.018	Undetected	0.002	≤0.05	Compliant
Hexavalent chromium	Undetected	Undetected	Undetected	Undetected	Undetected	≤0.05	
Nitrate nitrogen	2.23	13.9	0.51	0.09	0.22	≤20	Compliant
Nitrite nitrogen	0.041	0.043	0.005	0.003	0.037	≤0.02	Noncompliant
Arsenic	0.0007	0.0024	0.0006	Undetected	0.0004	≤0.05	Noncompliant
Mercury	Undetected	Undetected	Undetected	Undetected	Undetected	≤0.001	
Copper	0.0005	0.0005	0.0038	0.002	0.0038	≤1.0	Compliant
Zinc	Undetected	Undetected	Undetected	Undetected	0.06	≤1.0	Compliant
Nickel	0.18	0.16	Undetected	Undetected	Undetected	≤0.05	Noncompliant
Cadmium	Undetected	Undetected	Undetected	0.00016	Undetected	≤0.01	Compliant
Lead	0.0008	Undetected	0.0103	Undetected	0.0077	≤0.05	Compliant
Sulfate	4.27	29.6	3.44	38.9	3.71	≤250	Compliant
Volatile phenol	Undetected	Undetected	0.003	Undetected	0.003	≤0.002	Noncompliant
Ammonia nitrogen	0.12	0.05	0.07	0.06	0.08	≤0.2	Compliant
Total coliform	＞230	＞230	＞230	＞230	＞230	≤3.0	Noncompliant

Table 4.4-3 Underground water quality monitoring results during wet season Unit: mg/L

Monitoring	1#	2#	3#	4#	5#	Evaluation standard	Remarks
Turbidity	28	Undetected	207	64	469	≤3	Noncompliant
pH value	5.85	7.01	7.11	5.68	7.15	6.5～8.5	Compliant
Total hardness	23.6	148	34.5	35	39.7	≤450	Compliant
Permanganate index	0.9	1.2	7.5	1.2	2.6	≤3.0	Noncompliant
Cyanide	0.002	0.004	0.016	Undetected	0.002	≤0.05	Compliant
Hexavalent chromium	Undetected	Undetected	Undetected	Undetected	Undetected	≤0.05	
Nitrate nitrogen	2.21	13.7	0.5	0.07	0.21	≤20	Compliant
Nitrite nitrogen	0.037	0.034	0.004	0.004	0.036	≤0.02	Noncompliant
Arsenic	0.0007	0.0024	0.0006	Undetected	0.0004	≤0.05	Compliant
Mercury	Undetected	Undetected	Undetected	Undetected	Undetected	≤0.001	
Copper	0.0005	0.00053	0.00356	0.00201	0.00352	≤1.0	Compliant
Zinc	0.0206	0.0302	0.0198	0.0205	0.0607	≤1.0	Compliant
Nickel	0.176	0.156	0.00966	0.00871	0.009	≤0.05	Compliant
Cadmium	Undetected	Undetected	Undetected	0.00014	Undetected	≤0.01	

Lead	0.00084	Undetected	0.01	Undetected	0.00751	≤0.05	Compliant
Sulfate	4.09	29.5	3.32	38.8	3.57	≤250	Compliant
Volatile phenol	0.16	0.06	0.06	0.07	0.09	≤0.002	Noncompliant
Ammonia nitrogen	Undetected	Undetected	0.004	Undetected	0.002	≤0.2	Compliant
Total coliform	>230	3500	>230	49000	>230	≤3.0	Noncompliant

Monitoring results show the underground water in the project site suffers pollution to a certain extent.

(1) Turbidity

With exception to 2# monitoring point, the turbidity in other monitoring points during dry and wet season is not compliant with Class III in the Quality Standard for Underground Water (GB/T14848-93). 5# monitoring point is the most significant, up to 478mg/L.

(2) pH value

pH value at 1# and 4# during dry and wet season is less than the standard lower limit, acidic, and up to Class III standard specified in the Quality Standard for Underground Water (GB/T14848-93).

(3) Total hardness

Monitoring value of total hardness in monitoring points during wet and dry season are all up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(4) Permanganate index

With exception to 3# monitoring point, permanganate index at other monitoring points during dry and wet season is not compliant with Class III in the Quality Standard for Underground Water (GB/T14848-93).

(5) Cyanide

Monitoring value of cyanide in monitoring points during wet and dry season are all up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(6) Hexavalent chromium

No hexavalent chromium was detected in all monitoring points during dry and wet season.

(7) Nitrate nitrogen

Monitoring value of nitrate nitrogen in monitoring points during wet and dry season are all up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(8) Nitrite nitrogen

Monitoring value of nitrite nitrogen at 1#, 2# and 5# during dry and wet season is not compliant with Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93), with exception to that at 3# and 4# monitoring point.

(9) Arsenic

No arsenic was detected at 4# monitoring point during wet and dry season, monitoring value in other monitoring points are all up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(10) Mercury

No mercury was detected in all monitoring points during wet and dry season.

(11) Copper

Monitoring value of copper in monitoring points during wet and dry season are all up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(12) Zinc

No zinc was detected at all monitoring point during wet and dry season, or monitoring value in monitoring points are all up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(13) Nickel

Monitoring value of nickel at 1# and 2# during dry and wet season is not compliant with Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93), and nickel at other monitoring points was not detected or not compliant with Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(14) Cadmium

Cadmium is detected at 4# monitoring point only during wet and dry season, with monitoring value compliant with Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93). No cadmium was detected in other monitoring points.

(15) Lead

No lead was detected at 2# and 4# monitoring point during wet and dry season, monitoring value of lead at other monitoring points is compliant with Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(16) Sulfate

Monitoring value of sulfate in all monitoring points during wet and dry season is all up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(17) Volatile phenol

Monitoring value of volatile phenol in 3# and 5# monitoring points during wet and dry season is not up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93), and no volatile phenol was detected in other monitoring points. Volatile phenol was detected in all monitoring points during wet season, with all monitoring values not compliant with Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(18) Ammonia nitrogen

No ammonia nitrogen was detected at all monitoring point during wet and dry season, or monitoring value in monitoring points are all up to the Class III standard requirement in Quality Standards for Ground Waters (GB/T14848-93).

(19) Total coliform

Total coliform at all monitoring points during wet and dry seasons substantially exceeded the evaluation standard.

4.4.4 Conclusion

Geomorphic type of planned construction site, Lanzilong, Shatian Town, Huiyang, is plateau and low-hill, landfill is located in the V shaped valley, convenient for surface and underground water discharge, unfavorable for underground water replenishment. The region is poor in permeability, locally replenished and discharged. Underground water is dynamically controlled by atmospheric precipitation. According to site survey and relevant materials, most of the region is covered by fruit trees, the remaining area is used for chicken farm, pig farm, fish pond and waste yard. The site discharges wastewater and waste gas every day, one side of landfill has served as municipal solid waste yard for many years, the waste residue contains hazardous substances such as lead, nickel, nitrite nitrogen, ammonia nitrogen, cyanide and phenols. Waste gas and smoke lands on ground surface and permeates slowly into the ground along with atmospheric precipitation. In addition, sewage and farming would also cause underground water pollution source

Because of above pollution caused by human activities, some indicators of underground water in the region exceed Class III standard specified in the Quality Standard for Ground Water, and pH value, potassium permanganate index and nitrite nitrogen in some monitoring points also exceed the standard limit, particularly the turbidity and total coliform. With exception to nickel in some monitoring points, heavy metal indicators are compliant with standard requirement. In general, underground water in the project site has been subject to pollution to some extent, with low water quality.

4.5 Current status survey and evaluation for ecological environment

Contents in the section are referenced from Environmental Impact Assessment Report on Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City (the 1st stage) (draft for approval, August 2013, Guangzhou Research Institute of Environmental Protection).

4.5.1 Current ecological status survey and evaluation for terrestrial vegetation

4.5.1.1 Survey content and methods

Survey involves flora, vegetation forms and distribution in the region. On-site inspection reveals that, the region has no rare animals and plants, not classified as the nature reserve. Survey methods are mainly the data collection and site survey. Typical survey method is used for sampling. Quadrat area of arborous layer, shrub layer and herb layer is 10m×10m, 5m×5m and 1m×1m respectively. In addition, indicators such as specific name, tree height (plant height for shrub and grass), DBH (branch diameter for shrub), crown breath (cover degree for shrub and grass) are recorded as well as their occurrence and number of plants. Coenotype and distribution condition are determined by calculating importance value, increment, and biomass and the species diversity index according to relevant formula.

4.5.1.2 Evaluation method and standard

Biomass and production of green plant are the basis of ecological system material flow and energy flow, also the most important feature and the essential nature of ecosystem. In addition, the stability of ecological environment is positively correlated to biological diversity, also the diversity of species is the best indicator of full use of environment by wildlife. In this evaluation, the plant biomass, yield and the amount of species are taken as a basic parameter of the ecological environment evaluation.

(1) Plant biomass and standard relative biomass

Biomass of Guangdong subtropical native vegetation is quite homogeneous, while the biomass of actual vegetation is subject to significant variation. According to research, the present maximum biomass of subtropical evergreen broad-leaved forest, the zonal vegetation, is about 400t/ha. The value is considered as the highest level of plant biomass and the standard biomass, and divided into 6 grades, detailed in Table 4.5-1. The ratio of each grade of biomass to standard biomass is the standard relative biomass.

$$B_a = B_i / B_{\max}$$

Where:

B_a —Standard relative biomass;

B_i—Biomass (t/ha);

$B_{\max}$ —Standard biomass (t/ha);

The higher the B_a value, the better the environmental quality.

Table 4.5-1 Plant biomass and its relative biomass of subtropical plants in Guangdong.

Grade	Biomass （t/ha）	Standard relative biomass
I	≥400	≥1.00
II	400~300	1.00~0.75
III	300~200	0.75~0.50
IV	200~100	0.50~0.25
Va	100~40	0.25~0.10
Vb	<40	<0.10

(2) Net production and relative net production of plant

Net production of plant is organic matters produced by plant photosynthesis minus the amount consumed by the plant. The net production is directly related to the purification capacity of plant to carbon, oxygen balance and pollutants. The size of net production is closely related to regional ecological environment.

According to research on subtropical evergreen broad-leaved forest, the zonal vegetation has its maximum net production about 25t/ha•a. The value is considered as the highest level of plant biomass and the standard biomass, and divided into 6 grades, detailed in Table 4.5 2. The ratio of each grade of biomass to net standard production is the standard relative net production.

$$P_a = P_i / P_{\max}$$

Where:

P_a —Standard relative net production

P_i—Net production

$P_{\max}$ —Standard net production

The higher the B_a value, the better the environmental quality.

Table 4.5 2 Net productions and relative net production of subtropical plants in Guangdong

Grade	Net production（t/ha·a）	Standard relative net production
I	≥25	≥1.00
II	25~20	1.00~0.80
III	20~15	0.80~0.60
IV	15~10	0.60~0.40
Va	10~5	0.40~0.20
Vb	<5	<0.20

(3) Plant species number and standard relative species number

It is difficult to determine the species number of all plants, and the evaluation would allow for only the number of dominant vascular plant species. Since the investigation is generally conducted in quadrat, covering about 1000m^2, the species number in the quadrat is considered as the indicator.

According to research, the maximum species number in a quadrat (covering 1000m^2) of subtropical evergreen broad-leaved forest would be more than 100, therefore 100 species/1000m^2 is deemed as the species number of the highest grade and the standard species number, detailed in Table 4.5-3.

$$S_a = S_i / S_{\max}$$

Where:

S_a —Standard species number;

S_a —Species number (species/1000m^2);

$S_{\max}$ —Standard species number (species/1000m^2);。

The higher the S_a value, the better the environmental quality.

Table 4.5-3 Species number and relative species number of subtropical plants in Guangdong

Grade	Species number	Relative species number
I	≥100	≥1.00
II	100~75	1.00~0.75
III	75~50	0.75~0.50

IV	50~25	0.50~0.25
Va	25~10	0.25~0.10
Vb	<10	<0.10

Production, biomass and species are three important biological parameters for evaluating the environmental ecology, their integration, to a large extent, reflects the change of environmental quality. The above three factors, therefore, are selected in the evaluation, and the project comprehensive evaluation index of ecological environment and its classification are formulated, as detailed in Table 4.5‐4.

Table 4.5-4 Comprehensive evaluation index for ecological environmental quality and its distribution

Standard relative biomass（1）	Standard relative net production （2）	Standard relative species number （3）	Ecological and environmental quality comprehensive index （1）+（2）+（3）	Grade	Evaluation
≥1.00	≥1.00	≥1.00	≥3.00	I	Good
1.00~0.75	1.00~0.80	1.00~0.75	3.00~2.30	II	Good
0.75~0.50	0.80~0.60	0.75~0.50	2.30~1.60	III	Medium
0.50~0.25	0.60~0.40	0.50~0.25	1.60~0.90	IV	Poor
0.25~0.10	0.40~0.20	0.25~0.10	0.90~0.40	Va	Poor
<0.10	<0.20	<0.10	<0.40	Vb	Very poor

4.5.1.3 Status of ecologic environment of terrestrial vegetation and its evaluation

(1) Ecological change in vegetation

This project is located in the low hilly land, because of human activities, the zonal vegetation, has gone. At present, the vast majority of artificial vegetation is composed mainly of pines, eucalyptus, longan, Taiwan acacia, and grasslands.

(2) Plant diversity and common plants

According to field investigation, plants within existing ecological evaluation range include: 1) arbor plants: pinus massoniana, longan, eucalyptus, bamboo, Taiwan acacia. (2) shrubs: euphorbiaceae, papaya, myrtle, psychotria rubra, pubescent holly root, ivy tree bark. (3) vine plants: mikania micrantha, smilax, Chinese fevervine herb and root, zebrawood, embelia, lygodium japonicum. (4) herbaceous plants: dicranopteris pedata, clerodendrum fortunatum, miscanthus floridulus, adiantum, cyclosorus parasiticus, sticktight, intermediate bothriochloa, rose mallow root, eupatorium catarium, cynodon dactylon, wild citronella, imperata cylindrica, ischaemum ciliare, cotoneaster, cesmodium heterocarpum, herba euphorbiae hirtae, panicum repens, wire grass, ditch millet.

(3) Major vegetation forms

1) Masson pine- miscanthus floridulus community

Pinus massoniana community is mainly distributed on either side of the hill within the evaluation scope, the community is as high as 10 m, canopy density of 0.90, 45 species. In a sample area of 100 m^2, 54 masson pines are found, 8 with 25 cm diameter at breast height (DBH), 8 with 10 cm DBH, which is a dominant species in the community. The herb layer is 0.67m high, masson pine is the dominant species. Associated species includes dicranopteris pedata, intermediate bothriochloa, eupatorium catarium veldkamp, wild citronella, cynodon dactylon.

2) Acacia confusa — myrtus community

Acacia confusa — myrtus community is mainly distributed on the southern hill within the evaluation scope, the arborous layer is as high as 6 m, with coverage of 0.90, dominated by acacia mangium and myrtus. Shrub layer is 1.2m high, with canopy density of 0.20, dominated by myrtus. Associated species includes schefflera octophylla, pubescent holly root, euphorbiaceae. The herb layer is 0.2m high, with coverage of 10%, mainly including eupatorium catarium, euphorbia hirta, rose mallow root, panicum repens, miscanthus floridulus.

3) Litchi- eucalyptus community

Litchi- eucalyptus community is mainly distributed on the southern low hills within the evaluation scope, relatively centralized. The community is 7m high, with canopy density of 0.75, 12 community species, dominated by litchi, eucalyptus, ditch millet and eupatorium catarium veldkamp. Associated species include dicranopteris pedata, miscanthus floridulus, wild citronella, ischaemum ciliare, wire grass and herba euphorbiae hirtae.

4) Carambola community

Carambola community is mainly distributed on the southern low-hill grounds within evaluation scope, relatively centralized. The community is 4m high, with canopy density of 0.85, 8 community species, dominated by carambola. Associated species includes dicranopteris pedata, herba euphorbiae hirtae, miscanthus floridulus, panicum repens.

5) Dicranopteris pedata- eupatorium catarium- cynodon dactylon community

Dicranopteris pedata, miscanthus floridulus and eupatorium catarium veldkamp are distributed in the region. The community is 0.55m high, with canopy density of 0.85, 32 community species, dominated by dicranopteris pedata, eupatorium catarium, panicum repens, cynodon dactylon. Associated species include ischaemum ciliare, cotoneaster, wild citronella, imperata cylindrica, cynodon dactylon, desmodium heterocarpum, herba euphorbiae hirtae, miscanthus floridulus, ditch millet, panicum repens.

(4) Ecological environment quality evaluation for plants

A total of 5 plant groups are distributed in the region, mainly artificially cultivated plants, including pinus massoniana community, acacia confusa community, litchi community, carambola community and brush community. Arborous layer of those communities are mostly covered by artificially cultivated plants, and the wild plants mainly include shrubs and herbals of small size, easily to be spread, with strong tolerance to barren soil, suitable to environment with high interference. Plant community structure is quite complete, and 4 plant communities among five have arborous layer, generally consisted of few species while both shrub and herbaceous layers are relatively rich in plant species.

Biomass of 5 plant communities varies from 45 t/ha to 260 t/ha, detailed in Table 4.5-5. Compared with the biomass of south subtropical succession climax community (400t/ha), the value is relatively low, indicating that the region has considerable biomass and relatively strong capacity to improve environmental quality.

Table 4.5-5 Standard relative biomass and grade of major plant communities in the region

Community	Biomass（t/ha）	Standard relative biomass	Grade
Masson pine- miscanthus floridulus community	260	0.65	III
Acacia confusa —myrtus community	100	0.250	IV
Litchi- eucalyptus community	70	0.175	Va
Carambola community	200	0.5	IV
Dicranopteris pedata- eupatorium catarium- cynodon dactylon community	45	0.075	Vb

South subtropical plants grow fast, while different plant communities, different development stages of plant community and the habitat conditions of plant community would affect the production of plant community. Based on investigation and estimation, the net production of 5 plant communities in the region varies from 7.5～15.5 t/ha•a, detailed in Table 4.5- 6.

In general, net production of major plant communities in the region is relatively ideal, indicating a good vegetation restoration condition available in the region and, it is favorable for vegetation recovery in the region as long as proper ecological restoration measures are taken.

Table 4.5-6 Standard relative net production and grade of major plant communities in the region

Community	Net production （t/ha·a）	Standard relative net production	Grade
Masson pine- miscanthus floridulus community	15.5	0.620	Ⅲ
Acacia confusa — myrtus community	10.1	0.404	Ⅳ
Litchi- eucalyptus community	7.5	0.30	Ⅴa
Carambola community	10	0.4	Ⅳ
Dicranopteris pedata- eupatorium catarium- cynodon dactylon community	7.5	0.300	Ⅴa

The diversity of species composition is consistent with community stability, therefore species number is the important biological parameter for ecological environmental evaluation. According to the survey, vascular plant species in 5 plant communities in the region varies from 11～41 species/ km^2, detailed in Table 4.5-7. In general, the community is rich in species.

It is necessary to protect species and, by taking ecological protection measures and natural succession, improve species number in the region. The ecological system stability would be subject to threat if no species protection measures are taken.

Table 4.5-7 Standard relative species number and grade of major plant communities in the region

Community	Species number (km2）	Standard relative species number	Grade
Masson pine- miscanthus floridulus community	41	0.410	Ⅳ
Acacia confusa — myrtus community	12	0.120	Ⅴa
Litchi- eucalyptus community	10	0.100	Ⅴa
Carambola community	10	0.100	Ⅴa
Dicranopteris pedata- eupatorium catarium- cynodon dactylon community	11	0.090	Ⅴb

Biomass, net production and species number are used for evaluating plant community, reflecting the ecological environment in the region. Such three parameters are complementary, therefore can comprehensively reflect the ecological environmental quality status in the region.

The comprehensive indexes for the eco-environmental quality of the region can be obtained by summing standard relative biomass, production and species number.

The comprehensive indexes for the eco-environmental quality demonstrates that, as shown in Table 4.5-7, masson pine- miscanthus floridulus community is grade III, carambola community grade IV, and other three are grade Va, indicating the eco-environmental quality in the region is in the middle level. Since the plant community in the region has significant production, rich in south subtropical plant species, it is easy to be restored and advantageous in restoring ecological environment. Table 4.5- 8 below shows the comprehensive evaluation index for ecological environmental quality and its grade in the region.

Table 4.5-8 Comprehensive evaluation index for ecological environmental quality and its grade in the region

Community	Standard relative biomass	Standard relative production 2）	Standard relative species number （3）	Comprehensive evaluation index for ecological environmental quality （1）＋（2）＋（3）	Grade
Masson pine- miscanthus floridulus community	0.65	0.620	0.410	1.68	III
Masson pine- miscanthus floridulus community	0.250	0.404	0.120	0.774	Ⅴa
Litchi- eucalyptus community	0.175	0.30	0.100	0.575	Ⅴa
Carambola community	0.5	0.4	0.100	1	Ⅳ
Masson pine- miscanthus floridulus community	0.075	0.300	0.090	0.465	Ⅴa

4.5.2 Current status survey and evaluation for animals

4.5.2.1 Survey and analysis of animal

Common animal species in the region include:

(1) Reptile

It mainly includes Gekkochinens~Gray, Enchinens chinensis, Xenochrophis piscater, Eumeces chinensis Gray, Eumeces quadrilineatus, Amphiesma stolata.

(2) Mammals

It mainly includes Rattus pectus Milne-Edwards, Rattus norvegicus Berkenhout, Pipistrellus abramus Temminck, Rattus rattoides Hodgson, Bandicota indica Bechstein.

(3) Amphibian

It mainly includes Bufo melanostictus Schneider, Microh pulchra, Rana limnocharis Boie, Kaloulapulchra Gray, Rhacophorus leucomystax.

(4) Birds

It mainly includes Ardeola bacchus, Bubulcus ibis, Cuculus micropterus Gould, Apus affinis, Halcvon Linn Linnaeus, Myna, Linnaeus.

(5) Insect

Insects are the mostly widely distributed creature in nature, mainly include Nezara Viridula, odopter Litura, Gastrimaegus marmoratus, Culexans, Gryllulus species, Hierodula species, Crocothemis servilia Drury, Macroterma 0rmosanus, Crypto mpana mimica, Gaeana maculate, Nepa species, Heliothiszmera, Sntomis imaon, Euploeamidamus, Hebomoia glaucippe, Sarcophaga specie, Musca domestica.

4.5.2.2 Rare and endangered species

No rare and endangered species under national protection was found in the evaluation scope.

4.6 Soil and plant testing result

4.6.1 Monitoring item

The soil and plant test was carried out the Environmental Monitoring Center, South China Institute of Environmental Sciences, MEP on April 23, 2013.

Soil samples are taken from surface layer (plough layer) and plant samples are mainly litchi and longan.

To know the degree, scope and pattern of soil pollution, contents of heavy metals in soil and plant, including Cu, zinc, Pb, As, Cd, Hg, pH and dioxins, are analyzed.

4.6.2 Distribution of monitoring points

In accordance with the requirements specified in the Notice on Further Enhancement of Evaluation Management of Environmental Impact by Biomass Power Generation Projects on environmental impact assessment and monitoring for municipal solid waste incineration power generation plant, four monitoring points have been set up for soil and plant: 1# Huangsha Village, 2# Hantang'ao, 3# Xiaowu Village (control point in upwind direction) and 4# Jinju

Natural Reserve (control point in upwind direction), collect surface layer soil and take local crops and fruits as plant samples.

Figure 6.6-1 Diagram of soil monitoring points

4.6.3 Monitoring result and evaluation

The evaluation standard for soil environmental quality will be subject to Class II standard specified in the Environmental Quality Standard for Soils (GB15618-1995) and single-factor index method is used. See Table 4.6-1 for monitoring results.

Indicators such as Pb, Cu, Zn, Cd, Cr, As, Ni and Hg in monitoring points are monitored in accordance with Class II standard (soil limit value for agricultural production and human health) specified in the Environmental Quality Standard for Soils (GB15618-1995).

There is no national environmental quality standard for dioxin in soil, therefore it is referenced to the concentration reference value specified by Netherlands, namely the value specified in 1987: 100ngTEQ/kg for residential and agricultural lands and 10ngTEQ/kg for milk cow pasture.

As shown in Table 4.6-1 and Table 4.6-2, monitoring indexes at each monitoring point has reached Class II standard requirement in the Environmental Quality Standard for Soils

(GB15618-1995) and the ratio to standard value is relatively low.

Table 4.6-1 Soil monitoring results (Unit: mg/kg, with exception to pH and dioxin)

Monitoring factor / Sampling point	pH	Cadmium	Mercury	Arsenic (dry land)	Copper (farmland)	Lead	Chromium (dry field)	Zinc	Nickel	dioxin (ng-TEQ/kg)
Huangsha Village	6.89	0.20L	0.023	4.53	1.94	18.3	7.74	16.1	0.64	4.04
Hantang'ao	7.18	0.20 L	0.059	25.9	2.67	22.2	10.5	14.8	1.25	1.42
Xiaowu Village	6.95	0.20 L	0.060	10.1	7.07	32.5	7.74	38.6	1.64	6.07
Jinju Natural Reserve	6.36	0.20 L	0.024	4.25	4.71	17.9	13.3	31.6	2.26	7.15
Standard	<6.5	≤0.30	≤0.30	≤40	≤50	≤250	≤150	≤200	≤40	100
	6.5~7.5	≤0.30	≤0.50	≤30	≤100	≤300	≤300	≤250	≤50	100
status of compliance	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Table 4.6-2 Evaluation index of soil environmental quality

Monitoring factor / Sampling point	pH	Cadmium	Mercury	Arsenic (dry land)	Copper (farmland)	Lead	Chromium (dry field)	Zinc	Nickel	Dioxin (ng-TEQ/kg)
Huangsha Village	—	0.33	0.046	0.151	0.019	0.061	0.026	0.064	0.013	0.040
Hantang'ao	—	0.33	0.118	0.863	0.027	0.074	0.035	0.059	0.025	0.014
Xiaowu Village	—	0.33	0.120	0.337	0.071	0.108	0.026	0.154	0.033	0.061
Jinju Natural Reserve	—	0.33	0.080	0.106	0.094	0.072	0.089	0.158	0.057	0.071

See Table 4.6-3 for monitoring results of heavy metal and dioxin. No evaluation is made for heavy metal and dioxin in the plant because of the lack of relevant standard.

Table 4.6-3 Plant monitoring results (Unit: mg/kg, with exception to pH and dioxin)

Monitoring factor / Sampling point	pH	Cadmium	Mercury	Arsenic	Copper	Lead	Chromium	Zinc	Nickel	Dioxin (ng-TEQ/kg)
Huangsha Village	5.44	<0.20	0.014	0.11	9.38	2.57	13.7	16.3	1.98	1.50
Hantang'ao	6.49	<0.20	0.010	0.19	<0.5	<1.0	<1.0	3.0	2.22	2.23
Xiaowu Village	5.79	<0.20	0.013	0.09	9.96	3.37	5.8	25.1	3.92	2.19
Jinju Natural Reserve	5.70	<0.20	0.008	0.10	10.6	0.81	4.7	25.2	<0.5	4.31

Chapter V Environmental impact prediction and evaluation

5.1 Atmospheric environmental impact prediction evaluation

5.1.1 Climate of Huizhou

Statistical data in recent 20 years from Huiyang Meteorological Station (station number: 59298) show that, Huizhou enjoys plenty of sunshine, high temperature, long summer and warm winter and early spring. It has annual sunshine duration of 1806h, annual mean temperature of about 22.4℃, and the highest and lowest temperature is 38.9℃ and 0.5℃ respectively. Average temperature in July and January is 28.7℃ and 14.1℃ respectively. Average annual rainfall is 1758.3 mm, the highest annual rainfall recorded in 2006 was 2570.9 mm, while in 2004, the year with least annual rainfall, it is 1173.3 mm. The annual average relative humidity is 76%.

Statistical data in recent 20 years from Huiyang Meteorological Station demonstrate that wind in the region is influenced heavily by seasonality, dominated by northeast airflow in the whole year (with 33.8% occurrence probability of NNE~NE), frequency of calm condition up to 14.8%, and average annual wind speed of 2.0m/s. Typhoon usually occurs during summer and autumn. Based on the statistics of meteorological observation data from 1989~2008 of Huiyang Meteorological Station, climatic characteristics of the city are described in Table 5.1-1~5.1-4.

Table 5.1-1 Climatic conditions of Huizhou in past years

Item	Value
Annual mean wind speed (m/s)	2.0
Maximum wind speed (m/s) and the occurrence time	16.5, corresponding wind direction: NNE Occurrence time: August 31, 1995
Annual average temperature	22.4
Extreme maximum temperature and the occurrence time	38.9, occurrence time: July 2, 2004
Extreme minimum temperature and the occurrence time	0.5, occurrence time: December 29, 1991
Annual average relative humidity	76
Average annual precipitation（mm）	1758.3
Annual maximum precipitation and the occurrence time	Maximum value: 2570.9mm; occurrence time: 2006
Annual minimum precipitation and the occurrence time	Minimum value: 1173.3mm; occurrence time: 2004
annual average sunshine duration (h)	1806.3

Table 5.1-2 Monthly average wind speed of Huizhou in past 20 years (m/s)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Wind speed	2.2	2.1	2.0	1.9	1.9	1.7	1.8	1.7	1.9	2.1	2.2	2.2

Table 5.1-3 Monthly average temperature of Huizhou in past 20 years (℃)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Temperature	14.1	15.4	18.5	22.6	25.6	27.6	28.7	28.4	27.3	24.5	20.3	15.9

Table 5.1-4 Wind direction frequency of Huizhou in past 20 years (m/s)

Wind direction	N	NNE	NE	ENE	E	ESE	SE	SSE	C
Wind frequency	5.7	13.8	14.1	5.9	6.1	6.2	11.6	7.8	14.8
Wind direction	S	SSW	SW	WSW	W	WNW	NW	NNW	Dominant wind direction
Wind frequency	5.2	1.6	1.6	1.1	1.2	0.8	1.4	1.2	NE

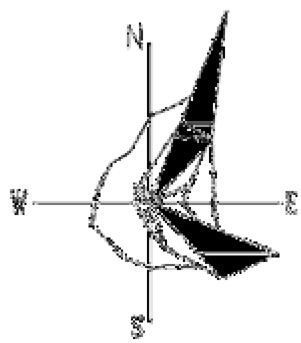


Figure 5.1-1 Rose diagram of wind in past years in Huizhou

5.1.2 Wind characteristic on the ground

In accordance with the Technological Guide on Environmental Impact Evaluation (HJ2.2—2008), meteorological data of each day and hour in 2012 from Huizhou Meteorological Station was collected and processed for statistics.

See Table 5.1-1 for Climatic conditions of Huizhou in past years, Table 5.1-2 for Monthly average wind speed of Huizhou in past 20 years, Table 5.1-3 for Monthly average temperature of Huizhou in past 20 years,, Table 5.1-4 for Wind direction frequency of Huizhou in past 20 years, and see Table 5.1-5 for Monthly change in annual mean wind speed.. See Table 5.1-6 for Monthly change in annual mean temperature. According to the figures below, Dominant wind direction of the project site is south-eastern, north-eastern, so the impact of the project is focus in Southwest and northwest area. The Shatian town and Biguiyuan are at the Southeast and northeast of the project site, hence the impact is less.

Table 5.1-5 Monthly change in annual mean wind speed (m/s)

Month	January	February	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Wind speed (m/s)	2.46	2.40	2.27	2.23	2.21	2.25	2.22	1.78	2.09	2.03	2.22	2.36

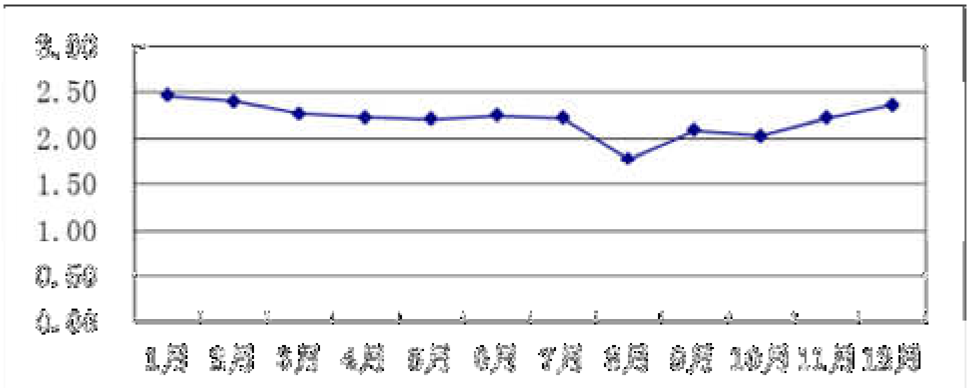


Figure 5.1-2 Monthly change in annual mean wind speed (m/s)(y-axis:wind speed (m/s) x-axis: month)

Table 5.1-6 Monthly change in annual mean temperature

Month	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Temperature (℃)	11.70	14.01	18.53	22.91	26.35	27.38	28.11	28.34	26.95	24.41	19.64	15.20

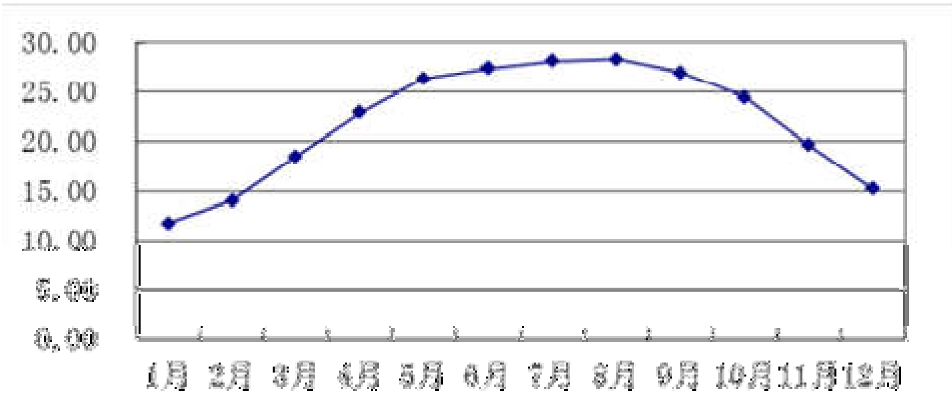
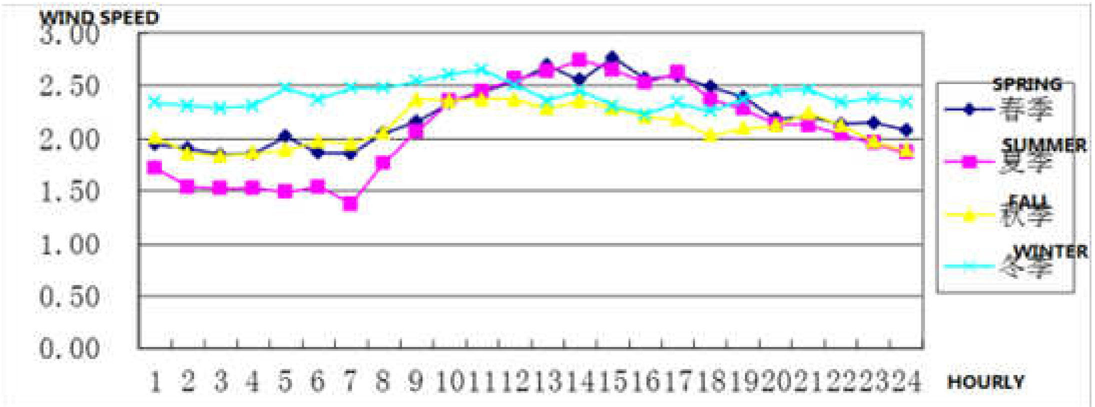


Figure 5.1-3 Monthly change in annual mean temperature (℃) (y-axis:wind speed (m/s) x-axis: month)

Table 5.1-7 Hourly change in daily average wind speed by seasons (m/s)

Season \ Hour	1	2	3	4	5	6	7	8	9	10	11	12
Spring	1.95	1.91	1.85	1.86	2.02	1.87	1.86	2.05	2.16	2.34	2.44	2.54
Summer	1.72	1.54	1.52	1.53	1.49	1.54	1.38	1.77	2.07	2.35	2.45	2.57
Autumn	2.01	1.86	1.84	1.87	1.89	1.98	1.95	2.06	2.37	2.36	2.37	2.37
Winter	2.34	2.31	2.29	2.31	2.48	2.37	2.48	2.48	2.55	2.61	2.66	2.51
Season \ Hour	13	14	15	16	17	18	19	20	21	22	23	24
Spring	2.70	2.56	2.77	2.57	2.60	2.49	2.39	2.19	2.21	2.14	2.15	2.08
Summer	2.64	2.75	2.66	2.53	2.63	2.37	2.28	2.14	2.13	2.04	1.96	1.87
Autumn	2.28	2.36	2.29	2.21	2.18	2.03	2.10	2.12	2.24	2.13	1.97	1.89
Winter	2.36	2.45	2.31	2.23	2.34	2.26	2.37	2.45	2.46	2.34	2.38	2.34



NOTE: (Spring: March to May, Summer: June to August, Fall: September to October, Winter: November to February)

Figure 5.1-4 Hourly change in daily average wind speed by season

Table 5.1-8 Monthly and seasonal change in annual average wind frequency and the annual average wind frequency

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	C
January	1.5	22.7	50.9	15.6	3.1	1.5	1.3	0.8	0.3	0.1	0.1	0.4	0.5	0.4	0.3	0.4	0.0
February	1.6	15.2	39.4	15.2	7.0	6.3	8.8	2.6	1.1	0.7	0.3	0.1	0.1	0.4	0.4	0.6	0.0
March	1.5	10.5	24.1	14.9	7.4	8.5	17.7	6.4	4.0	1.3	0.9	0.3	0.8	0.8	0.7	0.1	0.0
April	1.8	5.4	11.8	14.6	6.0	7.9	18.5	10.1	10.1	6.0	1.3	1.1	1.0	1.5	2.1	0.8	0.0
May	0.9	5.2	7.5	7.7	6.8	11.7	28.2	7.4	7.7	2.8	2.5	2.5	4.0	2.3	1.9	0.7	0.0
June	2.8	3.2	7.5	9.3	6.5	9.7	18.5	8.2	8.9	4.7	1.9	4.7	5.3	4.4	2.9	1.3	0.1
July	1.3	3.4	6.6	9.7	8.2	7.5	16.8	11.6	9.9	4.6	4.8	4.3	5.0	1.6	3.1	1.6	0.0
August	6.1	7.4	5.5	6.7	5.4	6.3	12.2	4.2	3.2	3.0	3.0	3.8	5.8	9.0	15.1	3.5	0.0
September	4.4	14.6	18.6	10.4	4.9	8.3	14.9	4.6	3.3	2.9	1.3	1.7	1.3	1.4	4.2	3.3	0.0
October	2.4	11.3	15.6	10.9	7.9	12.1	22.7	4.6	2.7	0.4	1.1	0.9	1.9	1.8	1.9	1.9	0.0
November	2.8	13.1	29.4	17.1	6.1	8.1	11.7	4.6	2.6	1.8	0.4	0.4	0.3	0.1	0.7	0.7	0.1
December	1.2	13.4	40.7	20.4	5.4	3.8	7.4	3.1	1.2	0.8	0.1	0.3	0.1	0.5	0.5	0.9	0.0

Table 5.1-9 Seasonal change in annual average wind frequency

Wind direction / Season	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	C
Spring	1.4	7.1	14.5	12.4	6.8	9.4	21.5	8.0	7.3	3.3	1.6	1.3	2.0	1.5	1.5	0.5	0.0
Summer	3.4	4.7	6.5	8.6	6.7	7.8	15.8	8.0	7.3	4.1	3.3	4.3	5.3	5.0	7.1	2.1	0.1
Autumn	3.2	13.0	21.1	12.8	6.3	9.5	16.5	4.6	2.9	1.7	0.9	1.0	1.1	1.1	2.2	2.0	0.1
Winter	1.4	17.2	43.8	17.1	5.1	3.8	5.8	2.2	0.9	0.6	0.2	0.3	0.3	0.5	0.4	0.6	0.0
Yearly	2.4	10.4	21.4	12.7	6.2	7.6	14.9	5.7	4.6	2.4	1.5	1.7	2.2	2.0	2.8	1.3	0.0

5.1.3 Atmosphere prediction mode

AERMOD model is used for prediction in accordance with the Technological Guide on Environmental Impact Evaluation – Atmospheric Environment (HJ2.4-2009).

AERMOD model recommended by Atmospheric Environment is used, with version of 09292.

Atmospheric preprocessor model is AERMET, with the version of 6.4. Meteorological data on the ground is sourced from meteorological data of 2012 from Huizhou Meteorological Station and the data for upper air is the mesoscale simulation data supplied by assessment center.

Table 5.1-10 AERMET underlying surface parameter setting

Season	Albedo	Bowen-ratio	Surface roughness（90°~180°）	Surface roughness（0°~90°&180°~360°）
Spring	0.14	0.48	1.0	1.0
Summer	0.16	0.62	1.0	1.3
Autumn	0.15	0.51	1.0	1.3
Winter	0.13	0.43	1.0	1.0

Topographic processor model is AERMAP, with version of 09040. SRTM3 topographic data information with resolution ratio of 90m is sourced from NASA and NIMA, as shown in Figure 5.1-6.

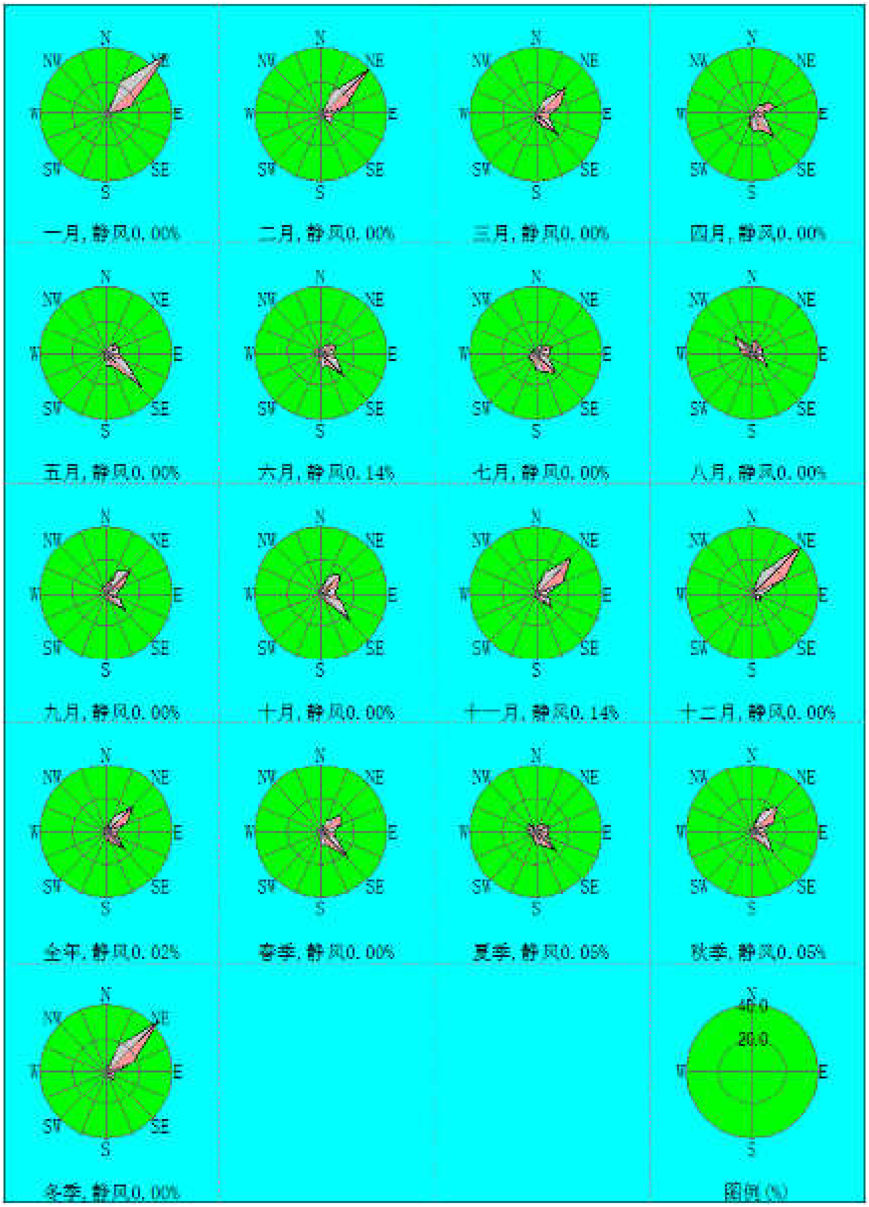


Figure 5.1-5 Rose diagram of wind in Huizhou (2012)

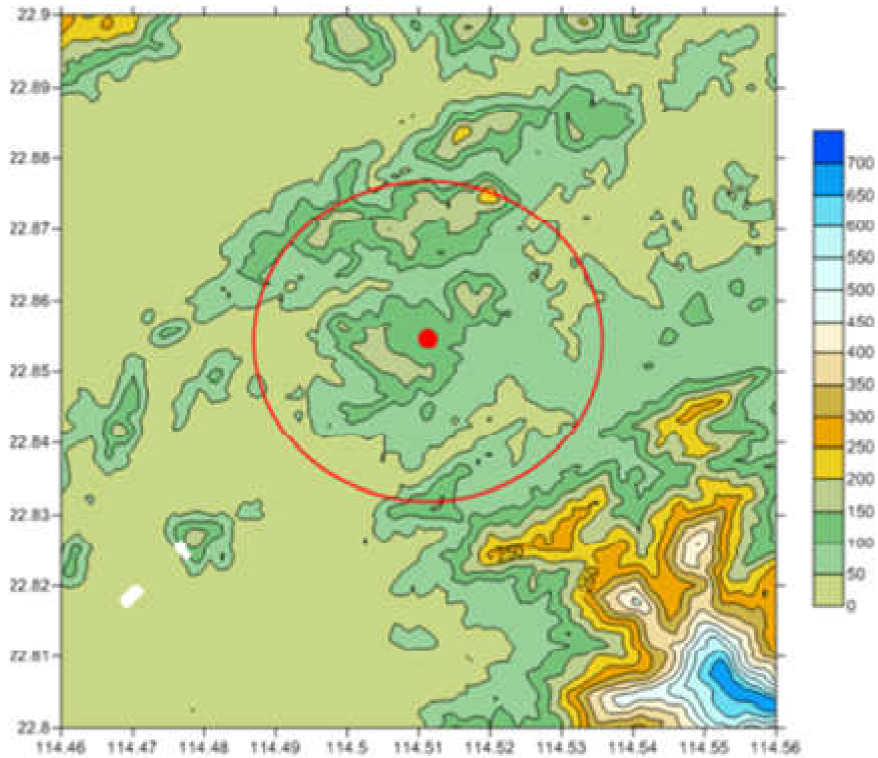


Figure 5.1-6 Topographic map of surrounding area (Unit: m)

(Red circle means the atmospheric evaluation scope and red dot is the location of chimney)

5.1.4 Prediction factor

Environmental impact prediction factors include:

Regular factor: SO_2, NO_2 and PM_{10}.

Specific pollutant: HCl, Hg, Cd, Pb, dioxin, H_2S and NH_3.

5.1.5 Prediction range and grid design

To comprehensively assess the influence of waste incineration plant on surrounding environment after its completion, the evaluation range is designed to be a circle with radius of 2.5km, grid distance of 50m. It takes chimney as the origin, with relative coordinate being (0,0).

5.1.6 Impact of pollution source

See Table 5.1-11 for impact of pollution source. Emission concentration of pollutants under abnormal working condition in Table 5.1-11 is the maximum concentration under abnormal working condition (under the condition of broken bag-filter). It is important to note that the concentration is the pollutant concentration discharged under abnormal working condition and, for atmospheric influence prediction under abnormal working condition, it is required to take into account of the discharge of the other two incinerators under normal working condition.

Table 5.1-11 Prediction on impact of atmospheric source

Normal working condition			
Organized emission			
1	(Emission source (three-tube tube-in-tube chimney)	Height （m）	80
		Inner diameter （m）	1.8×3
		Equivalent inner diameter （m）	3.12
		Gas exit temperature（℃）	150
		Environment temperature（℃）	22.0
		Smoke quantity under standard condition （Nm3/ h）	177000
		Smoke quantity under actual working condition （m3/ h）	274199
		Flue gas velocity under actual working condition（m/s）	9.98
2	Organized emission velocity （kg/h）	Flue gas	1.77
		NOx (Based on NO_2)	35.4
		SO_2	8.85
		HCl	1.77
		Hg	0.00885
		Cd	0.00885
		Pb	0.177
		Dioxin (μgTEQ/ h)	17.7
Fugitive emission			
3	Emission factor	L*W*H	Emission velocity （kg/h）
4	H_2S	69*22*7	0.012
5	NH_3	69*22*7	0.36
Under abnormal working condition			
6	Emission velocity	Flue gas	107.33

7	of pollutants (kg/h)	Cd	0.01
8		Pb	0.09
9		dioxin (mgTEQ/ h)	0.02478
10		NOx	17.4
11		SO_2	9.75
12		HCl	5.85

5.1.7 Prediction scenario and contents

As per the requirements specified in the Atmosphere Guide, we have determined the prediction scenario and contents, detailed as below:

1) Under hourly or successive hourly meteorological conditions, ambient air protection target, ground concentration at grid point and maximum hourly concentration on ground of all prediction factors within evaluation scope;

2) Under hourly meteorological condition in the whole year, ambient air protection target ground concentration at grid point and maximum daily concentration on ground of all prediction factors within evaluation scope;

3) Under long-term meteorological condition, ambient air protection target ground concentration at grid point and maximum annual mean concentration on ground of all prediction factors within evaluation scope;

4) Under abnormal emission condition, and hourly or successive hourly meteorological conditions, ambient air protection target ground concentration at grid point and maximum hourly concentration on ground of all prediction factors within evaluation scope.

5.1.8 Atmospheric environmental impact prediction and assessment

5.1.8.1 Atmospheric environmental impact prediction and assessment under normal emission

(1) Prediction results and analysis of SO_2

①Hourly concentration

See Table 5.1-12 for the top ten maximum hourly ground concentration of SO_2, location and time. The increment of maximum hourly ground concentration of SO_2 is 3.650μg/m^3, accounting for 0.730% of the standard value.

Table 5.1-12 Top ten maximum hourly ground concentration of SO_2

No.	Relative coordinates (m)		Date (Y, M, D, H)	Hourly maximum concentration increment	Concentration limit (μg/m³)	Ratio to standard value （%）
	X coordinate	Y coordinate				
1	-335	-426	2012010403	3.650	500	0.730
2	-326	-294	2012090111	3.617	500	0.723
3	-302	-388	2012091500	3.612	500	0.722
4	-364	-326	2012081619	3.608	500	0.722
5	-335	-426	2012072318	3.608	500	0.722
6	-335	-426	2012012422	3.587	500	0.717
7	-270	-349	2012061910	3.580	500	0.716
8	-287	-262	2012090110	3.575	500	0.715
9	-335	-426	2012122217	3.572	500	0.714
10	-287	-262	2012090111	3.543	500	0.709

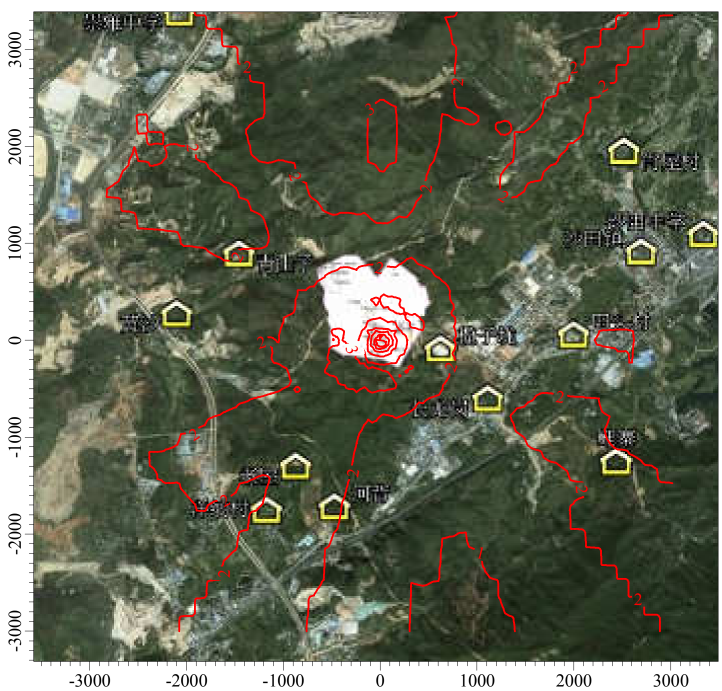


Figure 5.1-7 Distribution of maximum contribution value of hourly SO_2 concentration

②Daily average concentration

See Table 5.1-13 for the top ten maximum daily ground concentration of SO_2, location and time. The increment of maximum daily ground concentration of SO_2 is 1.626μg/m^3, accounting for 1.084% of the standard value.

Table 5.1-13 Top ten maximum daily mean ground concentration of SO_2

No.	Relative coordinates (m)		Date (Y, M, D)	Daily maximum concentration increment	Concentration limit (μg/m^3)	Ratio to standard value（%）
	X coordinate	Y coordinate				
1	-335	-426	2012,11,23	1.626	150	1.084
2	-335	-426	20120104	1.618	150	1.079
3	-335	-426	20121111	1.585	150	1.057
4	-335	-426	20120226	1.571	150	1.047
5	-335	-426	20120122	1.556	150	1.038
6	-335	-426	20120324	1.548	150	1.032
7	-335	-426	20120723	1.529	150	1.020
8	-302	-388	20120104	1.527	150	1.018
9	-335	-426	20121230	1.513	150	1.008
10	-302	-388	20120723	1.495	150	0.997

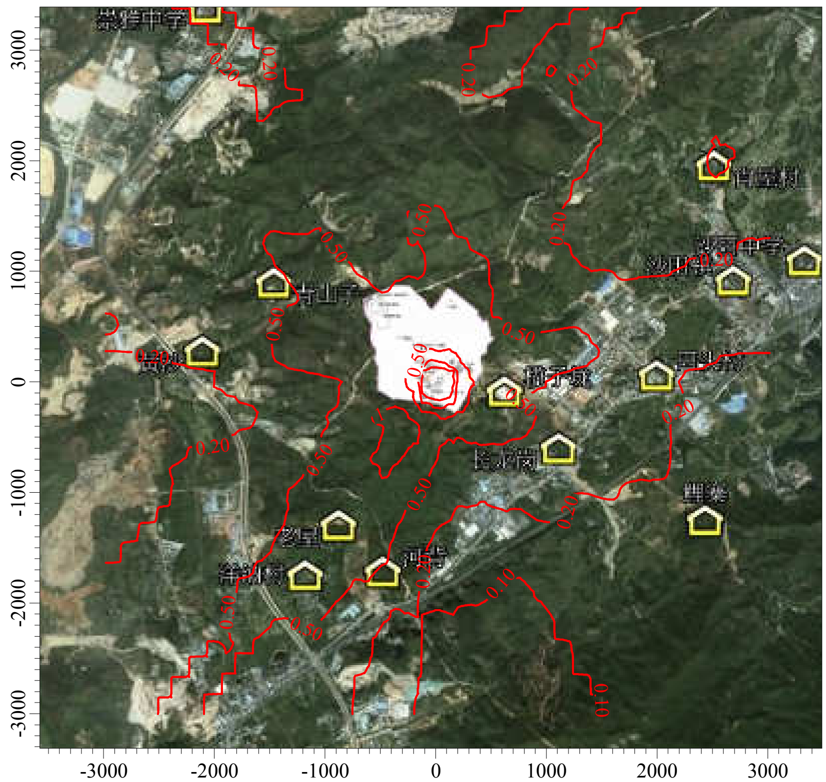


Figure 5.1-8 Distribution of maximum contribution value of SO_2 daily mean concentration

③ Annual mean concentration

See Table 5.1-14 for the top ten maximum annual ground concentration of SO_2, location and time. The increment of maximum annual ground concentration of SO_2 is 0.383μg/m^3, accounting for 0.64% of the standard value. See Figure 5.1-9 for the distribution of maximum annual mean ground concentration of SO_2.

Table 5.1-14 Annual mean concentration of SO_2 (μg/m^3)

No.	Relative coordinates (m)		Maximum annual mean concentration increment	Concentration limit (μg/m^3)	Ratio to standard value (%)
	X coordinate	Y coordinate			
1	-335	-426	0.383	60	0.64

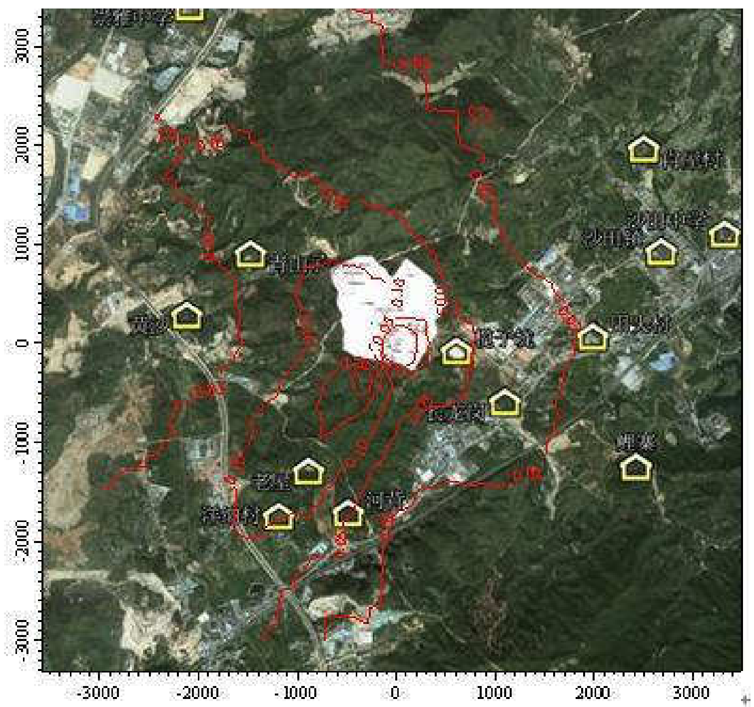


Figure 5.1-9 Distribution of maximum contribution value of SO_2 annual mean concentration （μg/m^3）

④ Environmental impact analysis of sensitive areas

See Table 5.1-15, Table 5.1-16 and Table 5.1-17 for monitoring value, contribution value and accumulated concentration in each sensitive area. In general, the emission of SO_2 has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region.

Table 5.1-15 Prediction result of hourly mean value impact of SO_2 in each sensitive area (μg/m3)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value （%）
Lanzilong	24	2.258	26.258	5.25
Huangsha Village	24	1.930	25.930	5.19

Hantang’ao	24	2.349	26.349	5.27
Jinju Natural Reserve	10	2.129	12.129	8.09
Tiantou Village	24	1.978	25.978	5.20
Xiaowu Village	25	1.376	26.376	5.28
Changlonggang	24	1.836	25.836	5.17
Shanhe Town, Country Garden	25	2.032	27.032	5.41
Maximum ground concentration	25	3.650	28.650	5.73

Note: Current background value for sensitive area without monitoring data is substituted by concentration value from monitoring point nearby, similarly hereinafter.

Table 5.1-16 Result of daily mean concentration impact prediction of SO_2 in each sensitive area ($\mu g/m^3$)

Sensitive area	Current monitoring value	Contribution value of the item	Accumulated value	Ratio to standard value（%）
Lanzilong	13	0.642	13.642	9.09
Huangsha Village	13	0.430	13.430	8.95
Hantang’ao	12	0.370	12.370	8.25
Jinju Natural Reserve	3	0.136	3.136	6.27
Tiantou Village	13	0.236	13.236	8.82
Xiaowu Village	12	0.093	12.093	8.06
Changlonggang	13	0.306	13.306	8.87
Shanhe Town, Country Garden	13	0.180	13.180	8.79
Maximum ground concentration	13	1.626	14.626	9.75

Table 5.1-17 Prediction result of annual mean concentration impact of SO_2 in each sensitive area (μg/m^3)

Sensitive area	Contribution value of the item	Ratio to standard value（%）
Lanzilong	0.055	0.09
Huangsha Village	0.065	0.11
Hantang’ao	0.043	0.07
Jinju Natural Reserve	0.012	0.06
Tiantou Village	0.016	0.03
Xiaowu Village	0.008	0.01
Changlonggang	0.028	0.05
Shanhe Town, Country Garden	0.013	0.02
Maximum ground concentration	0.383	0.64

（2）NO_2 Prediction results and analysis

① Hourly concentration

See Table 5.1-18 for the top ten maximum hourly ground concentration of NO_2, location and time. The increment of maximum hourly ground concentration of NO_2 is 14.600μg/m^3, accounting for 7.30% of the standard value.

Table 5.1-18 Top ten maximum hourly ground concentration of NO_2 (μg/m^3)

No.	Relative coordinates (m)		Date (Y, M, D, H)	Hourly maximum concentration increment	Concentration limit	Ratio to standard value（%）
	X coordinate	Y coordinate				
1	-335	-426	2012010403	14.600	200	7.30
2	-326	-294	2012090111	14.468	200	7.23
3	-302	-388	2012091500	14.448	200	7.22
4	-364	-326	2012081619	14.432	200	7.22
5	-335	-426	2012072318	14.432	200	7.22
6	-335	-426	2012012422	14.348	200	7.17
7	-270	-349	2012061910	14.320	200	7.16
8	-287	-262	2012090110	14.300	200	7.15
9	-335	-426	2012122217	14.288	200	7.14
10	-287	-262	2012090111	14.172	200	7.09

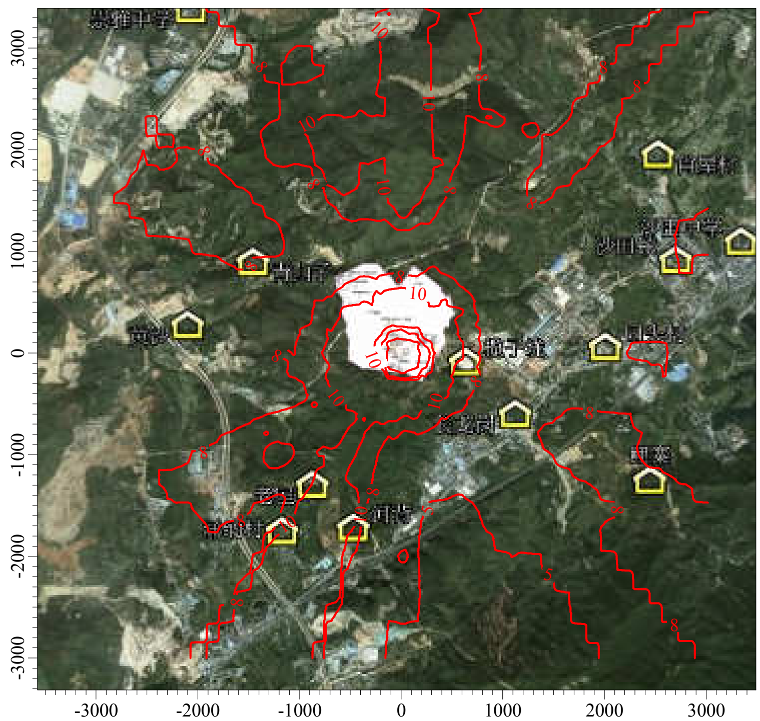


Figure 5.1-10 Distribution of maximum contribution value of NO_2 hourly mean concentration ($\mu g/m^3$)

② Daily mean concentration

See Table 5.1-19 for the top ten maximum daily mean ground concentration of NO_2, location and time. The increment of maximum daily ground concentration of NO_2 is 6.504$\mu g/m^3$, accounting for 8.13% of the standard value. See Figure 5.1-11 for the distribution of maximum daily mean ground concentration of NO_2.

Table 5.1-19 Top ten maximum daily mean ground concentration of NO_2 ($\mu g/m^3$)

o	Relative coordinates (m)		Date (Y, M, D)	Daily max conc'n. increment	Concentration limit	Ratio to std. value (%)
	X coordinate	Y coordinate				
1	-335	-426	20121123	6.504	80	8.13
2	-335	-426	20120104	6.472	80	8.09
3	-335	-426	20121111	6.340	80	7.93
4	-335	-426	20120226	6.284	80	7.86
5	-335	-426	20120122	6.224	80	7.78

6	-335	-426	20120324	6.192	80	7.74
7	-335	-426	20120723	6.116	80	7.65
8	-302	-388	20120104	6.108	80	7.64
9	-335	-426	20121230	6.052	80	7.57
10	-302	-388	20120723	5.980	80	7.48

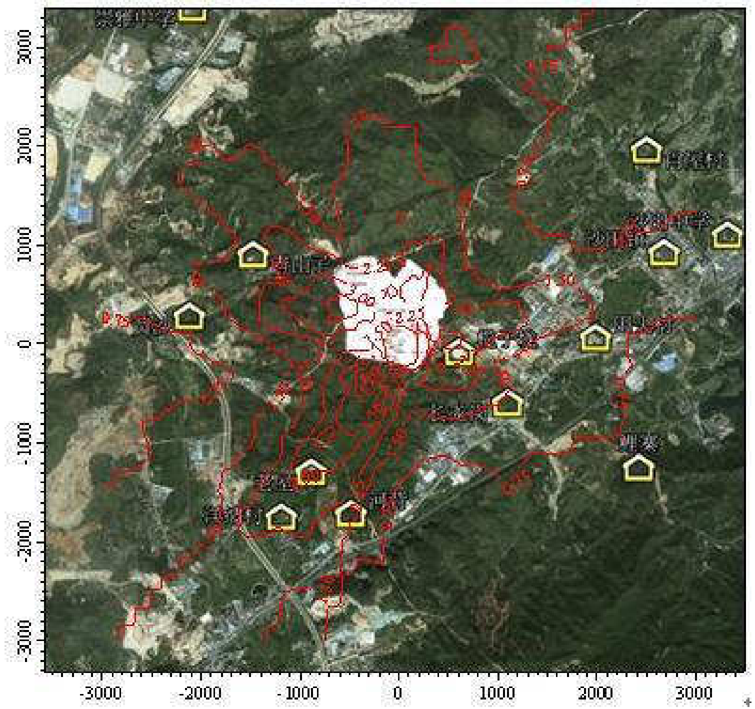


Figure 5.1-11 Distribution of maximum contribution value of NO_2 daily mean concentration (μg/m^3)

③ Annual mean concentration

See Table 5.1-20 for the prediction result of top ten maximum annual ground concentration of NO_2, location and time. The maximum annual ground concentration of NO_2 is 1.532μg/m^3, accounting for 3.83% of the standard value. See Figure 5.1-12 for the distribution of maximum annual mean ground concentration of NO_2.

Table 5.1-20 Annual mean concentration of NO_2 (μg/m3)

No.	Relative coordinates (m)		Maximum annual mean concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate			
1	-335	-426	1.532	40	3.83

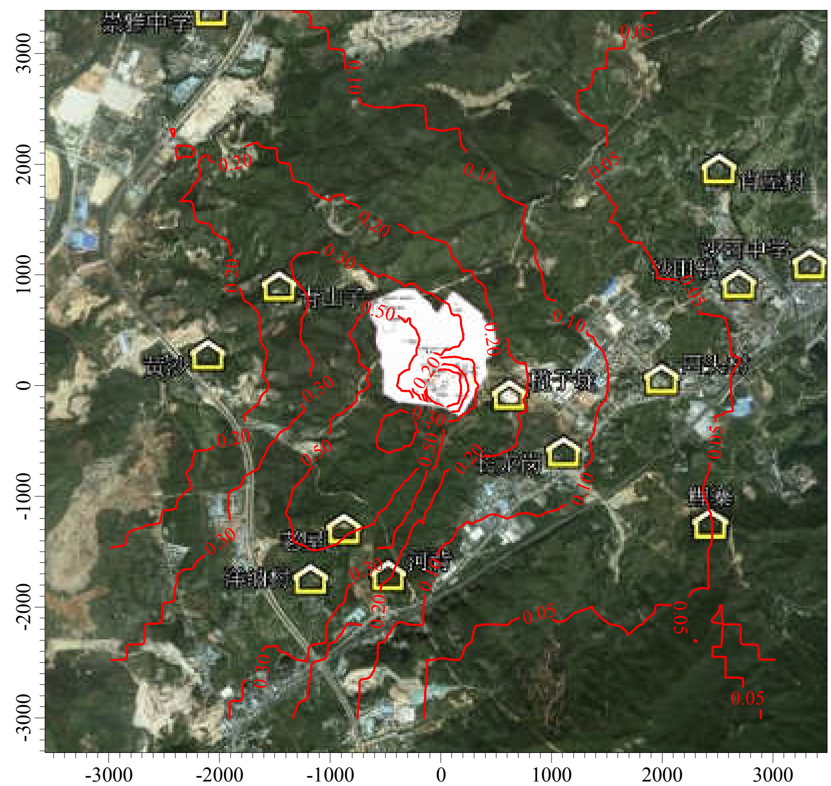


Figure 5.1-12 Distribution diagram of annual concentration contribution value of NO_2 (Unit: $\mu g/m^3$)

④Environmental impact analysis of sensitive areas

See Table 5.1-21, 5.1-22 and 5.1-23 for current status monitoring value, contribution value and accumulated concentration in each sensitive area. In general, the emission of NO_2 has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region.

Table 5.1-21 Result of hourly mean value impact of NO_2 in each sensitive area (μg/m^3)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value（%）
Lanzilong	38	9.032	47.032	23.52
Huangsha Village	38	7.720	45.720	22.86
Hantang’ao	34	9.396	43.396	21.70
Jinju Natural Reserve	70	8.516	78.516	39.26
Tiantou Village	34	7.912	41.912	20.96
Xiaowu Village	34	5.504	39.504	19.75
Changlonggang	34	7.344	41.344	20.67
Shanhe Town, Country Garden	34	8.128	42.128	21.06
Maximum ground concentration	70	14.600	114.600	39.26

Table 5.1-22 Result of daily mean concentration impact prediction of NO_2 in each sensitive area (μg/m^3)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value（%）
Lanzilong	30	2.568	32.568	40.71
Huangsha Village	30	1.720	31.720	39.65
Hantang’ao	28	1.480	29.480	36.85
Jinju Natural Reserve	26	0.544	26.544	33.18

Tiantou Village	29	0.944	29.944	37.43
Xiaowu Village	30	0.372	30.372	37.97
Changlonggang	29	1.224	30.224	37.78
Shanhe Town, Country Garden	28	0.720	28.720	35.90
Maximum ground concentration	30	6.504	36.504	45.63

Table 5.1-23 Prediction result of annual mean concentration impact of NO_2 in each sensitive area ($\mu g/m^3$)

Sensitive area	Contribution value of the item	Ratio to standard value (%)
Lanzilong	0.220	0.55
Huangsha Village	0.260	0.33
Hantang'ao	0.172	0.22
Jinju Natural Reserve	0.048	0.06
Tiantou Village	0.064	0.08
Xiaowu Village	0.032	0.04
Changlonggang	0.112	0.14
Shanhe Town, Country Garden	0.052	0.07
Maximum ground concentration	1.532	1.92

(3) Prediction result and analysis of PM_{10}

① Daily mean concentration

See Table 5.1-24 for the top ten maximum daily mean ground concentration of PM_{10}, location and time. The increment of maximum daily ground concentration of PM_{10} is 0.325$\mu g/m^3$, accounting for 0.217% of the standard value.

Table 5.1-24 Top ten maximum daily mean ground concentration of PM_{10} ($\mu g/m^3$)

No.	Relative coordinates (m)		Date (Y, M, D)	Daily maximum concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate				
1	-335	-426	20121123	0.325	150	0.217

2	-335	-426	20120104	0.324	150	0.216
3	-335	-426	20121111	0.317	150	0.211
4	-335	-426	20120226	0.314	150	0.209
5	-335	-426	20120122	0.311	150	0.207
6	-335	-426	20120324	0.310	150	0.206
7	-335	-426	20120723	0.306	150	0.204
8	-302	-388	20120104	0.305	150	0.204
9	-335	-426	20121230	0.303	150	0.202
10	-302	-388	20120723	0.299	150	0.199

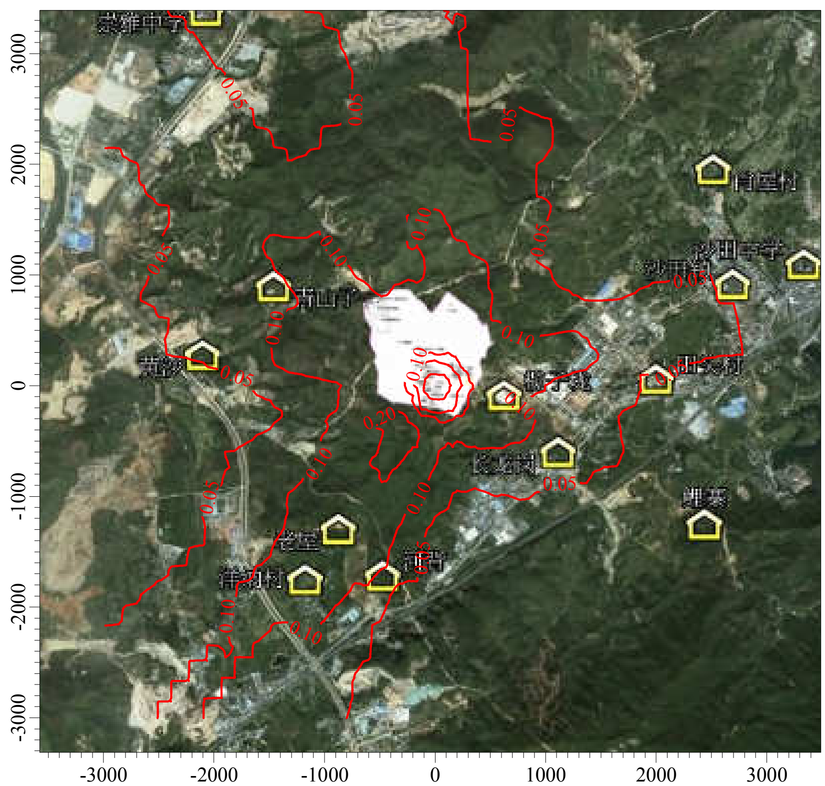


Figure 5.1-13 Distribution of maximum contribution value of PM_{10} daily mean concentration

②Annual mean concentration

See Table 5.1-25 for prediction result of the top ten maximum annual mean ground concentration of PM_{10}, location and time. The increment of maximum annual ground concentration of PM_{10} is 0.0766μg/m^3, accounting for 0.109% of the standard value.

Table 5.1-25 Annual mean concentration of PM_{10}

No.	Relative coordinates(m)		Maximum annual mean concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate			
1	-335	-426	0.0766	70	0.109

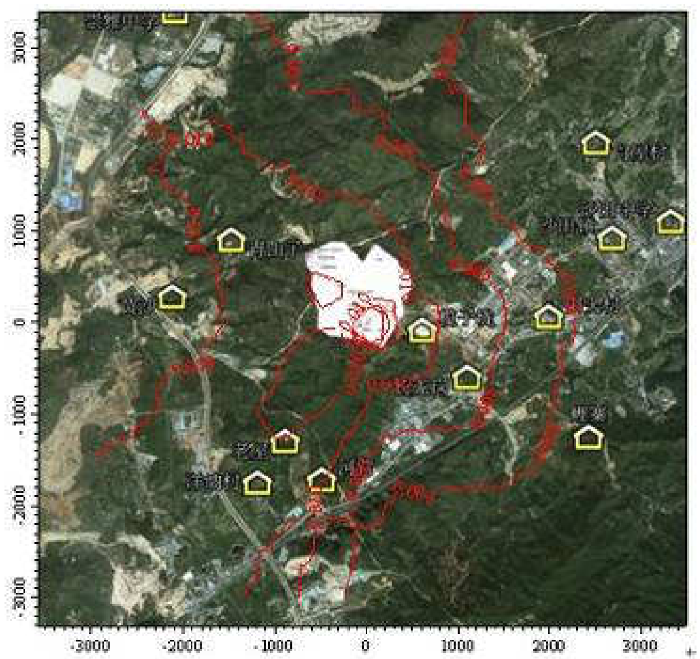


Figure 5.1-14 Distribution of contribution value of PM_{10} annual mean concentration

③Environmental impact analysis of sensitive areas

See Table 5.1-26 and Table 5.1-27 for current status monitoring value, contribution value and accumulated concentration in each sensitive area. In general, the emission of PM_{10} has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region. Due to the higher background value relating to natural fugitive dust, Jinju Natural Reserve, the Category I zone, has quite high ratio to standard limit in terms of accumulated concentration.

Table 5.1-26 Result of daily mean concentration impact prediction of PM_{10} in each sensitive area

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value (%)
Lanzilong	74	0.128	74.128	49.42
Huangsha Village	74	0.086	74.086	49.39
Hantang'ao	73	0.074	73.074	48.72
Jinju Natural Reserve	49	0.027	49.027	98.05
Tiantou Village	74	0.047	74.047	49.36
Xiaowu Village	69	0.019	69.019	46.01
Changlonggang	74	0.061	74.061	49.37
Shanhe Town, Country Garden	73	0.036	73.036	48.69
Maximum ground concentration	74	0.325	74.325	49.55

Table 5.1-27 Result of annual mean concentration impact prediction of PM_{10} in each sensitive area

Sensitive area	Contribution value of the item	Ratio to standard value (%)
Lanzilong	0.011	0.016
Huangsha Village	0.013	0.019
Hantang'ao	0.009	0.012
Jinju Natural Reserve	0.002	0.003
Tiantou Village	0.003	0.005
Xiaowu Village	0.002	0.002
Changlonggang	0.006	0.008
Shanhe Town, Country Garden	0.003	0.004
Maximum ground concentration	0.077	0.109

(4) Prediction result and analysis of HCl

① Hourly concentration

See Table 5.1-28 for the top ten maximum hourly ground concentration of HCl, location and time. The increment of maximum hourly ground concentration of HCl is 0.730μg/m^3, accounting for 1.460% of the standard value.

Table 5.1-28 Top ten maximum hourly ground concentration of HCl (μg/m^3)

No.	Relative coordinates (m)		Date (Y, M, D, H)	Hourly maximum concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate				
1	-335	-426	2012010403	0.730	50	1.460
2	-326	-294	2012090111	0.723	50	1.447
3	-302	-388	2012091500	0.722	50	1.445
4	-364	-326	2012081619	0.722	50	1.443
5	-335	-426	2012072318	0.722	50	1.443
6	-335	-426	2012012422	0.717	50	1.435
7	-270	-349	2012061910	0.716	50	1.432
8	-287	-262	2012090110	0.715	50	1.430
9	-335	-426	2012122217	0.714	50	1.429
10	-287	-262	2012090111	0.709	50	1.417

② Daily Average Concentration

See Table 5.1-29 for the top ten maximum daily ground concentration of HCl, location and time. The increment of maximum daily ground concentration of HCl is 0.325μg/m^3, accounting for 的 2.168% of the standard value.

Table 5.1-29 Top ten maximum daily mean ground concentration of HCl (μg/m^3)

No.	Relative coordinates (m)		Date (Y, M, D)	Daily maximum concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate				
1	-335	-426	20121123	0.325	15	2.168
2	-335	-426	20120104	0.324	15	2.157
3	-335	-426	20121111	0.317	15	2.113
4	-335	-426	20120226	0.314	15	2.095
5	-335	-426	20120122	0.311	15	2.075
6	-335	-426	20120324	0.310	15	2.064
7	-335	-426	20120723	0.306	15	2.039
8	-302	-388	20120104	0.305	15	2.036
9	-335	-426	20121230	0.303	15	2.017
10	-302	-388	20120723	0.299	15	1.993

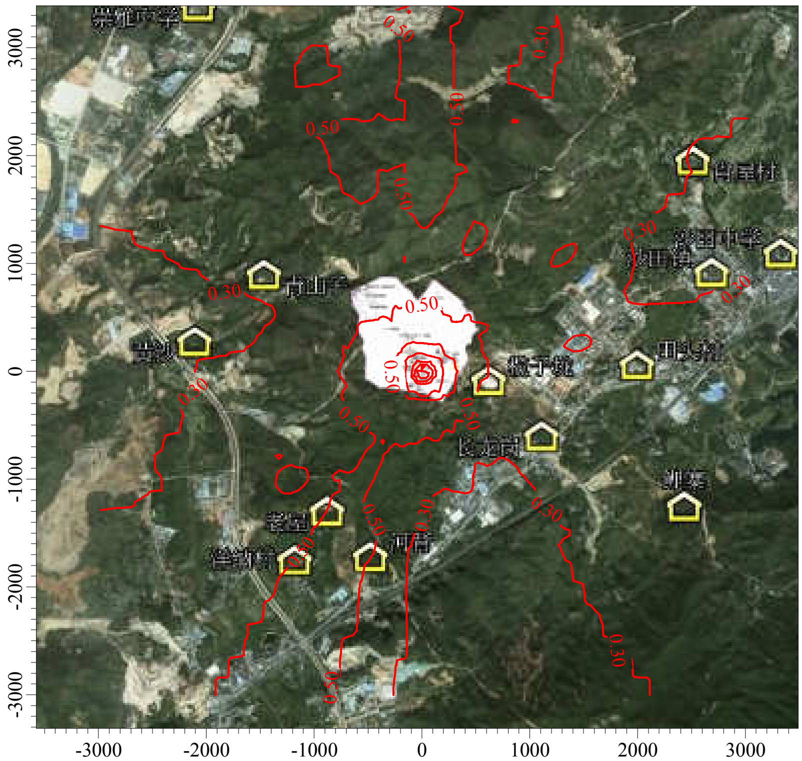
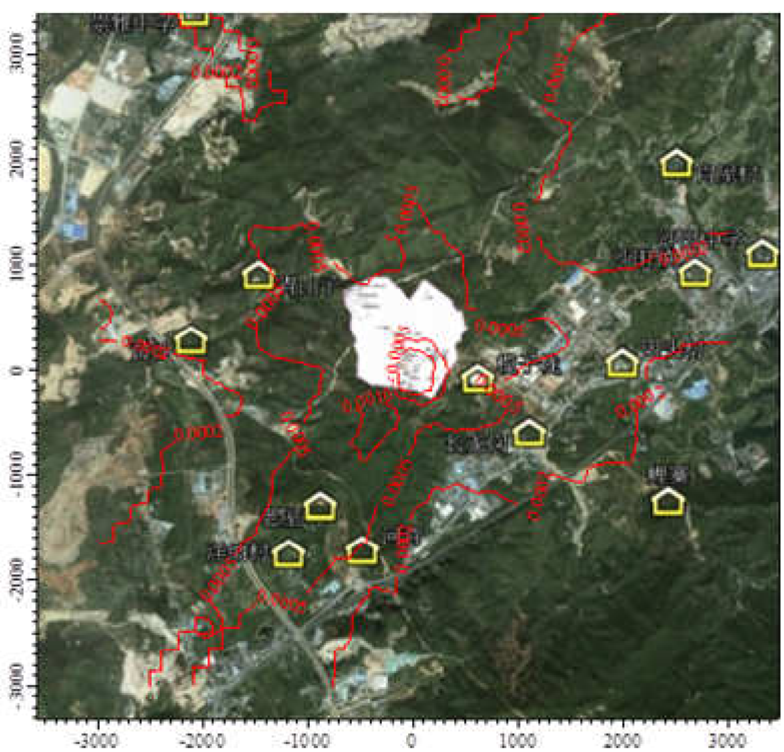


Figure 5.1-15 Distribution of maximum contribution value of HCl hourly mean concentration（μg/m^3）

Figure 5.1-16 Distribution of maximum contribution value of HCl daily mean concentration（μg/m^3）



③Environmental impact analysis of sensitive areas

See Table 5.1-30 and Table 5.1-31 for current status monitoring value, contribution value and accumulated concentration in each sensitive area. In general, the emission of HCl has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region.

Table 5.1-30 Result of hourly mean value impact of HCl in each sensitive area (μg/m^3)

Sensitive area	Current background value※	Contribution value of the item	Accumulated value	Ratio to standard value (%)
Lanzilong	12	0.452	12.452	24.90
Huangsha Village	9	0.386	9.386	18.77
Hantang'ao	9	0.470	9.470	18.94
Jinju Natural Reserve	15	0.426	15.426	30.85
Tiantou Village	27	0.396	27.396	54.79
Xiaowu Village	21	0.275	21.275	42.55
Changlonggang	27	0.367	27.367	54.73
Shanhe Town, Country Garden	21	0.406	21.406	42.81
Maximum ground concentration	27	0.730	27.730	55.46

※: No hourly monitoring value, the value three times of daily average monitoring value will be taken.

Table 5.1-31 Result of daily mean concentration impact prediction of HCl in each sensitive area (μg/m^3)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value (%)
Lanzilong	4	0.128	4.128	27.52
Huangsha Village	3	0.086	3.086	20.57
Hantang'ao	3	0.074	3.074	20.49
Jinju Natural Reserve	5	0.027	5.027	33.51
Tiantou Village	9	0.047	9.047	60.31
Xiaowu Village	7	0.019	7.019	46.79
Changlonggang	9	0.061	9.061	60.41
Shanhe Town, Country Garden	7	0.036	7.036	46.91
Maximum ground concentration	9	0.325	9.325	62.17

(5) Prediction result and analysis of Hg

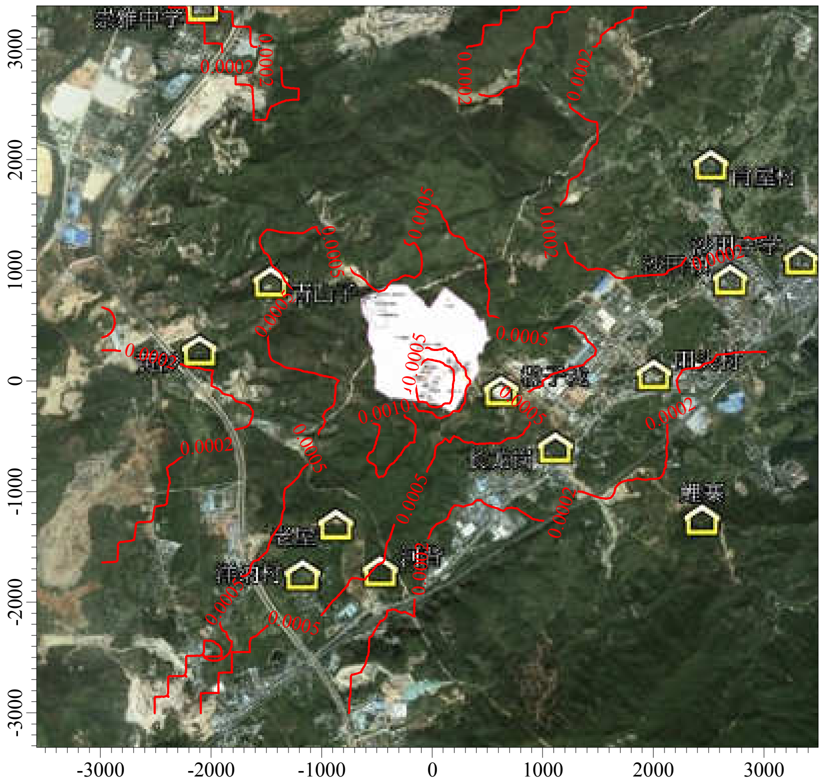
① Daily mean concentration

See Table 5.1-32 for the top ten maximum daily ground concentration of Hg, location and time. The increment of maximum daily ground concentration of Hg is 0.00163μg/m^3, accounting for 1.161% of the standard value.

Table 5.1-32 Top ten maximum daily mean ground concentration of Hg (μg/m^3)

No.	Relative coordinates (m)		Date (Y, M, D)	Daily maximum concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate				
1	-335	-426	20121123	0.00163	0.14	1.161
2	-335	-426	20120104	0.00162	0.14	1.157
3	-335	-426	20121111	0.00159	0.14	1.132
4	-335	-426	20120226	0.00157	0.14	1.121
5	-335	-426	20120122	0.00156	0.14	1.111
6	-335	-426	20120324	0.00155	0.14	1.107
7	-335	-426	20120723	0.00153	0.14	1.093
8	-302	-388	20120104	0.00153	0.14	1.089
9	-335	-426	20121230	0.00152	0.14	1.082
10	-302	-388	20120723	0.00150	0.14	1.068

Figure 5.1-17 Distribution of maximum contribution value of Hg daily mean concentration ($\mu g/m^3$)



②Annual mean concentration

See Table 5.1-33 for the prediction result of top ten maximum annual ground concentration of Hg, location and time. The increment of maximum daily ground concentration of Hg is 0.00039$\mu g/m^3$, accounting for 0.78% of the standard value. See Figure 5.1-18 for the distribution of maximum annual ground concentration of Hg.

Table 5.1-33 Annual mean concentration of Hg($\mu g/m^3$)

No.	Relative coordinates (m)		Maximum annual mean concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate			
1	-335	-426	0.00039	0.05	0.78

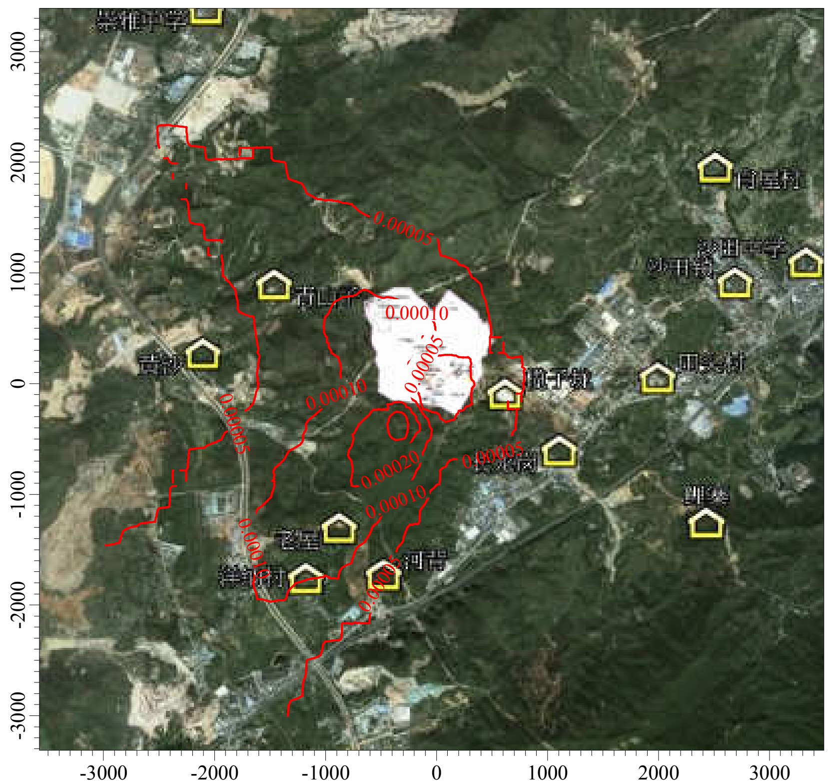


Figure 5.1-18 for the distribution of maximum annual ground concentration of Hg.

③Environmental impact analysis of sensitive areas

See Table 5.1-34 and Table 5.1-35 for current status monitoring value, contribution value and accumulated concentration in each sensitive area. In general, the emission of Hg has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region.

Table 5.1-34 Result of daily mean concentration impact prediction of Hg in each sensitive area (μg/m3)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value (%)
Lanzilong	0.00001L	0.0006	0.0006	1.22
Huangsha Village	0.00001L	0.0004	0.0004	0.82
Hantang’ao	0.00001L	0.0004	0.0004	0.82
Jinju Natural Reserve	0.00001L	0.0001	0.0001	0.22
Tiantou Village	0.00001L	0.0002	0.0002	0.42
Xiaowu Village	0.00001L	0.0001	0.0001	0.22

Changlonggang	0.00001L	0.0003	0.0003	0.62
Shanhe Town, Country Garden	0.00001L	0.0002	0.0002	0.42
Maximum ground concentration	0.00001L	0.0016	0.0016	3.22

Table 5.1-35 Result of annual mean concentration impact prediction of Hg in each sensitive area (μg/m^3)

Sensitive area	Contribution value of the item	Ratio to standard value（%）
Lanzilong	0.00006	0.12
Huangsha Village	0.00007	0.14
Hantang'ao	0.00005	0.10
Jinju Natural Reserve	0.00001	0.02
Tiantou Village	0.00002	0.04
Xiaowu Village	0.00001	0.02
Changlonggang	0.00003	0.06
Shanhe Town, Country Garden	0.00002	0.04
Maximum ground concentration	0.00039	0.78

(6) Prediction result and analysis of Cd

① Daily mean concentration

See Table 5.1-36 for the top ten maximum daily mean ground concentration of Cd, location and time. The increment of maximum daily ground concentration of Cd is 0.00163μg/m^3, accounting for 11.64% of the standard value. See Figure 5.1-19 for the distribution of maximum daily mean ground concentration of Hg.

Table 5.1-36 Top ten maximum daily mean ground concentration of Cd (μg/m^3)

No.	Relative coordinates(m)		Date (Y, M, D)	Daily maximum concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate				
1	-335	-426	20121123	0.00163	0.014	11.64
2	-335	-426	20120104	0.00162	0.014	11.57
3	-335	-426	20121111	0.00159	0.014	11.36
4	-335	-426	20120226	0.00157	0.014	11.21
5	-335	-426	20120122	0.00156	0.014	11.14
6	-335	-426	20120324	0.00155	0.014	11.07
7	-335	-426	20120723	0.00153	0.014	10.93
8	-302	-388	20120104	0.00153	0.014	10.93
9	-335	-426	20121230	0.00152	0.014	10.86
10	-302	-388	20120723	0.00150	0.014	10.71

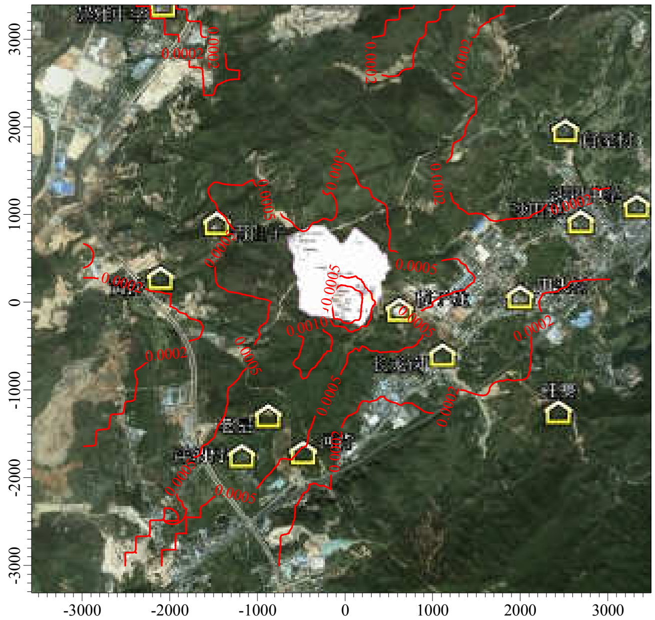


Figure 5.1-19 Distribution of maximum contribution value of Cd daily mean concentration (μg/m^{3})

②Annual mean concentration

See Table 5.1-37 for the top ten maximum annual mean ground concentration of Cd, location and time. The increment of maximum annual ground concentration of Cd is 0.00039μg/m^3, accounting for 7.80% of the standard value. See Figure 5.1-20 for the distribution of maximum annual mean ground concentration of Cd.

Table 5.1-37 Annual mean concentration of Cd (μg/m^3)

No.	Relative coordinates (m)		Maximum annual mean concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate			
1	-335	-426	0.00039	0.005	7.80

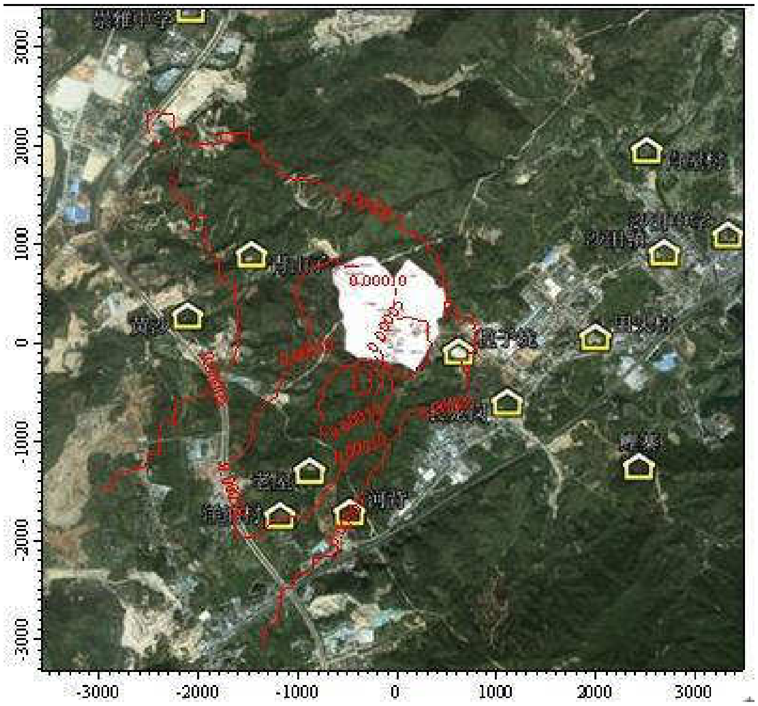


Figure 5.1-20 Distribution of contribution value of Cd annual mean concentration (μg/m^3)

③Environmental impact analysis of sensitive areas

See Table 5.1-38 and Table 5.1-39 for current status monitoring value, contribution value and accumulated concentration in each sensitive area. In general, the emission of Cd has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region.

Table 5.1-38 Result of daily mean concentration impact prediction of Cd in each sensitive area (μg/m^3)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value (%)
Lanzilong	0.0009	0.0006	0.0015	10.71
Huangsha Village	0.00078	0.0004	0.0012	8.43
Hantang’ao	0.00122	0.0004	0.0016	11.57
Jinju Natural Reserve	0.00093	0.0001	0.0010	7.36
Tiantou Village	0.00081	0.0002	0.0010	7.21
Xiaowu Village	0.00153	0.0001	0.0016	11.64
Changlonggang	0.00081	0.0003	0.0011	7.93
Shanhe Town, Country Garden	0.00153	0.0002	0.0017	12.36
Maximum ground concentration	0.00153	0.0016	0.0031	22.36

Table 5.1-39 Result of annual mean concentration impact prediction of Cd in each sensitive area (μg/m^3)

Sensitive area	Contribution value of the item	Ratio to standard value (%)
Lanzilong	0.00006	1.20
Huangsha Village	0.00007	1.40
Hantang'ao	0.00005	1.00
Jinju Natural Reserve	0.00001	0.20
Tiantou Village	0.00002	0.40
Xiaowu Village	0.00001	0.20
Changlonggang	0.00003	0.60
Shanhe Town, Country Garden	0.00002	0.40
Maximum ground concentration	0.00039	7.80

(7) Prediction result and analysis of Pb

①Daily mean concentration

See Table 5.1-40 for the top ten maximum daily mean ground concentration of Pb, location and time. The increment of maximum daily ground concentration of Pb is 0.0325μg/m^3, accounting for 2.17% of the standard value. See Figure 5.1-21 for the distribution of maximum daily mean ground concentration of Pb.

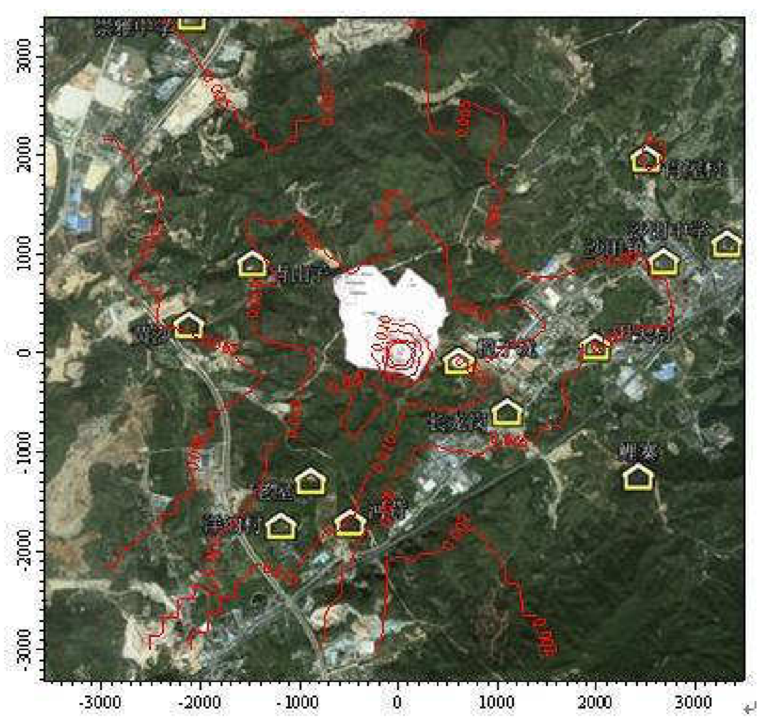


Figure 5.1-21 Distribution of maximum contribution value of Pb daily mean concentration (μg/m^3)

Table 5.1-40 Top ten maximum daily mean ground concentration of Pb (μg/m^3)

No.	Relative coordinates(m)		Date (Y, M, D)	Hourly maximum concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate				
1	-335	-426	20121123	0.0325	1.5	2.17
2	-335	-426	20120104	0.0324	1.5	2.16
3	-335	-426	20121111	0.0317	1.5	2.11
4	-335	-426	20120226	0.0314	1.5	2.09
5	-335	-426	20120122	0.0311	1.5	2.07
6	-335	-426	20120324	0.0310	1.5	2.07
7	-335	-426	20120723	0.0306	1.5	2.04
8	-302	-388	20120104	0.0305	1.5	2.03
9	-335	-426	20121230	0.0303	1.5	2.02
10	-302	-388	20120723	0.0299	1.5	1.99

②Annual mean concentration

See Table 5.1-41 for the prediction result of top ten maximum annual mean ground concentration of Pb, location and time. The increment of maximum daily ground concentration of Pb is 0.00766μg/m^3, accounting for 1.53% of the standard value. See Figure 5.1-22 for the isoline distribution of annual mean concentration increment of Pb.

Table 5.1-41 Annual mean concentration of Pb (μg/m^3)

No.	Relative coordinates (m)		Maximum annual mean concentration increment	Concentration limit	Ratio to standard value (%)
	X coordinate	Y coordinate			
1	-335	-426	0.00766	0.5	1.53

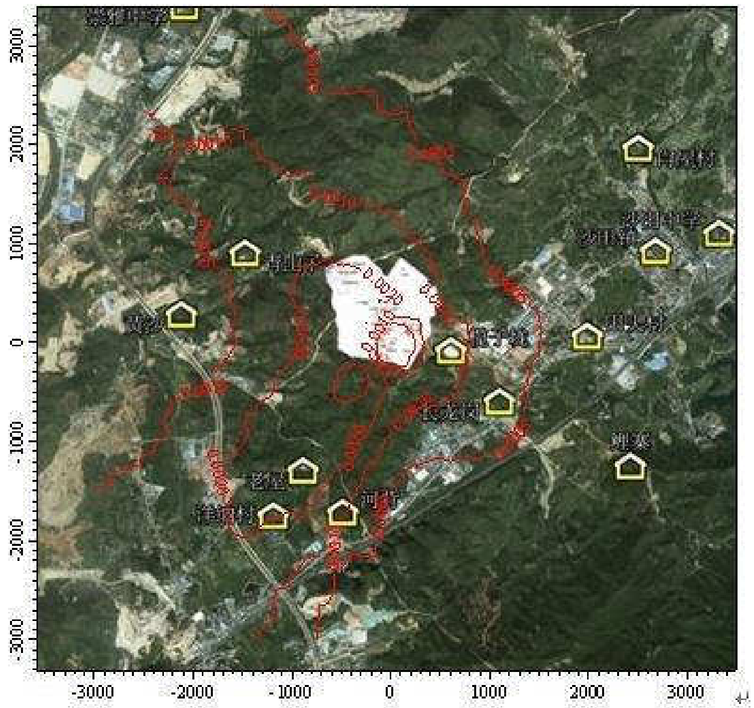


Figure 5.1-22 Distribution of contribution value of Pb annual mean concentration ($\mu g/m^3$)

③ Environmental impact analysis of sensitive areas

See Table 5.1-42 and Table 5.1-43 for current status monitoring value, contribution value and accumulated concentration in each sensitive area. In general, the emission of Pb has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region.

Table 5.1-42 Result of daily mean concentration impact prediction of Pb in each sensitive area ($\mu g/m^3$)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value (%)
Lanzilong	0.0502	0.0128	0.0630	4.20
Huangsha Village	0.0335	0.0086	0.0421	2.81
Hantang’ao	0.0443	0.0074	0.0517	3.45
Jinju Natural Reserve	0.0328	0.0027	0.0355	2.37
Tiantou Village	0.0407	0.0047	0.0454	3.03
Xiaowu Village	0.0399	0.0019	0.0418	2.79
Changlonggang	0.0407	0.0061	0.0468	3.12
Shanhe Town, Country Garden	0.0399	0.0036	0.0435	2.90
Maximum ground concentration	0.0502	0.0325	0.0827	5.51

Table 5.1-43 Result of annual mean concentration impact prediction of Pb in each sensitive area (μg/m^3)

Sensitive area	Contribution value of the item	Ratio to standard value (%)
Lanzilong	0.0011	0.22
Huangsha Village	0.0013	0.26
Hantang'ao	0.0009	0.18
Jinju Natural Reserve	0.0002	0.04
Tiantou Village	0.0003	0.06
Xiaowu Village	0.0002	0.04
Changlonggang	0.0006	0.12
Shanhe Town, Country Garden	0.0003	0.06
Maximum ground concentration	0.0077	1.53

(8) Prediction result and analysis of dioxin

①Annual mean concentration

See Table 5.1-44 for prediction result of the maximum annual ground concentration, location and time of dioxin. The increment of maximum annual ground concentration of dioxin is 0.000766 pg-TEQ /m^3, accounting for 0.13% of the standard value. See Figure 5.1-23 for the isoline distribution of maximum annual mean ground concentration of dioxin.

Table 5.1-44 Annual mean concentration of dioxin.

No.	Relative coordinate (m)		Increment of maximum annual ground concentration（pg-TEQ/m3）	Concentration limit（pg-TEQ/m^3）	Ratio to standard value (%)
	X coordinate	Y coordinate			
1	-335	-426	0.000766	0.6	0.13

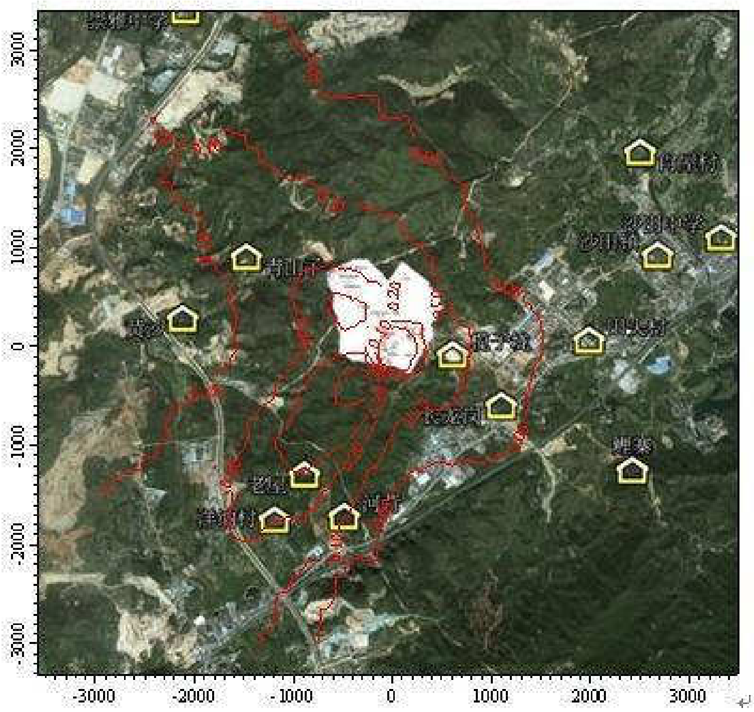


Figure 5.1-23 Distribution of contribution value of dioxin annual mean concentration （ng-TEQ/m^3）

②Environmental impact analysis of sensitive areas

See Table 5.1-45 for contribution value of dioxin concentration in each sensitive area. In general, the emission of dioxin has little impact on surrounding environment

Table 5.1-45 Result of annual mean concentration impact prediction of dioxin in each sensitive area

Sensitive area	Contribution value of dioxin （pg-TEQ/m3）	Ratio to standard value
Lanzilong	0.00011	0.018
Huangsha Village	0.00013	0.022
Hantang’ao	0.00009	0.015
Jinju Natural Reserve	0.00002	0.003
Tiantou Village	0.00003	0.005
Xiaowu Village	0.00002	0.003
Changlonggang	0.00006	0.010
Shanhe Town, Country Garden	0.00003	0.005
Maximum ground concentration	0.00077	0.128

(9) Prediction result and analysis of H_2S

① Compliance analysis of concentration at plant boundary

See Table 5.1-46 for result of concentration of H_2S at plant boundary. As shown in the table, fugitive emission of H_2S is compliant with standard limit.

Table 5.1-46 Result of concentration impact prediction of H_2S at plant boundary ($\mu g/m^3$)

Boundary	Coordinate of receptor(m)		Date (Y, M, D, H)	Increment of hourly maximum concentration	Emission standard value at boundary	Ratio to standard value (%)
	X coordinate	Y coordinate				
South boundary 1	228	-197	12091104	3.66	60	6.11
South boundary 2	305	-72	12011604	3.27	60	5.45
East boundary 1	305	119	12032507	4.77	60	7.95
North boundary 1	-534	811	12121422	0.99	60	1.65
North boundary 2	-627	585	12120621	1.12	60	1.86
West boundary 1	114	-228	12060905	1.51	60	2.52
West boundary 2	-95	-105	12011603	4.44	60	7.40

②Environmental impact analysis of sensitive areas

See Table 5.1-47 for current monitoring value, contribution value and accumulated concentration in each sensitive area. In general, the emission of H_2S has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region. What worth noting is that, the final accumulated concentration has high ratio to standard value due to high current background concentration.

Table 5.1-47 Result of hourly mean concentration impact prediction of H_2S in nearby sensitive area (μg/m3)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value (%)
Lanzilong	1.0L	1.638	2.138	21.38

(9) Prediction result and analysis of NH_3

①Compliance analysis of concentration at plant boundary

See Table 5.1-48 for result of concentration of NH_3 at plant boundary. As shown in the table, fugitive emission of NH_3 is compliant with standard limit.

Table 5.1-48 Result of concentration impact prediction of NH_3 at plant boundary (μg/m^3)

Boundary	Coordinate of receptor (m)		Date (Y, M, D, H)	Increment of hourly maximum concentration	Emission standard value at boundary	Ratio to standard value (%)
	X coordinate	Y coordinate				
South boundary 1	228	-197	12091104	109.92	1500	7.33
South boundary 2	305	-72	12011604	98.01	1500	6.53
East boundary 1	305	119	12032507	143.17	1500	9.54
North boundary 1	-534	811	12121422	29.72	1500	1.98
North boundary 2	-627	585	12120621	33.56	1500	2.24
West boundary 1	114	-228	12060905	45.28	1500	3.02
West boundary 2	-95	-105	12011603	133.25	1500	8.88

②Environmental impact analysis of sensitive areas

See Table 5.1-49 for current monitoring value, contribution value of accumulated concentration in each sensitive area. In general, the emission of NH_3 has small impact on surrounding environment and, after project completion, surrounding environment can meet the requirement of air functional region. What worth noting is that, the final accumulated concentration has high ratio to standard value due to higher current background concentration. The accumulated value will be 21.38%, still within the standard limits.

Table 5.1-49 Result of hourly mean concentration impact prediction of NH_3 in nearby sensitive area (μg/m^3)

Sensitive area	Current background value	Contribution value of the item	Accumulated value	Ratio to standard value (%)
Lanzilong	130	49.15	179.150	89.58

5.1.8.2 Atmospheric environmental impact prediction and assessment under abnormal emission

See Table 5.1-50 and 5.1-51 for prediction result under abnormal working condition. As shown in the table, contribution concentration value of various pollutants gains increment in comparison with normal working condition; while accumulated concentration at each sensitive area still complies with the requirement of environment functional region and stays generally at low level.

Table 5.1-50 Table of hourly mean concentration prediction at each sensitive area under abnormal working condition（mg/m^3）

Sensitive area	NO_2			SO_2			HCl		
	Contribution value	Ratio to standard value (%)	Ratio of accumulated concentration to the standard value (%)	Contribution value	Ratio to standard value (%)	Ratio of accumulated concentration to the standard value (%)	Contribution value	Ratio to standard value (%)	Ratio of accumulated concentration to the standard value (%)
Lanzilong	10.43	5.21	24.22	3.37	0.67	5.47	2.79	5.58	29.58
Huangsha Village	8.92	4.46	23.46	2.88	0.58	5.38	2.39	4.77	22.78
Hantang'ao	10.85	5.43	22.43	3.50	0.70	5.50	2.90	5.81	23.80
Jinju Natural Reserve	9.83	4.92	39.92	3.17	2.12	8.79	2.63	5.26	35.26
Tiantou Village	9.14	4.57	21.58	2.95	0.59	5.39	2.44	4.89	58.88
Xiaowu Village	6.36	3.18	20.18	2.05	0.41	5.41	1.70	3.40	45.40
Changlonggang	8.49	4.24	21.24	2.74	0.55	5.35	2.27	4.54	58.54
Shanhe Town, Country Garden	9.39	4.70	21.70	3.03	0.60	5.60	2.51	5.02	47.02
Maximum value in the region	16.86	8.43	43.43	5.45	1.09	6.09	4.51	9.02	63.02

Table 5.1-51 Table of hourly mean concentration prediction at each sensitive area under abnormal working condition（mg/m^3）

Sensitive area	PM10		Dioxin※		Cd※		Pb※	
	Contribution value	Ratio to standard value (%)	Contribution value（$pg\text{-}TEQ/m^3$）	Ratio to standard value (%)	Contribution value	Ratio to standard value (%)	Contribution value	Ratio to standard value (%)
Lanzilong	27.68	6.15	0.009	0.19	0.004	0.05	0.053	1.18
Huangsha Village	23.66	5.26	0.008	0.16	0.003	0.04	0.045	1.01
Hantang'ao	28.80	6.40	0.010	0.19	0.004	0.05	0.055	1.23
Jinju Natural Reserve	26.10	5.80	0.009	0.18	0.004	0.04	0.050	1.11
Tiantou Village	24.25	5.39	0.008	0.16	0.004	0.04	0.046	1.03
Xiaowu Village	16.87	3.75	0.006	0.11	0.002	0.03	0.032	0.72
Changlonggang	22.51	5.00	0.008	0.15	0.003	0.04	0.043	0.96
Shanhe Town, Country Garden	24.91	5.54	0.008	0.17	0.004	0.04	0.048	1.06
Maximum value in the region	44.75	9.94	0.015	0.30	0.007	0.07	0.086	1.91

※Hourly quality standard of dioxin is converted from annual concentration standard, namely 5pg-TEQ/m^3: the hourly quality standard of PM_{10}, Cd and Pb is converted from daily mean concentration, namely 450μg/m^3, 9μg/m^3 and 2.1μg/m^3.

5.1.9 Environmental protection distance

(1) Atmospheric environment protection distance

Based on fugitive emission parameter, atmospheric environment protection distance of H_2S and NH_3 is given in Table 5.1-52.

Table 5.1-52 Calculation result of atmospheric environment protection distance

Emission factor	Length	Width	Height	Environmental quality standard（mg/m^3）	Discharge volume（kg/h）	Atmospheric environment protection distance(m)
H_2S	57	22	7	0.01	0.012	0
NH_3	57	22	7	0.20	0.36	150

(2) Width of sanitary protection zone

In accordance with the relevant regulations specified in the Technical Methods for Making Local Emission Standards of Air Pollutants (GB/T13201-91), width of sanitary protection zone of fugitive emission source may be determined and calculated as follows:

$$\frac{Q_c}{C_m} = \frac{1}{A}\left(BL^C + 0.25r^2\right)^{0.50} L^D$$

Where: Qc—— Fugitive discharge of pollutants, kg/h;

Cm—— Standard concentration limit of pollutants, mg/m^3;

L—— Width of sanitary protection zone, m;

r—— Equivalent radius of production unit, m;

A, B, C and D—— Calculation coefficient.

Table 5.1-53 Computation sheet of width of sanitary protection zone

Item	Area（m^2）	Mean wind speed of years（m/s）	Source intensity（kg/hr）	Environmental limit （mg/m^3）	Calculated value of width of sanitary protection zone （m）	Width of sanitary protection zone （m）
H_2S	1518	2.0	0.012	0.01	82	200
NH_3	1518	2.0	0.36	0.2	113	

As shown in Table 5.1-53, the width of sanitary protection zone for waste discharge area of incineration power generation plant is 200m.

(3) Notice on Further Enhancement of Evaluation Management of Environmental Impact by Biomass Power Generation Projects (H.F.[2008]No.82)

In accordance with the regulations specified in the Notice on Further Enhancement of Evaluation Management of Environmental Impact by Biomass Power Generation Projects (H.F.[2008]No.82), the width of sanitary protection zone for newly-built and expanded projects relating to incineration power generation plant should be no less than 300m.

See Figure 5.1-24 for the diagram of the width of sanitary protection zone.

Figure 5.1-24 Diagram of the width of sanitary protection zone. (the project site is marked as the yellow triangle)

5.1.10 Conclusion of atmospheric environmental impact

After the completion of Huizhou Waste-to-Energy Plant, the emission of atmospheric pollutants has small impact on surrounding environment, leads to little change in air quality, and compliant with the requirement of ambient air functional zone. The increment of maximum annual ground concentration of dioxin is 0.000766 pg-TEQ /m^3, accounting for 0.13% of the standard value.

Under abnormal working condition; while accumulated concentration at each sensitive area still complies with the requirement of environment functional region and stays at low level.

In conclusion, the project is designed with an environmental protection distance of 300m from the plant boundary, and no environmentally sensitive areas such as residences, culture and education facilities and hospitals are constructed within the scope. Based on site survey, only a small mechanical grinding tool plant (no dormitory building) is found in the scope, no permanent residential area. Lanzilong Village, the village with the shortest distance to the plant, is about 340m away from the plant and 600m away from waste discharge area and storage pit, without need to be relocated.

5.2 Water environment impact prediction evaluation

5.2.1 Surface water environment impact prediction evaluation

5.2.1.1 Analysis of the generation of wastewater

Based on the engineering analysis in section 2.4, the generation and treatment of wastewater are described in Table 5.2-1.

5.2.1.2 Feasibility analysis of wastewater zero discharge

With exception to boiler feed water, other production water for the project are the treated water from Huiyang sewage treatment plant, from waste landfill sewage treatment plant and the wastewater that may be directly used for reclaimed water system, totaling 4431.3m^3/d, and the effluent from landfill and domestic wastewater will be given priority. Wastewater that may be directly used for reclaimed water treatment system, effluent from landfill sewage treatment station and reclaimed water from Huiyang sewage treatment plant is about 216.3m^3/d, 220m^3/d and 3995m^3/d.

Domestic water and boiler feed water are mainly from municipal water supply, about 144.8m^3/d, including 124.8m^3/d boiler feed water and 20m^3/d domestic water.

Circulating water and makeup water is about 144960m^3/d and 3624m^3/d respectively, with repeating utilization factor of circulating water up to 97.5%, and the repeating utilization factor of industrial water is 99.7%.

Wastewater generated in the project is about 486.3m^3/d totally: including 240m^3/d leachate, 20m^3/d of wastewater from garbage truck cleaning and 10m^3/d of wastewater from workshop cleaning.

Such wastewater is treated by the Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City, after subject to treatment in reclaimed water treatment facility, the wastewater will be directed to water recycling system, used for circulating tower and slag comprehensive utilization and greening without discharge.

Domestic sewage, about 18m^3/d, after subject to treatment in reclaimed water treatment facility, will be sent to water recycling system, used for circulating tower and slag comprehensive utilization and greening without discharge.

Other wastewater, such as effluent from integrated automatic backwash water purifier, circulating water discharge and boiler, totaling 198.3m^3/d, will be directly sent to water reuse treatment system, used for circulating tower and slag comprehensive utilization and greening without discharge.

In conclusion, under normal condition, the waste incineration plant may discharge no wastewater, causing no unfavorable influence on surrounding surface water environment.

Table 5.2-1 Generation and treatment of wastewater（t/d）

No.	Type of discharge	Maximum daily generation quantity （m^3/d）	Discharge water quality index	Remark	Discharge to
W8	Waste leachate	240	BOD_5=10000-40000 mg/L CODcr=30000-60000 mg/L SS=500-2000 mg/L NH_3-N=750-1800 mg/L pH=4-8	High concentration organic wastewater containing heavy metal ions	Leachate treatment system + reclaimed water reuse system and, after treatment, used for circulating tower and slag comprehensive utilization and greening
W4、5	Sewage from cleaning waste dumping platform, garbage truck and workshop	30	BOD_5=100-250mg/L CODcr=200-450 mg/L SS=100-300mg/L pH=6-8	Organic wastewater, containing heavy oil, waste residue	
W1	Discharge of back wash water for water source purification treatment system	70	BOD_5=20-50mg/L CODcr=50-80mg/L SS=100-200mg/L pH=6-9	Low concentration wastewater	After passing through production wastewater treatment system and, after treatment, enter the reclaimed water reuse system, used for circulating tower and slag comprehensive utilization and greening
W2	wastewater from circulating cooling water	96	pH=6-9 BOD_5<4mg/L CODcr=10-20mg/L	Clean inorganic wastewater	
W3	Water for self-constructed wastewater treatment facility	10	BOD_5=20-50mg/L CODcr=50-80mg/L SS=100-200mg/L pH=6-9	Low concentration wastewater	
W6	Water from boiler chemical water room	22.3	BOD_5=10-40mg/L CODcr=30-70 mg/L SS=50-100mg/L	Acid-alkali wastewater	

No.	Type of discharge	Maximum daily generation quantity （m^3/d）	Discharge water quality index	Remark	Discharge to
			pH=10-11		
W7	Domestic sewage	18	BOD_5=80-150/L CODcr=100-250 mg/L SS=100-200mg/L pH=6-8 NH_3-N =20-30mg/L	Low concentration organic wastewater	Domestic sewage treatment system + the reclaimed water reuse system and, after treatment, used for circulating tower and slag comprehensive utilization and greening
Total		486.3			
Recycling quantity after treatment		432.3	Wastewater entering leachate treatment system at landfill is about 270 t/d, 80% of them are recycled; Wastewater entering self-constructed sewage treatment facility is 216.3 t/d, totaling 432.3 t/d.		

5.2.1.3 Feasibility analysis of back-spray of leachate concentrate

Incinerator in the project is equipped with leachate concentrate back-spray system and by which, concentrated leachate (accounting for 20%, about 54t/d) from effluent from leachate treatment station, will be sprayed back to waste storage pit or incinerator for incineration.

See Figure 5.2-1 for technological process of back-spray, and back-spray has been successfully applied for many years in South Korea.

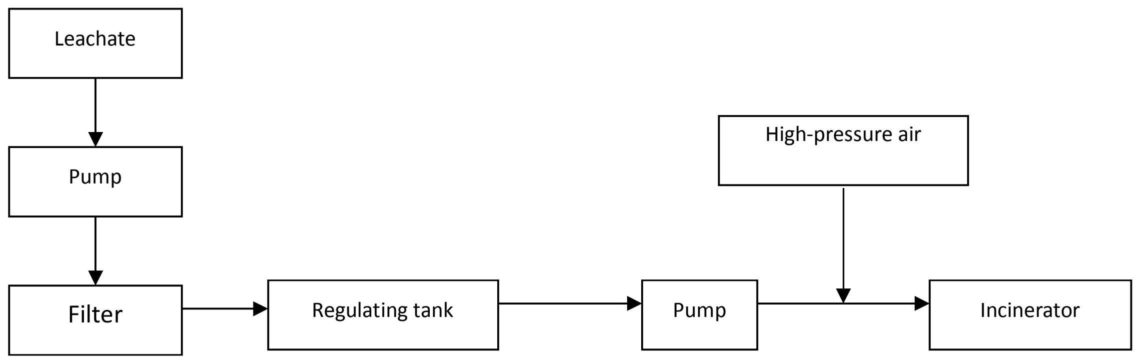


Figure 5.2-1 Technological process of waste leachate back-spray

The waste entering incinerator and leachate concentrate have calorific value of 6600kJ/kg and 1500kJ/kg respectively. Based on the analysis of their calorific value, the mixing calorific value of waste in rainy and non-rainy days is 6149kJ/kg. As shown in the energy release diagram of incinerator, incinerator runs stably if the waste's calorific value is higher than 5000kJ/kg or the thermal load in furnace is higher than 70%, each operation indicator compliant with specified requirement. Therefore when small amount of leachate concentrate is back-sprayed, incinerator will also maintain normal working, no change in each indicator since the waste's calorific value is kept around 6149kJ/kg.

Incineration flue gas after purification will be discharged through chimney. Since it contains a certain amount of moisture, it easily condenses into water, and white mist may be produced in winter, commonly known as the white smoke. The white smoke is produced by the condensation of water vapor in flue gas, and has no harm. Thermal power station adopts wet desulphurization process, exhaust smoke temperature is 80 ℃ with high moisture content, which can produce lots of white smoke. And in order to reduce flue gas low temperature corrosion, when a waste incineration power plant is running, exhaust smoke temperature will be controlled between 140 ~ 150 ℃; as water in flue gas will disperse before condensation takes place and won't lead to a lot of white smoke when flue gas is coming out from the chimney,.

5.2.1.4 Impact analysis of discharge of wastewater and sewage during rainy season

Waste leachate, production wastewater and domestic sewage after treatment by sewage treatment station in landfill treatment will have 20% of thick liquid that may not be suitable for subsequent treatment, and is proposed to be sprayed back into waste storage pool or incinerator for incineration disposal, the remaining 80% tail water will go into the recycling water system and not be discharged.

But during rainy season, reclaimed water is difficult to be completely recycled. Reclaimed water after treatment during rainy season will be discharged to the municipal sewage pipe network, entering the Shatian River after advanced treatment in Shatian Town sewage treatment plant.

According to environmental impact assessment report on Shatian Sewage Treatment plant, after subject to A^2/O oxidation ditch aeration, tail water will be discharged to Shatian River after meeting Class A standard of the Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002) and Class I, 2nd period of Discharge Limits of Water Pollutants (DB44/26-2001) (whichever is stricter). According to prediction, tail water discharge would cause a certain impact on downstream water environment. Under normal discharge condition, the maximum increment of COD 4km downstream accounts for 13.32% of standard value, ammonia nitrogen accounts for 33.31%; while 6km downstream the maximum increment of COD and ammonia nitrogen accounts for 11.87% and 29.67% respectively. The impact on water environment would be more significant under abnormal conditions such as emergency shutdown.

Sewage subject to treatment will meet Reuse of Recycling Water for Urban Water Quality Standard for Urban Non-drinking Water Consumption (GB/T18920-2002), the Industrial Water Quality for Reuse of Recycled Urban Wastewater (GB/T19923-2005), the Class I standard (2nd Period) of Discharge Limits of Water Pollutants (DB4426-2001) and the Class I standard of Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008) (subject to the strictest one). Sewage plant receives sewage after treatment, therefore causing no impact on normal operation of sewage plant, nor leading to any significant impact on downstream water body.

5.2.1.5 Impact analysis of accidental discharge of sewage treatment station

Sewage treatment station, if fails to treat wastewater normally due to accident, must stop running immediately and leachate should be temporarily stored in regulating tank (not discharged to municipal sewage pipe network) while repairing sewage treatment station.

In addition, the project is provided with a 3,600m^3 fire fighting water pond and a leachate regulating tank with the same volume, capable of accommodating wastewater produced in nearly 16 days, including leachate, assuring no discharge of leachate to outside environment and adverse impact on surface water quality in case of sewage treatment station accident.

To effectively cope with overflow accident caused by increased leachate in stormy weather, regulating tank should be provided with lid or cover to keep rainwater out.

After taking above prevention and control measures and auxiliary actions, it is assured that no wastewater will be discharged to affect surrounding surface water during failure period of sewage treatment station.

5.2.1.6 Drain outlet control

The project is only provided with one drain outlet (in the south of environmental park, near the Changlonggang municipal sewage pipe network), is allowed to discharge reclaimed water after treatment during rainy season, and installed with measuring and monitoring devices; and in order to keep out the waste leachate and other production and living sewage, it is connected to the environmental protection bureau for continuous online monitoring.

5.2.1.7 Conclusion

Leachate, wash water for garbage trucks and wastewater from workshop cleaning are treated by the Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City, after subject to treatment in reclaimed water treatment facility, and will be sent to water recycling system, used for circulating tower and slag comprehensive utilization and greening without discharge. Both the domestic sewage, effluent entering self-constructed domestic sewage treatment system will enter water reuse system; other wastewater, such as effluent from integrated automatic backwash water purifier, circulating water discharge and boiler will be directly sent to water reuse treatment system. Under normal condition, the waste incineration plant may discharge no wastewater, causing no unfavorable influence on surrounding surface water environment.

In addition, the project is provided with a 3,600m^3 fire fighting water pond and a leachate regulating tank with the same volume, capable of accommodating wastewater produced in nearly 16 days, including leachate, assuring no discharge of leachate to outside environment and adverse impact on surface water quality in case of sewage treatment station accident.

In rainy season, reclaimed water after treatment will be discharged to Shatian sewage treatment plant via sewage pipe network and, after reaching relevant standard, to Shatian River.

Water environmental pollution can be managed by taking above measures and the project would not impose any significant adverse impact on surrounding water environment.

5.2.2 Impact analysis of underground water environment

Regional underground water environment pollution would occur when the leaked wastewater and waste leachate permeate into soil layer. As indicated by the engineering analysis, two pollution sources would cause pollution to underground water during operation of the project: infiltration of leachate from solid wastes; and wastewater leakage that might occur during operation.

1. Impact of stacked solid wastes on underground water environment

(1) Waste stockpiling

Wastes are transported by environmental sanitation department via enclosed and negative pressure garbage trucks to the storage pit and an enclosed waste discharge hall is installed outside the waste storage pit. Garbage truck enters into plant and, after being weighed by weighbridge, drives to waste discharge hall and dumps wastes to the pit. Discharge hall is installed with sewage ditches to gather waste leachate from transport vehicles and lead them to leachate collecting tank, then pump to leachate treatment system at landfill.

Waste storage pit is built with reinforced concrete structure, semi-underground. The bottom should be designed with anti-seepage, 2% longitudinal slope, and the bottom of front wall of pit should be equipped with stainless steel grids so as to drain waste leachate to collecting tank. The tank is designed with effective volume of $400m^3$, capable of accommodating leachate of 3 days. Collected waste leachate is pumped to leachate treatment system at sewage treatment station. To protect concrete wall against leachate corrosion, waste storage pit, leachate collecting ditch and tank should be subject to heavy-duty anti-corrosion treatment.

During operation, wastewater and landfill leachate are collected and sent to the landfill leachate treatment station; foundation of facilities such as waste receiving system, waste storage pit, waste leachate pool are subject to anti-seepage anticorrosive treatment, therefore effectively avoid liquid leakage under normal conditions, project waste storage and processing have no adverse impact on the regional groundwater environment.

(2) Solid wastes

Solid wastes produced in the project mainly include incineration slag and fly ash.

Slag discharged from boiler are cooled down in the water tank of slag extractor and then directly discharged to slag pit. Slag is loaded to dump truck by grabbing crane to slag comprehensive treatment site for comprehensive utilization. Wastes of fine size leaked from fire grate gap will be delivered to slag pit by special conveyor. Slag will be classified as general solid wastes in accordance with the Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2001), and both slag and fly ash treatment site should be subject to anti-seepage treatment as per the Standards for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001).

Collected fly ash is transported to fly ash bunker by enclosed conveyor, finally to the solidification workshop. No leaching waste solution will be produced since fly ash has no moisture and the fly ash bunker is indoor, free from rainfall during storage and processing.

In conclusion, the temporary stacking of wastes in solid waste site, under normal working condition, would cause no adverse impact on underground water environment.

2. Influence of wastewater on underground water environment under normal working condition

After operation, both waste leachate and high-concentration wash water are directly sent to leachate treatment system of the Municipal Solid Waste Landfill of Lanzilong Integrated Waste Treatment Project in Huiyang District, Huizhou City. Effluent after treatment will be recycled for production and, under normal condition, will not be discharged to the outside environment. In order to effectively prevent underground water pollution caused by wastewater leakage, waste unloading hall, leachate pool, waste storage pit, slag pit and slag warehouse are subject to corresponding anti-seepage treatment.

Therefore, the wastewater would not cause any adverse impact on underground water environment under normal working condition.

3. Influence of wastewater leakage on underground water environment

Influence on underground water environment under abnormal working condition mainly involves the possible influence of pollutants from wastewater infiltration/leakage into aquifer on underground water due to equipment damage.

Untreated waste leachate has extremely high pollutants concentration, in the event of leakage/leakage accident, if response is not quick, it may adversely affect the regional groundwater environment. To analyze the magnitude and extent of possible impact on surrounding underground water environment of pollutants from wastewater infiltration/leakage moving along with underground water in the plant site, based on the generalization of hydrogeological conditions and accident scenario, prediction of movement of different pollutants into underground water and change in its concentration is made by referring to the common underground water evaluation prediction model (See Guide, appendix F) provided in the Technological Guide on Environmental Impact Evaluation- Underground Water Environment (HJ 610-2011) and relying on analytical method model.

According to engineering analysis, assume that the foundation of waste storage pit is partially subject to cracking, pollutant calculation is based on 10% of daily leachate during accident and COD, SS and NH_3-N is selected as prediction factors.

(1) Setting scenario:

For the waste leachate leakage due to cracked foundation of waste leachate collecting tank because of production accident, assume leak is found and proper anti-seepage measures are taken 30 days after accident occurrence, about 10% of waste leachate produced are leaked. Irrespective of the obstruction and absorption of aeration zone, pollutants in leaked wastewater all filtrate into underground aquifer through cohesive soils (As shown in Table 5.2.2-1).

Table 5.2.2-1 Concentration of pollutant in waste leachate

Type and name of pollutant		Water quality index (mg/l)	Discharge to
Waste leachate	COD	60000	Leachate treatment system + reclaimed water reuse system and, after treatment, for
	SS	2000	

240m^3/d	NH3-N	1800	circulating tower and slag comprehensive utilization and greening

(2) Generalization of hydrogeololgy

Considering the factory won't carry out groundwater exploitation and utilization, regional water supply is relatively stable, it can be assumed that groundwater flow field maintains overall stability during accident period; as indicated by hydrological drill hole water level monitoring and landform in the region, the underground water flow field runs generally from northeast to southwest.

The following assumptions are made: 1) aquifers in the plant region (intensely and moderately weathered sandstone) have uniform thickness, homogeneous aqueous medium and isotropy, the impermeable base is basically horizontal; 2) In general, underground water flows from northeast to southwest, in one-dimensional steady flow; 3) assume the pollutants infiltrate from one leakage point, a transient source point (leakage time may be considered as transient input relative to prediction time); 4) Filtration of pollutants would not affect underground water flow field.

Analytical method model (transient input tracer agent- transient source point on the plane):

$$C(x,y,t)=\frac{m\ /M}{4\pi n\sqrt{D_L D_T}\,t}e^{-\left[\frac{(x-ut)^2}{4D_L t}+\frac{y^2}{4D_T t}\right]}$$

$$m = 30 \cdot 10\% \cdot Q_{漏}$$

$$u = KI$$

Where: x, y — coordinate of prediction point location;

t—time (d);

C (x,y,t)— Concentration (mg/L) of tracer agent at x and y at the moment of t;

m— Mass of pollutant factors infiltrated in underground water in unit time (kg/d);

u— Velocity of local underground water (m/d);

I— Hydraulic gradient, 0.3 by referring to topographic slope of the site;

Q_{leak}— Total leakage of pollutants in wastewater (kg/d);

n—Effective porosity, 0.36, an empirical value based on lithology;

K—Permeability coefficient, 0.0035cm/s, a permeability coefficient based on survey report;

M—Aquifer thickness, 9.8m, average thickness of intensely and moderately weathered layer based on the drilling thickness;

DL—Coefficient of longitudinal dispersion, 10 m^2/d, empirical value based on dispersion testing of similar sites;

DT—Coefficient of transverse dispersion, 1m^2/d, based on the ratio of 1:10 of longitudinal and transverse dispersion.

Since the utilization of analytical method model fails to take into account the absorption, dilution and biochemical reaction of pollutants in aquifer during underground water movement, conservative consideration should be given to each parameter relating to scenario and model. Taking waste storage pit leakage point as the origin (o), prediction is made for the downstream boundary (A). See Figure 5.2.2-1 for distribution.

(3) Analysis of prediction results: Wastewater flows on ground surface, the leaked waste solution filtrates into aeration zone through surface soil layer and, after through cohesive soils, completely weathered layer and aquitard, part of the wastewater comes in contact with underground water, and most of the wastewater make transverse diffusion due to barrier effect, so very little waste water will go to the ground, most of it will stay at the aquitard and comes to stagnation partially on the roof of aquitard. Since pollutants (such as COD) concentration in waste leachate is extremely high, and both regional intensely and moderately weathered layer has quite strong permeability, pollutants would move downstream of plant boundary along with underground water after filtration into aquifer and, after 70 days, to the location A. According to the direction of underground water and prediction results, underground water at the southwest side of leakage point (o) is the major affected area. While based on prediction results, pollutant concentration is kept at very low level and, subject to further dilution and absorption during downstream movement, consistently decreases. As long as proper prevention and control action are taken after wastewater leakage/filtration, the sphere of possible adverse impact on underground water would be considerably small, no influence on underground water environment in surrounding sensitive areas .

Figure 5.2.2-1 Diagram of prediction point location for environmental impact of underground water（unit: m）

Table 5.2.2-2 Pollutant concentration at downstream boundary during accident (unit: mg/L)

Days / Index	70	90	180	365	730	1095
COD	0.00000024	0.000094	0.48	0.38	0.000057	0.000000002
SS	0.00000001	0.000003	0.016	0.013	0.000002	0.00000000005
NH_3-N	0.00000001	0.0000028	0.014	0.011	0.0000017	0.00000000005

5.3 Noise prediction and impact evaluation

Major noise sources in the plant include aerodynamic noise, electromagnetic noise and mechanical vibration noise from mechanical equipments such as fan, induced draft fan, exhaust valve, the exhaust pipe, high-power pump, steam turbine generator unit, and noises caused by garbage trucks and slag conveyors. Equipment noises are mainly low-frequency noise, generally with noise level below 85dB (A), only a few of them above 90dB (A), such as the turbo generator unit. After taking proper noise reduction measures, noise source intensity ranges from 65~107dB (A), as shown in Table 5.3-1.

Table 5.3-1 Source intensity of major noise equipments

Position of noise source	Equipment name	Equivalent sound level before reduction measure	Reduction measures	Sound level after reduction measure
Waste receiving, storage and transport system	Waste crane	80～90	Indoor	～70
	Slag crane	80～90	Indoor	～70
	Slag conveyer	80～90	Indoor	～70
	Garbage truck	76～85	Indoor	～70
Incineration system	Blower	85～90	Acoustic shield, indoor	～70
	Draught fan	85～90	Acoustic shield, indoor	～70
	Safety valve	95～110	Indoor	～70
	Exhaust pipe	95～110	Indoor	～70
	Condenser	85～95	Indoor	～70
Waste heat energy utilization system	Turbine generator set	105～110	Indoor	～70
	Air compressor	90～95	Indoor	～70
	Boiler exhaust (transient)	130～140	Silencer	～107
Public auxiliary facility	Cooling tower	80	Outdoor, water pool is provided with sound absorption device	72

5.3.1 Prediction formula

Noise in the project can be considered as industrial noise and, prediction mode may be described as below according to the Guide on Environmental Impact Assessment-Acoustic Environment (HJ2.4-2009):

(1) Point acoustic source

For point acoustic source in a free space, octave band sound pressure level ($Lp(r)_\theta$) of the source in θ direction with a distance of γ will be :

$$Lp(r)_\theta = Lw - 20\lg r + D_{I\theta} - 11$$

Where:

$D_{I\theta}$—— directivity index in the direction of θ,

R_θ——directivity factor,

I——Average sound intensity in all directions,

I_θ——Sound intensity in θ direction,

Where, $Lp(r)$ and $Lp(r_0)$ must be the octave band sound pressure level in the same direction.

(2) Limited-length line sound source

Assume the length of line sound source is l_0, octave band sound pressure level of line sound source per unit length is Lw, and the sound pressure level at the perpendicular bisector with a distance of r away from sound source is :

$$Lp(r) = Lw - 10\lg[\frac{1}{2}arctg(\frac{l_0}{2r})] + 8$$

or

$$Lp(r) = Lp(r_0) + 10\lg[\frac{\frac{1}{r}arctg(\frac{l_0}{2r})}{\frac{1}{r_0}arctg(\frac{l_0}{2r_0})}]$$

(3) Multiple sound sources

The prediction of sound pressure level from multiple sound sources to the prediction point j may be separately calculated for each source, and then cumulated together as per following formula:

$$L_{Pj} = 10\lg\left[\sum_i 10^{0.1LPij}\right]$$

(4) Plane sound source

Plane sound source may be considered as the combination of numerous point sound sources continuously emitting sound, and the combined sound level can be worked out according to energy cumulation method. Figure 6.3-1 gives the sound attenuation curve on the central axis of rectangle plane sound source. When the prediction point and central distance of plane sound source meets following condition, it may be approximately calculated as per the following methods: in case of $r < a/\pi$, it has no attenuation (Adiv ≈0); when $a/\pi < r < b/\pi$, double distance leads to attenuation 3dB (A), similar to the attenuation characteristics of line sound source ($Adiv \approx 10\lg(r/r_0)$); when $r > b/\pi$, double distance leads to attenuation 6dB (A), similar to the attenuation characteristics of line and point sound source ($Adiv \approx 20\lg(r/r_0)$).

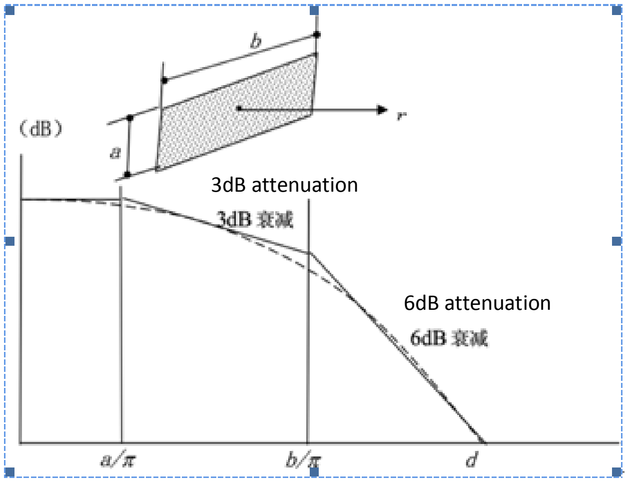


Figure 6.3-1 Attenuation characteristics on central axis of rectangle plane sound source

(5) Ground effect attenuation

Ground effect attenuation may be calculated as per following formula:

$$A_{gr} = 4.8 - \left(\frac{2h_m}{r}\right)\left[17 + \left(\frac{300}{r}\right)\right]$$ (path of transmission is mostly loose mixed ground)

Where:

r——Distance from sound source to prediction point, m;

hm—— Average height of transmission path, m; calculated based on Figure 6.5-2,

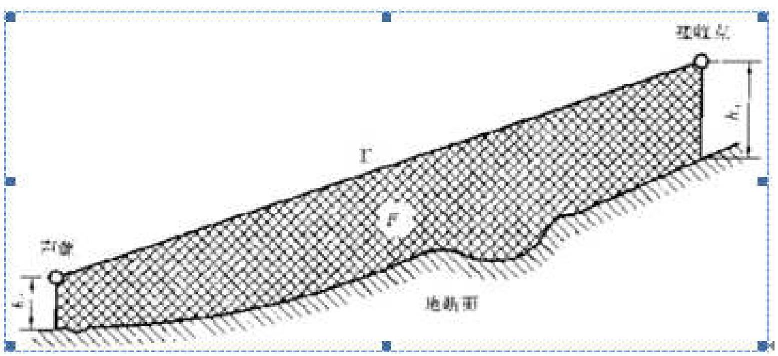


Figure 6.3-2 Method of estimating average height hm

(6) Obstacle-related attenuation （A_{bar}）

1) Work out first the path difference of three transmission paths as shown in Figure 6.5-3, δ_1、δ_2、δ_3 and corresponding Niel Bohr N1, N2 and N3;

2) Sound barrier related attenuation:

$$A_{bar} = -10\lg\left[\frac{1}{3+20N_1}+\frac{1}{30+20N_2}+\frac{1}{30+20N_3}\right]$$

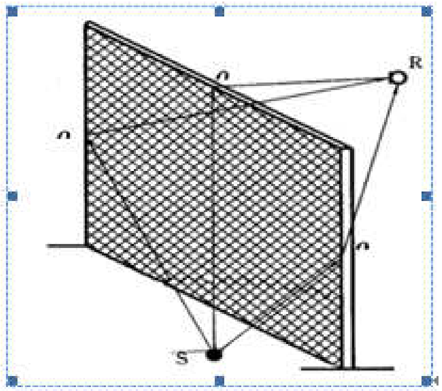


Figure 6.3-3 Different transmission paths in limited-length sound barrier

5.3.2 Prediction evaluation scope and criteria

Evaluation scope of environmental noise: 200m outside of plant boundary and 100m along both sides of waste transport arterial roads. After on-site survey, no residential areas are found within a radius of 200m outside the plant boundary.

5.3.3 Analysis of prediction result

(1) Noise prediction under normal working condition

See Table 7.3-2 for prediction result of noise at plant boundary. As shown in the table, noise at plant boundary meets corresponding evaluation standard.

Table 7.3-2 Prediction result of noise contribution value at boundary

Unit: dB(A)

Prediction result / Prediction point	Daytime		Night	
	Predicted contribution value	Compliance	Predicted contribution value	Compliance
1# east boundary	26.83	Yes	26.83	Yes
2# south boundary	34.08	Yes	34.08	Yes
3# west boundary	37.47	Yes	37.47	Yes
4# north boundary	24.43	Yes	24.43	Yes
Standard value	60		50	

Note: It is the boundary at Lanzilong Environmental Park.

(2) Noise prediction under abnormal working condition

When no noise reduction measures are taken, boiler exhaust has the maximum sound level of 140dB. Boiler should be equipped with throttling depressurization (compound silencer) with silencing capacity of 33dB(A). After taking proper measures, the prediction results of boiler exhaust noises are provided in Table 7.3-3 (with noise source intensity being 107dB(A)) without taking into the noise in the plant and surrounding environment.

As to sporadic noise, its maximum noise level is expected to be 15 dB(A) under the limit value, namely 75 dB(A) in daytime and 65 dB(A) in night at boundary, and 70 dB(A) in daytime and 60 dB(A) in night at sensitive areas.

According to prediction results, it is visible that, after installing silencer, noise level at both plant boundary and sensitive areas are compliant with standard requirement under abnormal working conditions.

Table 7.3-3 Prediction result of noise contribution value at boundary under abnormal working condition [Unit: dB(A)]

Prediction result / Prediction point	Daytime		Night	
	Predicted contribution value	Compliance	Predicted contribution value	Compliance
1# east boundary	52.69	Yes	52.69	Yes
2# south boundary	60.00	Yes	60.00	Yes
3# west boundary	62.86	Yes	62.86	Yes
4# north boundary	50.48	Yes	50.48	Yes
Standard value	75		65	

5.3.3 Prediction of noise at waste transport roads

Garbage truck noise is 85 dB(A), in the absence of any protective facilities and based on predicted line sound source, the calculation results are shown in Table 7.3-4.

Table 7.3-4 Noise value at both sides of arterial roads

Distance (m)	5	10	15	20	30	40	45
Noise value (dB(A))	71.71	68.38	66.30	64.73	62.33	60.48	59.67

Class 4 standard should be followed for noise at the range of 30m on both sides of transport lines, namely 70dB(A) in daytime and 55dB(A) in night.

Equivalent continuous sound level (Leq) at 10m on both sides of roads is 68.38dB(A), compliant with the noise standard value on both sides of the arterial road in daytime, namely 70 dB(A), but higher than the nighttime noise standard 55 dB(A); equivalent continuous sound level (Leq) at 30m on both sides of roads is 62.33 dB(A), compliant with the noise standard value on both sides of arterial road in daytime, but in the absence of barriers, equivalent continuous sound level (Leq) at night about 96 m away the road is up to 55 dB(A).

Domestic wastes are transported by municipal environmental sanitation department; fly ash solidification blocks are delivered to the safe landfill site designated by the government; slag are utilized, and transported 8h per day; other materials such as lime powder and activated carbon are supplied and transported by suppliers. Wastes are transported mainly in the morning and night, and other materials are transported around midday and may not be delivered at night. Daytime operation should only cause noise disturbance to residents 5-10m away from the arterial roads.

A dedicated waste transport road is planned to connect Hui'ao Avenue and the plant area and, as planned, the road is at least 100m away from nearby residents, therefore waste transport would cause little impact on surrounding sensitive areas.

5.3.4 Conclusion of noise impact evaluation

In conclusion, under normal working condition, noise at each plant boundary, after taking noise reduction measures will reach Class II standard in Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-2008) and, under abnormal working condition, noise at each plant boundary can also meet corresponding standard.

5.3.5 Noise pollution prevention and control measures

Noise pollution prevention and control measures include:

(1) Select technically advanced low- noise mechanical equipments, specify equipment noise limit in purchase contract and control noise from the source.

(2) Control the noise from the sources, take noise reduction measures for high noise

equipment, such as high pressure steam emergency vents, fan, inlet and outlet of draught fan, exhaust vent of waste heat boiler safety valve, ignition exhaust vent, startup bleeding vent, main stream mother tube are all provided with muffler; generators and water pumps and other equipments are also provided with noise barrier; inlet and outlet of the fan and water pump are equipped with rubber joint vibration damper; infrastructure such as water pump is equipped with vibration damping pad.

(3) Improve automation level, achieve unmanned monitoring for parameter and automatic operation of high-noise equipments like fans, water pumps. During maintenance, it is required to specify working time so as to reduce noise-related harm to staff.

(4) Enhance greening in the plant, completely utilize the sound-proof function of buildings in the plant, reduce noise with greening belt and alleviate noise impact on the environment.

(5) For vehicle noises, it is required to enhance vehicle management such as restricting horn use and vehicle speed so as to reduce traffic noise.

5.4 Solid waste environment impact prediction evaluation

5.4.1 Impact analysis of solid wastes

Solid wastes generated by waste incineration are mainly composed of slag and furnace ash discharged by incineration system and the fly ash discharged by flue gas cleaning system (including the ash generated after adding slaked lime and activated carbon during flue gas treatment). In accordance with the stipulation in the Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2001), incineration slag may be treated as general solid wastes, while incineration fly ash (including the ash generated after adding slaked lime and activated carbon during flue gas treatment) is treated as hazardous wastes.

(1) Slag

Slag composition

The main composition of slag is ash containing no organic matter, other components include iron and steel scrap, ceramics, glass, tile, sand. The ash containing no organic matter is mostly harmless substance, can be comprehensively utilized after leaching toxicity test, and has little impact on the environment.

Appraisal on hazardous nature of slag

See Table 7.4-1 for monitoring result of slag of Qinshuihe Waste Incineration Power Generation Plant on November 1998. It is evaluated in accordance with the Identification Standards for Extraction Toxicity of Hazardous Wastes (GB5085.3-1996), and each indicator is compliant with standard requirement, therefore slag is not considered as hazardous waste, and should be treated as general solid waste in accordance with the Standard for Pollution Control on the Municipal Solid Waste Incineration.

Table 7.4-1 Monitoring result of slag of Qinshuihe Waste Incineration Power Generation Plant

Item	Identification standard （mg/l）	Single sample concentration		Average concentration	
		Concentration range （mg/l）	Over-standard rate (%)	Concentration value (mg/l)	Times of standard value
Total Cd	0.3	0.017—0.024	0	0.021	0
Total Pb	3.0	0.13—0.27	0	0.20	0
Total Zn	50	0.519—0.982	0	0.751	0
Cyanide	1.0	(Y)—0.002	0	0.002	0
Total Hg	0.05	0.00005-0.0002	0	0.000125	0
Cr^{6+}	1.5	0.006—0.009	0	0.008	0

Impact analysis of slag

Slag produced by the project is used comprehensively in the plant and, after separating 1% metal, adding 10% cement and 0.1% additives, they are used for brick-making. Therefore slag produced in the project will not cause environmental impact.

Comprehensive utilization of slag

Generally, the slag meets many technical requirements of aggregate and gravel, and the content of heavy metal leaching and dissolved salt content is quite small, low in organic poison content, suitable for reuse, including: recovery of ferrous metals, making of asphalt pavement, substitution of the aggregate and cement concrete, landfill cover material, roadbed and the embankment construction packing.

(2) Fly ash

Percentage and composition of fly ash

According to the Prospect Analysis of the Reuse of Municipal Solid Waste Fly Ash, by Li Jianxin, published on the 1st edition, 2008 on Power System Engineering, solid residue produced after municipal solid waste incineration treatment accounts for about 30%～35% of wastes, 25%～30% of which is bottom slag and others are fly ash, about 5%, while the content of fly ash generated by fluidized bed incinerator is much higher. Table 7.4-2 gives the composition and pollutant content of two typical waste incinerators in China.

In terms of the composition of waste fly ash, two types of incinerators, the circulating fluidized bed and grate boiler has certain difference in the basic composition and toxic pollutants content of fly ash, namely the fluidized bed Si, Al, Fe oxides in the fly ash content is higher, this is mainly because of high content of these elements in the mixed coal. Ca in the two kinds of fly ash content is very high, this is because in order to reduce acidic gas calcium is sprayed at the tail part of the chimney. Dioxins and heavy metals content in the fly ash show that dioxins and heavy metals content in fly ash of fluidized bed is significantly lower than the fly ash of grate furnace, its toxicity is far lower than fly ash of grate boiler, which is closely related to combustion.

Table 7.4-2 Features of fly ash of different incinerators

Sample	Major composition of fly ash %								
	Si	Al	Ca	Fe	Na	K	O	Cl	Mg
Grate furnace	4.03	0.28	23.2	2.05	2.8	2.47	26.8	15.08	1.35
Fluidized bed	10.27	8.2	12.45	2.74	1.07	9.5	21.32	1.52	1.17
Sample	Content of heavy metal in fly ash ng/g						Content of dioxin in fly ash ng/g		
	Pb	Cd	Cu	Zn	Hg	Ni	dioxin	furan	dioxin/furan
Grate furnace	2462.5	72.19	1144.4	8015.82	4.538	85.724	94.7	72.86	167.56
Fluidized bed	465.19	7.26	578.35	2207.79	1.738	71.634	2.07	7.25	9.32

Note: Data from Prospect Analysis of the Reuse of Municipal Solid Waste Fly Ash, Li Jianxin, et al., published on the 1st edition, Jan. 2008 on Power System Engineering, Vol.24 No.1.

Identification of hazard nature of fly ash

Leaching toxicity refers to the process of migrating and transforming of hazardous substances in solid hazardous wastes after contacting with water and then causing environmental pollution. As to circulating fluidized bed, its ratio of fly ash to slag approximates even to 1:1 because of large amount of coal and larger discharge quantity of fly ash. In order to describe the leaching toxicity of hazardous fly ash generated by circulating fluidized bed, leaching toxicity of major solid wastes in the project are analyzed by analogical method on the basis of testing result of leaching toxicity of fly ash from Dongguan Zhongke Waste Power Generation Plant and Chengdong Combined Heat and Power Plant, as shown in Table 7.4-3 and 7.4-4. Dongguan Zhongke Waste Power Generation Plant adopts the leaching toxicity method for fly ash provided in the Solid Waste-Extraction Procedure for Leaching Toxicity - Sulphuric Acid & Nitric Acid Method (HJ/T299-2007). The extracting agent is mixed solution of concentrated sulfuric acid and concentrated nitric acid with mass ratio of 2:1 (pH 3.20±0.05), after 8h vibration and 16h leaching; while Chengdong Combined Heat and Power Plant prepares leachate with fly ash in accordance with GB5085-85.

Table 7.4-3 Leaching toxicity of fly ash from Dongguan Zhongke Waste Power Generation Plant （Unit: mg/L）

Name	Concentration	GB5085.3-2007 Standard limit	GB16889-2008 Concentration limit	Detection method
Mercury	0.422×10-3	50	0.05	GB7468-1987 Cold atomic absorption spectrophotometry
Lead	0.113	3	0.25	GB5085.3-1996
Cadmium	0.007	0.3	0.15	
Chromium	4.94	10	4.5	
Hexavalent chromium	0.565	1.5	1.5	GB7468-1987 Diphenylcarbazide spectrophotometry
Copper	<0.002	50	40	GB5085.3-1996
Zinc	0.016	50	100	
Beryllium	<0.002	0.1	0.02	
Barium	0.332	100	25	

Nickel	0.002	10	0.5	
Arsenic	<0.005	1.5	0.3	
Fluoride	4.00	50	—	GB7468-1987 Ion selective electrode method
Cyanide	<0.004	1.0	—	GB7468-1987 Isonicotinic acid - pyrazolone photometric method

Table 7.4-4 Leaching toxicity of fly ash from Chengdong Combined Heat and Power Plant （mg/L）

Name	Concentration	GB5085.3-2007 Standard limit	GB16889-2008 Concentration limit	Detection method
pH	8.5	—	—	GB6920-86 Glass electrode method
Mercury	<5×10-5	50	0.05	GB/T15555.1-1995 Cold atomic fluorescence spectrometry
Total chromium	<0.5	10	4.5	GB/T15555.6-1995 Atomic absorption spectrometry
Hexavalent chromium	<0.004	1.5	1.5	GB/T15555.4-1995 Diphenylcarbazide spectrophotometry
Copper	<0.2	50	40	GB/T15555.2-1995 Atomic absorption spectrometry
Zinc	<0.05	50	100	
Lead	<1.0	3	0.25	
Cadmium	<0.05	0.3	0.15	
Arsenic	0.002	1.5	0.3	GB/T15555.3-1995 Diethyl dithiocarbamate spectrophotometry

As shown by test results, hazardous content in fly ash leachate from both plants comply with the limit value specified in Identification Standards for Hazardous Wastes (GB 5085.3—2007), is deemed as general industrial solid wastes. In reference to the Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008), the leaching toxicity in total chromium from Dongguan Zhongke Waste Power Generation Plant slightly exceeds standard limit, and cannot be directly buried for landfill.

In addition, Shen Dongjian adopts fly ash composition of two sets of 150t/d circulating fluidized bed (CFBI) developed by the Department of Thermal Engineering, THU (excerpted from Analysis of Heavy Metals and Radioactivity of Slag and Fly Ash between Two Different MSW Incinerators, Shen Dongjian, Chen Yong et al, Journal of Safety and Environment, June 2005, Vol5 No.3). See GB 5085.3-1995 Test Method Standard for Leaching Toxicity of Hazardous Wastes for leaching toxicity. Plasma spectrum and atomic fluorescence spectrometry is used to detect the heavy metal contents in slag and fly ash. See GB15555.1-1995 Appendix B Preparation of Leachate for sample preparation (preparation of leachate). See Table 7.4-5 for detection result of leaching toxicity.

Analysis result demonstrates that, heavy metal leaching toxicity of slag and fly ash after incineration by circulating fluidized bed complies with standard value in the Test Method Standard for Leaching Toxicity of Hazardous Wastes, far less than 1-2 order of magnitudes of national standard, with lower total discharge of heavy metal, and is considered as general industrial solid wastes. Research demonstrates that, heavy metal contents in fly ash from fire grate are much higher. Since the incineration temperature in circulating fluidized bed is lower than grate furnace, the content of volatile heavy metal in fly ash is far less that grate furnace.

Table 7.4-5 Detection result of leaching toxicity of CFBI fly ash sample Unit: mg/L

Detection item	Detection value	Detection limit	GB5085.3-2007 Standard limit	GB16889-2008 Concentration limit
Cyanide	0.03	0.004	1.0	—
Fluoride	0.12	0.05	50	—
Hg	0.003	5×10-11	50	0.05
Pb	ND	0.4	3	0.25
As	ND	0.4	1.5	0.3
Cd	ND	0.03	0.3	0.15
Cu	ND	0.04	50	40
Zn	0.03	0.03	50	100
Be	ND	0.002	0.1	0.02
Ba	0.37	0.02	100	25
Ni	ND	0.1	10	0.5

Cr	ND	0.04	10	4.5

Note: ND means not detected.

As shown by monitoring results, leaching toxicity of fly ash by circulating fluidized bed complies with the limit value specified in Identification Standards for Hazardous Wastes (GB 5085.3—2007), and is deemed as general industrial solid wastes. Conservatively, incineration fly ash is considered as hazardous wastes as per the National Catalogue of Hazardous Wastes. Construction unit is recommended to make leaching toxicity test of fly ash, analyze leaching toxicity and determine the disposal solution.

Impact analysis of fly ash

The most components in fly ash are inorganic materials of fine particles, and there is a high heavy metal content. Negligence in management of hazardous solid wastes, improper discard or stacking will pollute local soils and environment, also pollute local underground water and surface water due to rainfall leaching, leading to the loss of original water body functions, and even resulting in human and animal poisoning, which would in turn cause long-term irreversible environmental devastation through ecological migration; in addition, the stacking site would also be polluted. High attention must be paid to the management and disposal of such solid wastes.

(3) Sludge

Sludge produced by sewage treatment contains a lot of organic matters and heavy metal materials that are difficult to degrade are considered as hazardous wastes. Since the excess sludge in sewage treatment plant is complicated in composition, besides its odor or stench, and still contains some bacteria, and if the sludge is not treated properly or timely collected or discarded or piled up as required, it will cause serious secondary pollution to the environment. It must be strictly managed, and burning the sludge along with waste would not cause secondary pollution.

5.4.2 Disposal solution of solid wastes

Solid wastes generated by waste incineration are mainly composed of slag and furnace ash discharged by incineration system and the fly ash discharged by flue gas cleaning system (including the ash generated after adding slaked lime and activated carbon during flue gas treatment). In accordance with the stipulation in the Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2001), incineration slag may be treated as general solid wastes, while incineration fly ash (including the ash generated after adding slaked lime and activated carbon during flue gas treatment) is treated as hazardous wastes.

Solid wastes produced in the project mainly include incineration slag 56,600t/a and fly ash 16,500t/a.

5.4.2.1 Slag

In accordance with the Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008), municipal solid waste incineration slag is considered as general solid wastes and, in the project, slag will be recovered for comprehensive utilization: after separating 1% metal, adding 10% cement and 0.1% additives, they are used for brick-making.

5.4.2.2 Fly ash

In accordance with the Technical Policy on Prevention and Control of Hazardous Waste Pollution (H.F. [2001] No. 199), fly ash produced by municipal solid waste incineration must be collected separately, may not be mixed with municipal solid waste and incineration slag, nor with other hazardous wastes; also must not be stored for a long time in the site and disposed or discharged at will.

To prevent fly ash from flying during loading and transport, fly ash from waste incineration must be solidified and stabilized in the site prior to transport.

Fly ash will be solidified and subject to leaching toxicity detection. Those compliant with Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008) will be transported to landfill to bury in different sections and those not compliant with GB16889-2008 will be safely disposed by Huizhou Dongjiang Veolia Environmental Services Ltd. Transportation needs special transport, must be the closed type transport means; if it is required take safety landfill, the Standard for Pollution Control on The Security Landfill Site for Hazardous Wastes must be followed.

The research conducted by Tongji University on leaching toxicity and surface leaching toxicity of heavy metal in fly ash cement solidification body relating to municipal solid waste incineration focuses on the safety evaluation of cement solidification body. It shows that, cement solidification presents ideal effectiveness and, in actual use, heavy metal leaching is very slow therefore the amount of release is far less than national standard value (detailed in Table 7.4-6); in addition, the environment may accept and dilute small amounts of hazardous substances, in such case, the fly ash cement solidification body would cause no environmental pollution and is feasible for resource reutilization.

Table 7.4-6 Change in leaching of heavy metal in solidified body along with leaching time （mg/L）

Leaching time h	Zn	Pb	Cd	Cr	Cu
4	1.234	0.105	0.015	0.032	0.186
8	1.567	0.224	0.023	0.040	0.205
16	1.896	0.345	0.032	0.049	0.238
24	2.254	0.376	0.036	0.053	0.256
36	2.581	0.412	0.040	0.058	0.272
48	2.712	0.425	0.043	0.063	0.283
60	2.803	0.438	0.047	0.068	0.297
72	2.872	0.449	0.052	0.071	0.303
GB5085.3-2007	50	3.0	0.3	1.5	50
GB16889-2008	100	0.25	0.15	1.5	40

Note: Data from the Safety Assessment for Municipal Solid Wastes Incineration Fly Ashes-Cement Solidification Body, JCR Science Edition, Journal of Tongji University, Edition 3, Vol 33, 2005.

Likeng Waste Power Generation Plant adopts the same solidification technology as the project’s, namely cement-based solidification. Cement-based solidification is a process used for waste solidification treatment based on hydration and aqueous cementitious property of cement. Since cement is inorganic cementing material and, after hydration reaction, would become solidified hard cement body. After mixing in cement base, waste would have lower migration rate in the waste-cement base under certain condition after subject to physical -chemical reaction.

At present, cement-based solidification technology has been proved to the technology with widest application and many hazardous wastes can be solidified by this technology. Since water will be used as reactant, it also applies to those with large moisture content. It features low operation costs, small investment in equipments, simple operation and low requirement for operator and in addition, shows advantages in safety, cost-effectiveness, applicability, technical maturity and other aspects.

The following figure (Figure 6.4-1) gives the monitoring report on fly ash solidification on March 2012 in Likeng Waste Power Generation Plant, indicating that heavy metal concentration in leachate is lower than the standard limit value specified in the Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008), therefore fly ash solidification is feasible to the project.

The fly ash after solidification with leaching toxicity not compliant with Pollution Control Standard for Municipal Solid Waste Landfill (GB16889-2008) will be safely disposed by Huizhou Dongjiang Veolia Environmental Services Ltd.

5.4.2.3 Sludge from sewage treatment

Sludge from sewage treatment is mixed with wastes for incineration.

5.4.2.4 Waste resin and machine oil

Waste resin and machine oil is mixed with wastes for incineration.

5.4.2.5 Domestic wastes

Domestic wastes produced in the plant are treated by means of incineration.

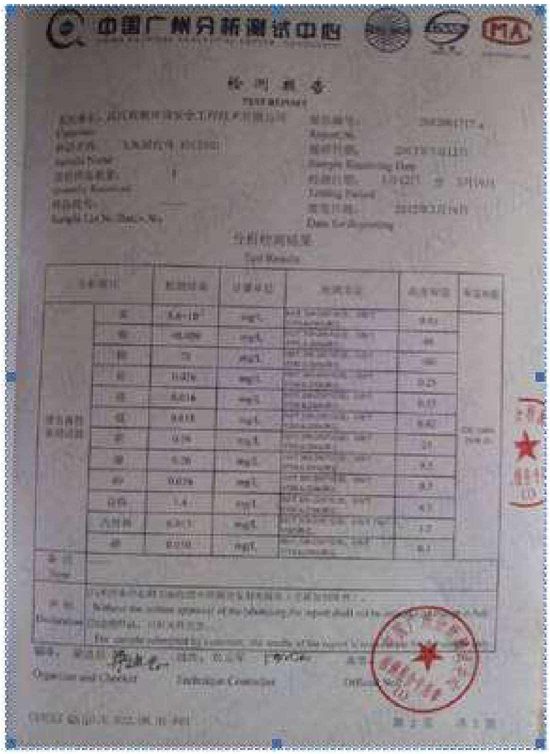
5.4.2.6 Scrap metal in slag

Nonmetal substances in slag will be recycled.

5.4.2.7 Conclusion

By taking the above measures, the influence of solid wastes on the environment can be kept at low level and the negative impact is acceptable.

As long as the environmental management system of solid waste is established and implemented, of solid waste is categorized and hazardous solid wastes are safely disposed, the danger caused by the project to the environment would be significantly reduced therefore the environmental impact of project’s solid wastes is acceptable.


中国广州分析测试中心

检测报告

TEST REPORT

分析检测结果

Test Results

Figure 6.4-1 Test result of fly ash solidification in Likeng Waste Power Generation Plant

5.5 Impact analysis of ecological environment

5.5.1 Analysis of impact of atmospheric pollutants on agricultural production

The harm caused by atmospheric pollution to agriculture first occurs in the plant production: 1. atmospheric pollutants directly affect the plant growth and development; 2. Impact of acid rain caused by atmospheric pollution affect vegetation; and 3. Trace toxic substances released along with industrial emission, whether in the atmosphere or rain to the land, are likely to cause a certain impact on the vegetation in area concerned.

After the project is completed and put into operation, the discharge of waste gas pollutants includes odour, dust, acid gases, heavy metals and dioxin-like pollutants. If pollution is not properly controlled, there is a large number of acidic gases discharged into the atmosphere, likely to fall with rain to the ground, called acid rain. The impact of acid rain on ecology mainly includes: (1) water acidification, destruction of aquatic ecosystem, reduced number of phytoplankton and animals, and when serious, fish and amphibian deaths; (2) soil acidification, accelerated soil deterioration process, dissolution of toxic substances in the soil that affect the survival and production of green plants, the most important producer in terrestrial ecosystem; (3) Acid rain dropped directly to plant leaves and resulted damage or death of plant as well as reduction in agricultural production.

According to the research data, air pollutants endangering to plant growth mainly include the sulfur dioxide, fluoride and photochemical smog. Sulfur dioxide starts from cells of back stoma, gradually spreads to the sponge and palisade cells. After entering the leaf, the chemical will be oxidized into sulfurous acid, then slowly into sulfate. Sulfite is a highly toxic substance, shows less toxicity after transformation into sulfate toxicity. However sulfur dioxide changes into sulfite faster than sulfite into sulfate block, which destroys chlorophyll, leading to tissue dehydration and necrosis, and forming many faded spots of dot, patch or strip shape.

The harm of sulfur dioxide to the plant has certain relation with sulfur dioxide concentration and exposure time. Plants are most likely to suffer damage during the period of active photosynthesis, namely the period around noon. Generally the leaf damage would occur with exposure to 0.05 to 0.5 PPM of sulfur dioxide in 8 hours.

The ambient air quality in the project site is subject to Class II standard specified in the Ambient Air Quality Standard (GB3095－2012), the standard is intended to protect animals and plants from damage. Since the maximum hourly and daily mean concentration of SO_2 discharged in the project accounts for small percentage of standard value, for instance, the increment of maximum hourly mean concentration of SO_2 is 3.650μg/m^3, on the hilltop about 542m away from plant site. After adding background value, it is still far less than the standard value, therefore air pollutants such as SO_2 has little impact on agricultural production.

5.5.2 Impact on surrounding landscape

Landscape pollution has been increasingly emphasized. Since it is long-term, usually irreversible, the impact on the landscape must be given more attention.

Four aspects should be taken into account in analyzing the landscape impact of construction project:

(1) Match with surrounding environment?

(2) Block view?

(3) Improve landscape?

(4) Reflection of sunlight and any dazzling artificial light source produced?

Since this project is still in the preparation stage, the overall design scheme is to be determined, this evaluation can only put forward some suggestions based on the existing data, reference for project in the process of design and construction, and match with the surrounding landscape as far as possible after the completion of the project.

(1) Integrate the modern aesthetic concepts in the building design process as much as possible. Design of main buildings and affiliated facilities should consider the match with the surrounding scenery, and has certain foresight, especially the tall chimney, which would become one of the main landscapes of the region. There have been numerous cases of chimney beautification at home and abroad, this project should take aesthetics into design, and make the chimney beautiful.

(2) Trees and grass not only absorb carbon dioxide, sulfur dioxide, nitrogen oxides, dust, but also absorb and block noise to a certain extent, therefore it is required to do a good job in greening, increase greening area, build a beautiful and comfortable working environment as far as possible, reduce influence on external environment. This project is suggested to create protection forest, choose plants that can absorb and show strong resistance to pollutants, in a mixed mode of arbor-shrub-grass.

In addition, in the protection forest, plant low shrubs and grass for air flow, choose tall broad-leaved tree species, and maintain higher planting density, to hide the whole plant area in green plants, to lessen people's impression of "waste incineration power plant".

The project is surrounded by woodlands and reservoir, and for the project construction, it would have little influence on the regional landscape as long as given full consideration to match with surrounding landscape.

5.5.3 Impact of heavy metal and dioxin on soils

Lead, a heavy metal, is grey white, with relative density 11.34 g/cm^3, melting temperature 327.5 ℃, boiling point 525 ℃, the relative abundance in the earth crust and ocean ranking 35th (13 μ g/kg) and 4th (0.03 μ g/kg), respectively. When heated to 400 ~ 450℃, a certain amount of lead vapor is generated, which becomes aerosol with high dispersity and pollutes the environment.

Heavy metals such as lead, mercury, cadmium and its compounds would, after entering soils, seriously destroy the natural ecological balance of soils, cause dysfunctions and soil deterioration, and serious ecological problems; lead, mercury, cadmium poisoning will directly cause impact on gene expression, inhibition of DNA replication, decreased photosynthesis, reduction in water and nutrition absorption by the plant, and presents obvious symptoms, such as chlorosis, growth inhibition, brown root tip, even death; lead and cadmium is teratogenic and carcinogenic to animals and lead to a variety of ecological effect on chromosome mutation, posing a threat to the ecology; Mercury accumulation in aquatic ecosystems is the most serious, since it can be converted to organic mercury in the environment, in which methyl mercury in the food chain will have a strong biological accumulation effect.

Research shows that in the polluted soil, heavy metal would not easily sink down, after entering soils, due to the fixed action of soils, and most would stay in the surface layer in concentrated distribution. Therefore the mass of heavy metal may be calculated based on surface soil of unit area and thickness of 20 cm (soil density 1.33 g/cm^3).

This project discharges flue gas every year, containing 1.416 t lead, 0.0708 t cadmium, 0.0708 t mercury and 0.142 gTEQ of dioxins. Conservatively, assuming that all of flue gas discharged throughout the year is evenly subsided in a circular area with radius of 2.5 km, then the annual average input of mercury and cadmium on surrounding soil would be 0.018 mg/kg, 0.36 mg/kg lead and 0.036 ng/kg dioxin.

In the future, heavy metal pollution in soil may be predicted using soil pollutants accumulation mode:

Wn = BKn+RK(1-Kn)/(1-K))

Where: W — Annual accumulative amount of pollutants in soil, mg/kg;

B — Local background vale of soil, mg/kg;

R — Annual input of pollutants, mg/kg;

K—Retention rate of pollutants in soil, %,

Where, R is the annual input of pollutants discharged by incineration plant. According to research, in general, heavy metals in the soil are not easily migrated by natural leaching, with retention rate generally around 90%, therefore it is confirmed in the prediction that K = 0.9. Based on this prediction, the cumulative impact of atmospheric precipitation of lead, mercury, cadmium and dioxins on surrounding soils may be worked out.

Table 7.5-1 Cumulative impact of atmospheric precipitation of heavy metals and dioxin on soils

Factor	Standard value(mg/kg)	Background value (mg/kg)	Cumulative impact(mg/kg)		
			10 years	20 years	30 years
Lead	300	32.5	13.45	14.18	14.44
Mercury	0.5	0.060	0.13	0.16	0.18

Cadmium	0.3	0.20L (based on 0.1)	0.14	0.18	0.19
Dioxin （ng-TEQ/kg）	100	7.15	2.70	2.78	2.80

5.5.4 Impact of dioxin on ecological environment

Dioxin is a persistent pollutant, can be accumulated and enriched in food chain. For the project, the maximum contribution value of dioxin accounts for only 0.13% of standard values, which is a small contribution to the cumulative effect in the ecosystem.

Dioxin compounds feature low water solubility (0.0002 g/m^3 in 25 ℃ water), high octanol-water partition coefficient (solubility of octanol is 4.8 g/m^3), and low steam pressure ($8.14 \times 10^{-8} \sim 1.33 \times 10^{-4}$ pa at 25 ℃), relatively stable in acid or alkali, but easy to decompose under the action of a strong oxidizer and can slowly decompose under the action of light and ultraviolet light; its microbial decomposition is slow, and very likely to be absorbed by soil.

Dioxin produced by waste incineration shows chemical stability in the environment, difficult to decompose, and accumulated in the environment because of its half-life generally up to 5 ~ 10 years. Dioxin compounds mainly exist in the form of solid at room temperature, mostly attached to gas particles during atmospheric transmission, and when settled in water body, especially in sediment, enrichment and accumulation occur in the food chain. Whether in living organism or nonliving medium, dioxin compounds are difficult to be naturally degraded, and are a persistent toxic pollutant that can be cycled and constantly enriched in different environmental media.

Atmospheric prediction shows that the maximum concentration of dioxins released in the project accounts for only 0.13% of the standard value, therefore the accumulation risk is small.

5.5.5 Impact of wastewater and gas on surrounding reservoir fishery

According to site survey, Huangsha Reservoir is presently contracted by migrant worker for farming, mainly fish and duck farming.

Under normal working condition, no production wastewater will be discharged, causing little impact on reservoir fishery.

Based on relevant literature, the waste gas that would affect surrounding farming industry mainly includes dioxin and heavy metal.

(1) Impact of dioxin on farming industry

Dioxin would not only bring huge economic losses to aquatic products and animal husbandry, also constitute a serious threat to the ecological balance and human health. It enters the body through digestive, respiratory route and skin contact or from mother to child, causing health hazard. Dioxin acute poisoning will lead to weight loss, accompanied by drastic muscle and adipose tissue decrease, degeneration and necrosis of liver cell, increased cytoplasm endoplasmic reticulum and smooth endoplasmic reticulum, enhanced vigor of microsomal enzyme and aminotransferase, and mononuclear cell infiltration; dioxin shows obvious resistance to reproductive hormones, affects reproductive function; has strong inhibition on hormonal immunity and cellular immunity; highly carcinogenic to many kinds of animals, especially to rodents. However, dioxin poisoning, toxic threshold and mechanism on people and animals, especially fish in water environment, are not yet clear. Basic research on dioxin is quite rare, and still in exploration stage, it lacks basis for assessment on human body, aquatic products and livestock health risk. Environmental quality and pollution emission standards formulated by industrially developed countries on dioxin are mostly based on an acceptable intake level of dioxins, still very inadequate in related research of effects on human and especially aquatic animal health, resulting in the lack of scientific basis for environmental decision-making and management. Current research urgently needs to address several issues: (1) Carcinogenic, teratogenic and mutagenic and other toxic thresholds of dioxin on aquatic animals; (2) under the condition of acceptable dosage, the damage of aquatic animals subject to long-term exposure to dioxin poisoning; (3) and the mechanism of dioxin toxicity to aquatic animals.

To sum up, dioxin theoretically affects surrounding farming, however, the project's emission of dioxin is low, and the ground concentration is also very low, suggesting a very small impact on the surrounding environment.

(2) Impact of heavy metal on farming

Heavy metal pollution would lead to harm to different degree on the immunity, respiration intensity, breathing of fish, physiological and biochemical effect, influence on fish embryo and fry toxicity, and on the gene toxicity. For instance, more and more scholars pay attention to the impact of heavy metal ions on immune system of fish, and the change in fish immunity caused by heavy metal is obvious; heavy metals such as aluminum, zinc, nickel, cadmium ions can be combined with gill secretion, filling the gap of gill filament, leading to breathing difficulty. Many research results show that high concentration of heavy metals will seriously affect the growth of fish embryo, and lead to interspecific differences; copper and zinc are essential elements, which are coenzyme for many enzymes and participate in the enzymatic biological reactions in the body. Once more than the required concentration in the body, it would produce toxic effects on cells, inhibit the activity of enzymes in the cell, and at the same time, produce a large number of reactive oxygen, hydrogen peroxide on superoxide anion free radicals, hydrogen peroxide, hydroxyl radicals and singlet oxygen, lead to lipid peroxidation in cell membrane, destructing intactness of cell membrane and affecting cell structure and functions. Cadmium and lead are essential elements to non-living organism, they also can produce kinds of free radicals at low concentrations, these free radicals would attack biological macromolecules, cause DNA damage, and in high concentration, influence the activity of endonuclease and enzyme in endonuclease, interfere with replication precision, and even triggering DNA mutation. After being absorbed by fish tissue, part of heavy metal ions can be carried by blood circulation to tissues and organs, cause the functional changes in various tissue cells; others can be combined with the protein and red blood cells in blood plasma, lead to reduced number of hemoglobin and red blood cells, inhibit blood function, causing anemia.

In this project, metal compounds in waste incineration flue gas generally contain metal oxides and salts and so on, mainly Hg, Pb, Cd and its compounds. Among the annual flue gas emissions, there are 1.416 t lead, 0.0708 t cadmium and 0.0708 t mercury, very small in amount and ground concentration is smaller. Shatian Reservoir has a total capacity of 14.2 million cubic meters, covers less than 2 square kilometers, is located in the southeastern portion of the project site and 3 ~ 5 km away from the chimney in the downwind position throughout the year. Therefore it would be affected only by northwest wind.

According to the wind direction frequency for many years in Huizhou, probability of such wind direction is about 5%. Conservatively, flue gas emission of this project would settle within a radius of 5 km, regardless of the chemical reaction. The annual mean concentration of mercury and cadmium in the reservoir would be 0.000006mg/L (for Class II water quality, mercury and cadmium should be 0.00005and 0.005mg/L), lead is 0.0001mg/L (for Class II water quality, lead should be 0.01mg/L), compliant with the requirement specified in Class II water quality standard.

Chapter VI Survey on Public Opinions

6.1 Purpose and Significance of Public Participation

According to Article 15 of Administrative Regulations for Environmental Protection in Construction Project, construction unit should solicit opinions of the organizations and residents in the place where the construction project is located in accordance with relevant laws when compiling report on environmental impact. Through public participation, the construction unit should give chance to the public to express their opinions, and should, for the purpose of eliminating negative influence, take various actions to improve the project's acceptability to the public, solve the public's different opinions or conflicts on environmental issues, and remove the resistance to project construction that is caused by such different opinions or conflicts. Construction unit should also conduct multi-lateral opinion exchange among government's administrative institution, the public and the investor, so as to identify major issues that the public concerns about and their perception, make the public aware of the plan for project construction, and enable the government institution to make satisfactory decision about whether to construct the project.

The public survey scheme for the project was formulated in accordance with relevant provisions of the promulgated Interim Method for Public Participation in Environmental Impact Evaluation (H.F.[2006]No.28) and Notice on Printing and Distribution of Implementation Opinions of Guangdong Province on Public Participation in Environmental Management of Construction Project (Y.H.[2007]No.99), with the aim of making the public familiar with project overview, pollution-related issues during construction period and operation period as well as corresponding environmental protection policies and measures by means of field interview, questionnaire, posted announcement and newspaper announcements. Meanwhile, the public's attitude towards the project as well as their requirements for and suggestions on the project were collected. The duration of the survey was from March to August, 2013.

6.2 Scope, Method and Subject of the Survey

(1) Survey Implementer

According to relevant provisions of the promulgated Interim Method for Public Participation in Environmental Impact Evaluation (H.F.[2006]No.28) and Notice on Printing and Distribution of Implementation Opinions of Guangdong Province on Public Participation in Environmental Management of Construction Project

(Y.H.[2007]No.99), as the construction unit and survey implementer, Huizhou Dynagreen Environmental Protection Co., Ltd. should be responsible for implementing survey on public participation in the project, and as the assisting unit, South China Institute of Environmental Sciences, Ministry of Environment Protection (MEP) should be responsible for working out the scheme for public participation in survey and cooperate with the construction unit to carry out the survey.

(2) Scope of Survey

The survey on public participation in the project covers the neighborhood of the project site, the waste collection & transportation route and the project service area.

The major subjects of the survey include downtown area of Shatian Town, Tiantou Village in Shatian Town, Xiaowu Village in Shatian Town, Huiyang Sanhe Economic Development Zone and Danshui Community. The number of the questionnaires distributed in environmentally sensitive areas accounts for over 70% of all questionnaires distributed. The total number of questionnaires distributed is 575, of which 569 effective ones written with real names and contact information were returned (484 were returned from the neighborhood of the factory site, while 85 were returned from waste transporting route), with the return rate reaching 99%. The statistics of basic information on individuals were based on these questionnaires.

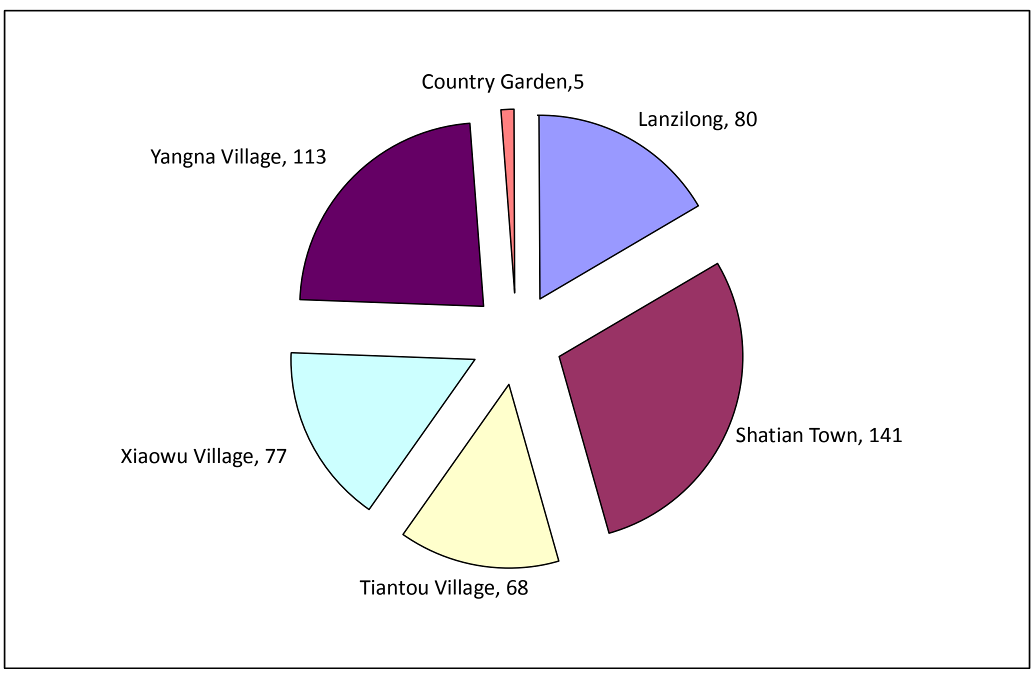


Fig. 6.2-1 Distribution of Effective Returned Individual Survey Questionnaires

There were 22 institutions and groups surveyed, including Huiyang District People's Government, Management Committee of Huizhou Daya Bay Economic and Technological Development Zone, Administration for City Appearance and Environmental Sanitation of Huiyang District in Huizhou City, Huiyang Jinju Municipal Natural Reserve Management Office, Management Committee of Huiyang Economic Development Zone in Huizhou City, Guangdong Province, Huiyang Branch of Huizhou Bureau of Land and Resources, Land and Resources Office of Huiyang Economic Development Zone under Huiyang Bureau of Land and Resources, Huiyang Water Authority in Huizhou City, Huiyang Bureau of Forestry, Huiyang Bureau of Agriculture, Villagers' Committee of Tiantou Village in Shatian Town, People's Government of Shatian Town in Huiyang District, Villagers' Committee of Sanhe Community in Huiyang Economic Development Zone, Villagers' Committee of Yangna Village in Huiyang District, Villagers' Committee of Guwu Village in Huiyang District, Villagers' Committee of Xiaowu Village, Lianhe Primary School in Shatian Town, Xiaowu Primary School, Qishan Holiday Resort Development Co., Ltd. in Huiyang District (Country Garden Shanhe City), Hantang Primary School in Danshui Town, Huiyang District, Huiyang Branch of Huizhou Administration and Law Enforcement Bureau of Urban Management, and Villagers' Committee of Shiwei Village in Sanhe Community.

(3) Method of Survey

Group survey was conducted through dispensing survey letter.; individual survey was carried out through dispensing written questionnaires and face-to-face communication. All kinds of survey were recorded with real names.

(4) Subject of Survey

The subjects of survey include relevant groups, villagers, representatives of residents, village cadres, and immigrants who had worked in the place for more than half a year.

(5) Content of Survey

Degree of the public's understanding with the project, their opinions on project construction, and issues that they most concern about; the subjects of survey were required to write down their opinions. For the detailed content of survey, please refer to the attached questionnaire.

6.3 Implementation of Public Participation in Survey

6.3.1 Phase I: Announcement of Information on Environmental Evaluation

Information on Phase I environmental evaluation was published on the website of Administration for City Appearance and Environmental Sanitation of Huiyang District (http://hwj.huiyang.gov.cn) within 7 days after the construction unit's entrustment was accepted. The content included project name, construction unit, construction scale & nature, name and contact information of environmental evaluation agency as well as matters, form and time of public participation. In addition, the construction unit announced project information by posting in the neighboring area of the project that were influenced by the project, and notified ways to feedback opinion to the public. For Phase I announcement at the website and announcement posted in neighboring area influenced by the project, please refer to Fig. 6.3-1 to 6.3-3.

Information on Phase I environmental evaluation was announced starting from March 28, 2013. The duration of announcement was not less than 10 working days.

6.3.2 Phase II: Announcement and Public Participation in Survey

(1) Stage 1: Announcement of Abridged Stage 2 Information and Report

The initial conclusion of evaluation on the project's environmental impact and other relevant information were published on the website of Administration for City Appearance and Environmental Sanitation of Huiyang District (http://hwj.huiyang.gov.cn) and New Huiyang Daily (May 24, 2013) starting from May 22, 2013. The link of abridged report that can be downloaded was offered on the website. The public can express their opinions via E-mail or letter. Meanwhile, the construction unit announced the evaluation result of environmental impact by posting in the neighboring areas affected by the project, and publicized channels of access to abridged report and ways of opinion feedback to the public. In addition, the construction unit announced project information by posting in the neighboring area of the project that were influenced by the project, and notified ways to feedback to the public.

For Phase II announcement on the website, newspaper and announcement posted in neighboring area influenced by the project, please refer to Fig. 6.3-4 to 6.3-8. The announcement of information on Phase II environmental evaluation will run through the whole process of public participation in survey. The information announced on the website and the link to the abridged report will be maintained until official reply to the report is made.

(2) Stage 2: Public Participation in Questionnaire Survey

From May 22, 2013 to July 2013, the construction unit carried out public participation survey on residents living in the neighborhood of the project site, residents living along the waste collection & transportation route and institutions in the neighborhood of the project, The nearest village is lanzilong, which is 340m far away; and the varying impact of the environment are assessed in this report and the result is showed to the public.

进场道路不经过自然村，距离最近的黄沙村有 300 多米，该进场道路将另案环评。introduced to them the project overview, possible environmental impact, regular protective actions and relevant policies., and informed the access to the abridged report.

(3) Stage 3: Return Visit for Public Participation

During August 1, 2013 to August 9, 2013, the construction unit organized return visit to those who held opposition in Phase 2 questionnaires, carefully collected their opinions and suggestions on the project, further explained the issues they worried about, made them better understand project construction through face-to-face communication, explanation and answering questions, and paid additional return visit to them to understand their attitudes, requirements and suggestions. The visit was done by making phone call and filling in return visit questionnaires. The whole process of return visit on phone was recorded by telephone recorder, for the purpose of knowing their final attitude towards the project.

Fig.6.3-1 First Announcement on Website

惠州市惠阳区榄子垅垃圾综合处理项目生活垃圾焚烧发电项目环境影响评价公众参与信息公示

（第1次）

根据《中华人民共和国可再生能源法》、《国务院批转国家经贸委等部门关于进一步开展资源综合利用意见的通知》、《可再生能源发电有关管理规定》、《当前国家重点鼓励发展的产业、产品和技术目录》等有关法规，生活垃圾集中焚烧处理发电是我国生活垃圾处理的基本方式之一，能够大量减少废物量，回收能源，是一种比较彻底的生活垃圾填埋处理更科学的方式，是国家重点鼓励发展的产业。惠州市惠阳区榄子垅垃圾综合处理项目生活垃圾焚烧发电项目的建设将严格按照国家及地方的环保法律、法规和排放标准执行，采用先进的环保治理技术和措施把污染减少到最低。

依据《环境影响评价公众参与暂行办法》（环发2006[28]号）以及《广东省建设项目环保管理公众参与管理办法》（粤环[2007]99号）的要求，对惠州市惠阳区榄子垅垃圾综合处理项目生活垃圾焚烧发电项目环境影响评价进行信息公示，以便了解社会公众对本项目的态度及本项目环境保护方面的意见和建议，接受公众的监督。

一、项目的名称及概要

项目名称：惠州市惠阳区榄子垅垃圾综合处理项目生活垃圾焚烧发电项目

建设单位：惠州绿色动力环保有限公司

建设规模：处理生活垃圾1200吨/日，年垃圾处理能力达到43.8万吨/年；

炉机配置：拟两台冷凝式汽轮发电机组（1×15MW+1×9MW），垃圾焚烧炉采用三组运炉焚烧炉；

拟建地点：惠州市惠阳区沙田镇榄子垅。

二、环境影响评价工作程序和主要工作内容

工作程序：启动环评工作（项目资料、社会经济、环境等资料收集分析），环境现状调查与监测，环境影响评价报告书编写，公众调查，报告书内部审核修改，专家评审，报告书修改报批。

主要工作内容：环境资料和气象水文资料收集以及监测调查，监测结果等资料分析，工程分析，模型预测计算与环境影响评价，报告书编写等。

报告书主要编制内容包括但不限于：1、总论；2、项目概况与工程分析；3、评价区域环境质量现状调查与评价；4、环境影响预测分析；5、环境风险评价；6、环境合理合法性分析；7、清洁生产及总量控制分析；8、公众参与分析；9、环境保护措施可行性论证；10、环境管理和监测制度；11、评价结论等。

三、征求公众建议和意见的范围和主要事项

关注本项目和周边环境影响区域内的居民、单位等公众，可针对目前该项目选址周边环境质量现状、对该项目的了解、带来的环境影响的可接受程度、该项目采取的环保措施以及其它方面提出合理化建议和要求。

四、公众意见反馈方式

采用通信及电话联系等方式进行。

即日起10个工作日内（信函以邮戳日期为准），公众可采取向公示指定地址发送信函、传真、电子邮件等方式，发表对项目及环评工作的意见和看法，发表意见的同时请提供详细的联系方式，环境影响评价单位将在本项目《环境影响报告书》中真实记录公众的意见和建议，并将公众的宝贵意见、建议向建设单位、设计单位和政府环保部门反映。

五、建设单位名称及联系方式

建设单位：惠州绿色动力环保有限公司，地址：惠州市惠阳区淡水白云二路惠阳世贸广场1号楼1004号房；

联系人：[illegible]，电话：0752-3266518；E-mail：ldhuiyang@sina.cn

六、环境影响评价单位名称及联系方式

评价单位：环境保护部华南环境科学研究所，地址：广州市天河区员村西街七号大院，邮编：510655；

联系人：赵工，联系电话：020-85533223，E-mail：huanjingpr@163.com

惠州绿色动力环保有限公司

环境保护部华南环境科学研究所

2013年3月28日

Fig.6.3-2 First Announcement on Website

 Danshui Community	 Changlonggang
 Lanzilong Village	 Management Committee of Huiyang Sanhe Economic Development Zone
 Shatian Hospital	 Shatian People's Government
	

Shangcun Village in Shatian Town	Shiwei Village
	
Tiantou Village in Shatian Town	Xiaowu Village in Shatian Town
	
Xiaowu Primary School	Yangna Village

Fig. 6.3-3 Pictures of First Announcement in Environmentally Sensitive Areas

惠州市惠阳区榄子垅垃圾综合处理项目
生活垃圾焚烧发电项目环境影响评价
公众参与信息公示

为解决惠阳区和大亚湾经济开发区的生活垃圾处理问题，惠阳区政府拟选址于惠州市惠阳区榄子垅建设惠州市惠阳区榄子垅垃圾综合处理项目生活垃圾焚烧发电项目。本项目设计规模为1200吨/日，建设3台400吨/日的机械炉排焚烧炉，配置两台(1*15MW+1*9MW)汽轮发电机组，同时配套烟气净化系统、渗滤液处理系统等环保工程。项目采用焚烧发电方式对惠阳区全区及大亚湾经济开发区内的生活垃圾进行处置，项目总投资5.98亿元，其中环保投资约为…62亿元，约占总投资的10%。项目采用BOT…，由惠州绿色动力环保有限公司负责建设…目已委托环境保护部华南环境科学研究所承担环境影响评价工作，目前环评报告书已基本编制完毕，现依据有关要求进行项目环境影响评价公众参与第二次信息公示。环境影响报告书简本与意见反馈方式请登录惠阳区市容环境卫生管理局网站(http://hwj.huiyang.gov.cn)查阅，反馈意见收集单位为建设单位和环评单位。公示期从2013年5月24日起，不少于10个工作日。

建设单位联系方式：邓工，电话：0752-3266517，邮箱：dengzhg1973@yahoo.com.cn，地址：惠州市惠阳区淡水白云二路惠阳世贸广场1号楼1004号房。

环评单位联系方式：黄工，电话：020-85550966，邮箱：huangmgp@163.com，地址：广州市员村西街7号大院。

Fig. 6.3-4 Stage 2 Information Announcement in Newspaper

Fig.6.3-5 Stage 2 Announcement on Website

Fig.6.3-6 Stage 2 Announcement on Website

Fig.6.3-7 Stage 2 Announcement of Abridged Report on Website

Country Garden Shanhe City


Changlonggang

Guwu Village


Huiyang People’s Government

Jinju Village

Lanzilong Village


Lianhe Primary School


Daya Bay Development Zone


Xiaowu Village


Xiaowu Primary School

Tiantou Village


Yangna Village

Fig. 6.3-8 Pictures of Stage 2 Announcement in Environmentally Sensitive Areas

6.3.3 Other Publicity and Communication Work at the Stage of Public Participation

In addition to the above Phase I and Phase II public participation in survey, the construction unit carried out other publicity and communication work including convening symposium and enhancing communication with the masses during April 2013 to August 2013. For details about work carried out, please refer to Table 6.3-1. In order to address the people's concern and advertise the environmental knowledge, on April 3rd in 2013, the "huiyang environmental park WTE project introduction conference" is held by the construction unit in the international hotel on huiyang street, 2 waste treatment experts are invited to this meeting. The content of the meeting is published on the local newspapers.

Table 6.3-1 Implementation of Other Publicity Work at the Stage of Public Participation

Implementation Stage	Duration of Implementation	Content and Mode of Implementation	Implemented by	Compliance with related requirements

Other Work	From April to August, 2013	The construction unit employed two domestic waste treatment experts to convene Conference for Introduction to Waste Treatment Project in Huiyang District Environmental Park in Homeland International Hotel in the afternoon of April 3, 2013.	Construction unit	Through symposium, publicizing knowledge about environmental protection and visit to waste treatment projects, eliminate the worries of some people and make them realize the significance of the project.
		Meanwhile, the construction unit compiled, printed and distributed 10000 publicity booklets named Knowledge about Lanzilong Environmental Park.	Construction unit	
		Compiled and posted 500 project publicity posters in the surrounding area of the project.	Construction unit	
		Opened the column "Huiyang Environmental Park" on the website of Huiyang Environmental Sanitation Bureau.	Construction unit	
		Opened the publicity column "Beautiful Huiyang is My Hometown • Knowledge about Huiyang Environmental Park" at Huiyang Radio Station and New Huiyang. Huiyang Radio Station has broadcasted the column for 18 times by July 1.	Construction unit	
		Additionally, New Huiyang has published relevant scientific knowledge on the website of Today's Huiyang.	Construction unit	
		Cooperated with Huizhou TV Station to finish publicity film of the project.		
		Organized representatives of villagers in the surrounding area of the project and reporters to visit Hangzhou Tianziling Waste Landfill-Haining Waste Incineration Power Generation Plant, Shanxi Datong Waste Incineration Power Generation Plant and other waste treatment projects. Three groups of people (more than 140 people in all) have participated in the visit.	Huiyang People's Government and construction unit	

The construction unit has made the public aware of project overview, pollution-related issues resulted during construction period and operation period as well as corresponding environmental protection policies and measures by means of posted announcement, online announcement, announcement in newspaper, field interview and questionnaires. Meanwhile, the public's attitude towards the project as well as their requirements for and suggestions on the project were collected. The construction unit has, in the form of interaction, fully honored the public's right to know, speak and supervise the project, become informed of their requirements for project construction, and fed back their requirements to the competent administrative authority, construction preparation unit, construction unit and design agency for possible adoption or proper settlement at the time of design, construction and operation, so as to minimize the possible impact resulted by the project and improve the social benefit and environmental benefit of the project.

6.4 Statistics and Analysis of Survey Result

6.4.1 Statistics of E-mail, Phone Call and Other Feedback Information and Opinions

During the survey on the public opinions, the construction unit received 130 E-mails, about 60 phone calls (50 during the first announcement and 10 during the second announcement) and 2 paper documents from the residents (the paper documents were affixed with signatures and fingerprints of the residents living in the surrounding area and expressed opposition to project construction). The residents giving opinions via E-mail, phone call and other means are mainly those living in Country Garden Shanhe City, Shiwei Village, Tiantou Village and Xiaowu Village. Their appeals were collected and summarized as follows:

1. There are lots of large-scale residential quarters in the surrounding area of the project (Country Garden, Zhenye City, CITIC New Town, Landscape Shire and Henghe Garden.), which is endowed with a favorable environment that has attracted a lot of residents from Shenzhen and other places. In addition, there are multiple primary schools and middle schools (Chongya Middle School, Nankai Primary School, Shatian Middle School and Shatian Primary School) as well as three drinking water reservoirs in the area, of which the water supply from Jixinshi Reservoir and Shatian Reservoir accounts for 60% of the fresh water supplied to the downtown area. In view of the aforesaid situation, the project should not be located in Lanzilong. It was suggested that the project location should be changed.

Reply from the construction unit: The opinions were not accepted for the time being. The comprehensive waste treatment project in Lanzilong Village, Huiyang District, Huizhou City—Municipal Solid Waste-to-Energy Project is located in a open space to the north of Lanzilong, Shatian Town, Huiyang District, over 300 meters away from the nearest residential quarter. According to the "12th Five-year Plan" of Huizhou City for Environmental Protection and Ecological Restoration, the main tasks of environmental protection and ecological restoration during the "12th Five-year Plan" are as follows: construct facilities for hazard-free treatment of municipal solid waste, maintain long-term and large-scale processing capacity for the hazard-free waste treatment bases in Huicheng District and Huiyang District; Quicken the construction of hazard-free waste treatment plants in Huiyang District, Boluo County and Longmen County; and Raise the hazard-free treatment rate of municipal solid waste in all towns in the city to 90%.

During the phase of project site selection, Huiyang Environmental Sanitation Bureau worked with planning, environmental protection, design, state land and geological departments to carry out project site selection according to relevant regulations.

However, as most of the places in the jurisdiction have been planned or constructed, it was deemed after multiple discussion that the selection of Lanzilong in Shatian Town as project location is fairly reasonable; the project design and location also conform to relevant requirements of Technical Specifications for Municipal Solid Waste Incineration Treatment Projects (CJJ 90-2009) and Document [2008] No.82 that was jointly issued by State Environmental Protection Administration and National Development and Reform Commission: Notice on Enhancement of Evaluation Management of Environmental Impact by Biomass Power Generation Projects.

As for environmentally sensitive areas in the surrounding area, they have been specifically considered in the report and have not been found to have any conflict with the promulgated laws and regulations. The project site selection conforms to the requirements of relevant laws and regulations. The prediction and analysis of environmental impact show that the impact on the surrounding environment that is resulted by the project after its completion is not considerable; the project can reach the standards for environmental and air quality; as the project discharges no wastewater in normal situation, it imposes no impact on the surrounding water environment.

2. Developed countries have stopped the construction of incineration power generation plants one after another. Why we still dispose municipal solid waste by means of incineration power generation?

Reply from construction unit: the suggestion is not accepted for the time being. Waste incineration has been a fairly common and acceptable waste treatment in the world. Thousands of waste incineration plants across the world have been completed and put into use. The residents' opinions—"Developed countries have stopped the construction of incineration power generation plants one after another" is not true, for developed countries still adopt the mode of waste incineration power generation as the major mode of waste disposal. However, as technology is becoming increasingly mature and the capacity of waste incineration power generation is growing continuously, many developed countries have shut down small-scale waste treatment plants with backward equipment and constructed large-scale waste incineration power generation plants. The total capacity has not been decreased substantially. Additionally, due to constant economic development, more information technology in everyday life and waste classification is being practiced, thus waste volume becomes less. That is why some developed countries adjust the scale of waste incineration power generation according to the changes in waste volume.

At present, the landfill method at the cost of consuming land resources cannot fulfill the constantly growing demand for municipal solid waste treatment. To bring limited land resources into full play and promote rapid economic development in Huiyang region, it is necessary to dispose of municipal solid waste by applying techniques featuring small land occupation and considerable reduction in waste volume, so as to settle the increasingly evident problem concerning pollution by municipal solid waste that is caused by urban development. Treatment of municipal solid waste through incineration power generation can meet the technical requirements for small land occupation and considerable reduction in waste volume. Therefore, it is proper that the project disposes of municipal solid waste by adopting incineration power generation techniques.

3. Build-operate-transfer (BOT) construction is adopted in the project, which is not helpful to later operation management of the project, so construction of the project is opposed.

Reply from construction unit: the suggestion is not accepted for the time being. BOT mode is a mature commercial mode that has been generally adopted by domestic civil environmental-protection infrastructure. BOT agreement for the project has definite requirements on project construction and operation with high-standard construction, high-standard discharge and operation in line with strict requirements. The government will establish supervision office for comprehensive waste treatment projects to intensify the supervision on project operation. The project investor selected by the government through public bidding—Dynagreen Environmental Protection Group Co., Ltd. is a large-scale state-owned enterprise which is specialized in recycling economy and renewable resource industry. Adhering to the values of “Social benefit goes first; economic benefit is foremost” and the corporate mission of “Benefit the society and serve the government”, Dynagreen is willing to assume the social responsibility of improving Chinese ecological environment together with various social circles, so as to jointly create a beautiful living environment.

4. Project operation will generate dioxin, malodor and other environmental pollutants, which will affect the health of the residents living in the surrounding area, so construction of the project is opposed.

5. Waste incineration project will result in secondary pollution, and the toxic gases resulting from the project cannot be completely degraded and will impose impact on the surrounding environment and people’s health.

Reply from construction unit about the above Opinion 4 and 5: the opinion is not accepted for the time being. The following environmental protection measures will be adopted during the operation period of the project:

(I) Treatment of malodor: waste transportation vehicles with good air-proof performance are used and then washed after unloading waste. Specific malodor control measures are taken in the factory to control various technical processes that generate malodor, including negative-pressure enclosed collection of malodorous gas by waste storage pits, conveyance of malodorous gas to incinerator for pyrolysis, and setup of malodor eliminating system and other auxiliary malodor removing facilities.

(II) Disposal of flue gas: to ensure the exhaust gas resulted from waste incineration power generation plant reaches the discharge standard, the flue gas purifying system is designed with the process of “SNCR intra-incinerator denitrogenation＋half-dry deacidification＋dry lime spraying＋activated carbon adsorption＋bag-type dust removal”. Device for continuous monitoring of concentration of discharged pollutants is set up in the flue, and the results are displayed to the public through a large electronic screen installed in the environmental park. The height of exhaust chimney is 80 meters. The treated flue gas that reaches the discharge standard will be emitted.

(III) Disposal of wastewater: waste leachate and other wastewater are completely collected and conveyed to the supporting wastewater treatment system in the factory, and then completely reused after it reaches the standard for recycled water reutilization, rather than being discharged to the outside. Waste storage pit, leachate collection pool, adjusting pool and other wastewater storage and treatment facilities are treated with strict antiseptic and antiseep measures, so as to avoid the pollution of underground water by leakage of waste leachate.

(IV) Disposal of solid waste: slag resulted from the project will be utilized in the factory. 1% metal will be separated and 10% cement and 0.1% additive will be added to make brick which will be sold.

Fly ash will undergo stabilization treatment in solidification workshop in the factory, will be stacked at the temporary fly ash storage yard built in the factory after the disposed fly ash reaches Pollution Control Standard for Landfill of Municipal Solid Waste (GB16899-2008), and then be conveyed regularly by special truck to the specific area in hygienic municipal solid waste landfill for final treatment.

(V) Noise control: low-noise equipment is chosen; measures for damping, sound insulation and noise elimination are adopted.

(VI) Risk control measures: set up online flue gas monitoring system; take measures to close, examine and repair incinerator when abnormal or nonstandard discharge of flue gas is found, so as to avoid accident-inducing discharge; strengthen antiseptic and antiseep measures for waste storage pit, for the purpose of avoiding pollution accident caused by waste leachate.

The construction unit commits that during the design, construction and operation of this project, it will seriously implement various environmental protection measures that were set forth in the environmental evaluation report, and introduce such measures as employing representative of villagers to stay in the factory for supervision on the premise that management in operation period is enhanced, with the aim of intensifying the residents' confidence in the project and seeking for their understanding of the project through taking practical actions.

In addition, according to the forecast and conclusion about the influence on atmospheric environment as set forth in the environmental evaluation report, the project will impose minor influence on the major environmentally sensitive areas in the surrounding area on the condition of normal discharge and will meet the requirements of environmental quality standard. It is necessary to enhance project management during production process, so as to ensure normal operation of flue gas purifying system and resolutely avoid pollution accident. Contingency plan should be implemented in case of accident. Additionally, the factory area is equipped with malodor removing system which can dispose H_2S and other odor that are produced by fermentation of waste in the waste storage pit, for the purpose of keeping the concentration of malodor in the factory area below the standard limited value. The distance for environmental sanitation protection (distance from the boundary) of the project is determined as 300 meters after calculation, which meets the requirements on Waste-to-Energy Projects as stated in Document H.F.[2008] No.82.

6.4.2 Symposium and Project Introduction Conference

In order to carry out favorable communication with the public, eliminate their worries, and popularize environmental knowledge, the construction unit employed two waste treatment experts to convene Conference for Introduction to Waste Treatment Project in Huiyang District Environmental Park in Homeland International Hotel on the afternoon of April 3, 2013.

Meanwhile, the construction unit compiled, printed and distributed 10000 publicity booklets named Knowledge about Lanzilong Environmental Park, compiled and posted 500 project publicity posters in the surrounding area of the project, opened the column "Huiyang Environmental Park" on the website of Huiyang Environmental Sanitation Bureau, opened the publicity column "Beautiful Huiyang is My Hometown • Knowledge about Huiyang Environmental Park" at Huiyang Radio Station and New Huiyang. Huiyang Radio Station has broadcasted the column for 18 issues by July 1. Additionally, New Huiyang has published relevant scientific knowledge on the website of Today's Huiyang.

The symposium, publicity of knowledge about environmental protection and visit to waste treatment projects have removed the worries of some people and make them realize construction significance of the project. Villagers living in the surrounding area of the project, residents of Country Garden Shanhe City and relevant representatives were invited to the conference. For conference sign-in form, pictures of conference scene and introduction to the conference, please refer to Figure 6.4-1 to 6.4-3.

惠阳区环境园垃圾处理项目情况介绍会签到表

2013.4.3

序号	姓名/网名	工作单位/家庭住址	联系电话	备注

Fig. 6.4-1 Conference Sign-in Form

橄子垅环境园将引入第三方全程监管

尾气排放达欧盟标准

新惠阳讯（今日惠阳网记者 周建妮许文昌）一直以来，我区位于沙田镇的橄子垅环境园垃圾处理项目的建设备受社会各界关注。4月3日，区环卫局召开橄子垅环境园垃圾处理项目情况介绍会，邀请了国内专家、人大代表，政协委员、项目周边村民、经济开发区碧桂园山河城小区住户等出席会议，现场解答与会代表的疑问。

会上，与会代表对橄子垅环境园的选址、工艺、监管等提出疑问。有关专家和区环卫局领导回应称，环境园的焚烧发电厂项目焚烧工艺是最成熟的炉排炉技术，烟气处理后排放达到欧盟标准。我区还将聘请第三方监管机构，对项目建设、运行情况进行现场跟踪监管，确保环境园按照有关要求进行建设和运营。

【居民】

希望选址离家园远一点

环境园项目为何要选址在沙田镇橄子垅？符不符合国家有关要求？为何不选择离居民区更远的地方……介绍会一进入自由发言时间，与会代表纷纷举手要求发言，直奔居民关心的问题。

记者看到，不少要求发言的与会代表都准备了文字资料，提问时有根有据，显得非常专业。家住惠阳碧桂园的王先生第一个发言。他表示，居民并不反对建垃圾处理厂，只是希望选址能离家园远一点。

【专家】

二恶英排放量低，不会对周边环境产生损害

中国环境保护产业协会固废物专家何伟才说，橄子垅环境园焚烧发电厂采取最成熟的炉排炉技术，烟气净化系统采用半干式中和塔，利用活性炭吸附有毒气体，并用布袋除尘器将灰尘固化下来。处理后的废渣可以制作环保砖，用以市政设施建设。至于市民关心的二恶英气体问题，在焚烧发电时，通过控制炉内温度，使其达到850℃以上，让烟气停留时间超过2秒，充分燃烧混合烟气，二恶英会被活性炭吸附。尾气中确实还会存留微量的二恶英，但浓度是极低的，可达到欧盟标准，不会对周边环境产生损害。

区环卫局局长吴卫既补充说明道，从填埋、堆肥、焚烧的技术对比中，环境园项目选择了焚烧发电这种国家倡导、对环境最友好的处理方式，可以减少垃圾填埋量，提高土地空间利用率，符合惠阳人多地少的实际。

【政府】

橄子垅环境园选址符合相关要求

吴卫既说，橄子垅环境园是政府有关部门经慎重考虑并按建设要求选址的。选址根据环卫设施相关规范和设置标准进行，通过对比4个拟选场址——沙田镇水口村、沙田镇田头村橄子垅、淡水龙尾村红花山、惠阳经济开发区与永湖镇交界处，从场地技术条件、工程经济

条件等方面进行了对比，最终确定在沙田镇田头村榄子垅建设环境园。该选址同时也符合市、区相关规划、《惠州市环境卫生专项规划》和《生活垃圾焚烧处理工程项目建设标准》的要求。

与会代表提出，榄子垅环境园尚未立项，就已经进行招投标，开始筹建工作，是否违反了有关法律法规？另外，这是一个BOT项目，建成后由企业运营，而企业运营则需要挣钱，担心企业为了挣钱偷排污染物，从而影响周边居民的生活环境。

吴卫瓯答复道，榄子垅环境园征地工作已基本完成，项目公司已全面开展项目筹建工作，填埋项目可研申请报告和初步设计已经完成编制，施工设计正在进行，环评报告正在编制，焚烧项目正在进行可研报告和环评工作。项目建设都严格按照国家相关法规要求和《惠州市政府特许建设与特许经营管理办法》的规定进行，可以先通过公开招投标方式选定投资建设人，再进行项目筹建，程序上符合有关法律法规的要求。

吴卫瓯表示，环境园项目，我区将聘请第三方监管机构，同时安装环保在线监控系统，对项目建设、运行情况进行现场跟踪监管，确保项目按照有关要求进行建设和运营。在环境园内，将会对烟气排放指标进行实时监控，并通过电子大屏幕向社会公布，确保符合排放标准。

链接

2010年，我区开始筹建榄子垅环境园。根据规划，环境园园区内将建设垃圾填埋场、垃圾焚烧发电厂、生态水塘、农场等，集废弃物处理、技术科研、宣传教育于一体，总规划控制面积1506亩，投资总额约7.25亿元。项目首期建设垃圾填埋场、垃圾焚烧发电厂，其中垃圾填埋场计划今年10月建成，垃圾焚烧发电厂计划明年底建成。

目前，惠阳城区（淡水、秋长）每日产生垃圾量约500吨，加上其他乡镇的垃圾已经超过1000吨，年生活垃圾增长量不低于8%。现在仍在运行的龙尾坑垃圾填埋场已基本填满，若不新建垃圾处理场，我区将会陷于垃圾无处处理的境地，环境园建设势在必行。

《新惠阳》2013年4月9日1版

http://news.huiyang.gov.cn/digital/html/20130409/1/20130409-1-3.html

Fig. 6.4-2 Extract of Media's Reports on the Conference

Fig. 6.4-3 Pictures of the Conference Site

6.4.3 Statistics and Analysis of Group Questionnaire Survey Result

There were 22 group questionnaires that were dispensed in the survey. The villagers of Shiwei Village in Sanhe Town refused to accept interview after many times of communication. Therefore, 21 questionnaires were returned, with the return rate being 95%. The survey complies with relevant provisions of Interim Method for Public Participation in Environmental Impact Evaluation (H.F.[2006]No.28) and Notice on Printing and Distribution of Implementation Opinions of Guangdong Province on Public Participation in Environmental Management of Construction Project (Y.H.[2007]No.99). See the attachment for the content of questionnaires; see Fig.6.4-4 for the statistic result of group opinions; see Fig.6.4-5 for information on group survey and feedback opinions.

Analysis is as follows according to the statistic result given in Fig.6.4-6.

① According to the brief introduction given above, 90% of the interviewed groups know well about the project; 5% of them know a little bit about the project; 5% of them (1 group) did not give the answer. The survey result shows that the interviewed groups know about the project to a certain extent and can better express their opinions and suggestions on the project.

② 95% of the interviewed groups agree with the adoption of incineration mode in treatment of municipal solid waste, while 5% of them (1 group) does not agree.

③On the premise that the project is constructed with high standard, environmental protection actions are seriously implemented, and management in operation period is enhanced, 85% of the interviewed groups support the project site selection, 10% of them (2 groups) support the project site selection conditionally, and 5% of them (1 group) does not support the project site selection. Among the two groups that support the project site selection conditionally, one raised the supporting condition that the project must be constructed in line with national standard, while the other one did not raised any condition. The group opposing the project location is Qishan Holiday Resort Development Co., Ltd. in Huiyang District, Huizhou City (Country Garden Shanhe City), which considers that the project is too close to the residential area. The project team will pay return visit to the group in the next stage.

④ The environmental issues after project completion that the interviewed groups most concern about are as follows: air pollution, malodor, dioxin and wastewater pollution.

⑤ As for general attitude towards the project construction, 90% of the interviewed groups support the project construction, 5% of them (1 group) support the project construction conditionally (the group did not set forth the specific conditions to support), 5% of them (1 group) does not support the project construction. The group opposing the project site selection-- Qishan Holiday Resort Development Co., Ltd. in Huiyang District, Huizhou City (Country Garden Shanhe City) did not definitely give the reason for opposition. The project team will pay return visit to the group in the next stage. For details of statistic result of the group survey, please refer to Fig.6.4-4 and Fig 6.4-5.

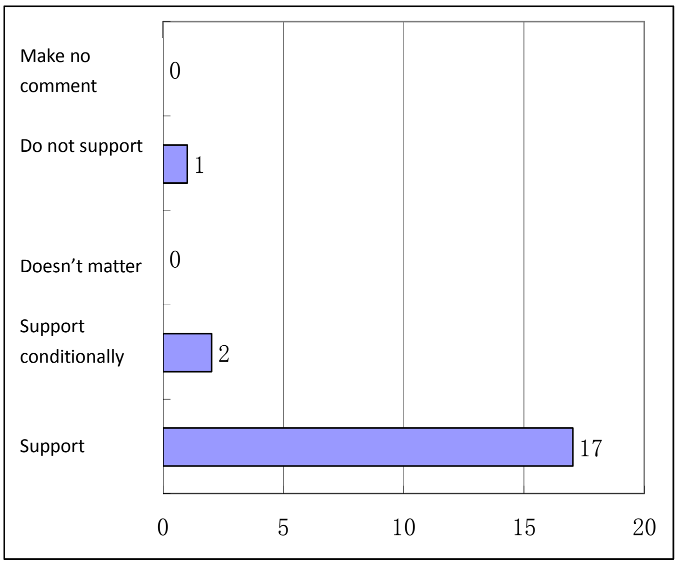


Fig. 6.4-4 Statistics of Surveyed Opinions on Project Site Selection

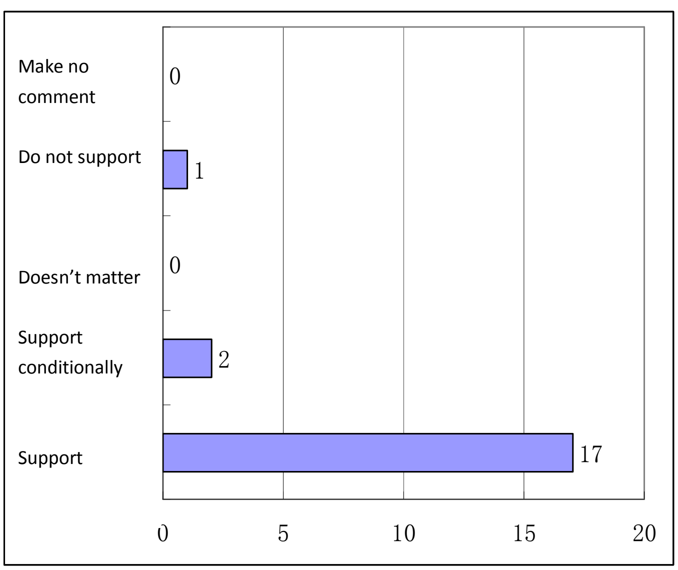


Fig. 6.4-5 Statistics of Surveyed Opinions on General Attitude Towards Project

Fig. 6.4-6 Statistics Form of Group Survey Result

Question	Option	Number of people	Percentage
1. Do you know something about this project via the brief introduction?	（1）Know well	19	90%
	（2）Know a little bit	1	5%
	（3）Do not know	0	0%
	Make no comment	1	5%
2. Do you agree upon disposal of municipal solid waste by incineration?	（1）Agree	20	95%
	（2）Disagree	1	5%
	（3）Do not know	0	0%
	Make no comment	0	0%
3. What's your opinion on the selection of the project location on the premise that the project is constructed with high standard, environmental protection actions are seriously implemented, and management in operation period is enhanced?	（1）Support	17	85%
	（2）Doesn't matter	2	10%
	（3）Support conditionally	0	0%
	（4）Do not support	1	5%
	Make no comment	0	0%
4. What's the environmental issue that you most concern about after this project is completed? (multiple-choice question)	（1）Malodor	8	--
	（2）Dioxin	7	--
	（3）Air pollution	15	--
	（4）Pollution by wastewater	5	--
	（5）Noise	1	--
	（6）Other	0	--
	Make no comment	0	--
5. What's your general attitude towards construction of the project?	（1）Support	19	90%
	（2）Doesn't matter	0	0%
	（3）Support conditionally	1	5%
	（4）Do not support	1	5%
	Make no comment	0	0%

.4-7 Information on Group Survey Subjects

ame of Unit	Address	Phone Number	Contact Person	Nature of Unit	Attitude Towards Project Site Selection	General Attitude Towards Project Construction	Opi
ople's Government	East Danshui Street, Huiyang District	3369999	Lv Zhi	Administrative department	Support	Support	
mittee of Huizhou Daya Bay nological Development Zone	Aotou, Daya Bay	5562718	Yang Guoguan	Administrative department	Support	Support	It is implemen strengther project is become a
r City Appearance and itation of Huiyang District,	14 East Shiyuan Street, Danshui Community	13502211456	Huang Huaqiang	Administrative department	Support	Support	
Municipal Natural Reserve e	24 East Tuhu Road, Danshui Community, Huiyang District	3398927	Liu Zhiqiang	Administrative department	Support	Support	
mittee of Huiyang Economic , Huizhou City, Guangdong	Second Ring Road in the development zone	13500189678	Zeng Zhipeng	Administrative department	Support	Support	
Huizhou Bureau of Land and	Building B, Huiyang Administrative Service Center	3369693	Xiang Zhishan	Administrative department	Support	Support	
rces Office of Huiyang ment Zone under Huiyang Resources	Second Ring Road in the development zone	13802864781	Zhou Liuqing	Unspecified	Support	Support	
hority, Huizhou City	49 No.1 Zhongshan Road, Danshui Community, Huiyang District	3368953	Zhang Yongxun	Administrative department	Support	Support	
Agriculture	24 East Shanghu Road, Danshui Community	3373528	Zhang Zuodao	Administrative department	Support	Support	
Agriculture	9 North Kaicheng Avenue, Danshui Community	3821992	He Jianbin	Administrative department	Support	Support	
ee of Tiantou Village, Shatian		13829999639	Zeng Zhaoxiong	Villagers' committee	Support conditionally	Support	
nt of Shatian Town, Huiyang ity	8 Xiangyang Road, Shatian Town	13829999829	Zhang Wenxin	Administrative department	Support	Support	
tee of Sanhe Community in	Residents' Committee Office	3500280	Xu Jinyun	Administrative	Support	Support	The air

ame of Unit	Address	Phone Number	Contact Person	Nature of Unit	Attitude Towards Project Site Selection	General Attitude Towards Project Construction	Opi
Development Zone, Huizhou rovince				department			maintaine
tee of Yangna Village in uizhou City	Maliuling, Yangna Village, Danshui Community	13500180055	Ye Zewen	Villagers' committee	Support	Support	
ttee of Guwu Village in uizhou City	Guwu Village, Danshui Community	13829999978	Cao Wei'ai	Villagers' committee	Support	Support	
ee of Xiaowu Village	Xiaowu Village	13502213366	Xiao Jianwei	Villagers' committee	Support	Support	
ool, Shatian Town	Lianhe Primary School, Tiantou Village	13622796222	Chen Xiuyan	Unspecified	Support on the condition that project construction complies with national standard	Support conditionally	
hool	Xiaowu Village, Shatian Town	13502578318	Xiao Weilian	Administrative department	Support	Support	
sort Development Co., Ltd. in uizhou City (Country Garden	Sanhe Economic Development Zone, Huiyang District, Huizhou City	18026526613	Lv Peng	Private enterprise	Do not support for the reason that the project is too close to residential quarters	Do not support	It is su importanc residents developm surroundi decision p
School, Danshui Town, uizhou City	Hantang Village, Maliuling	13680778696	Wu Jiansuo	Unspecified	Support	Support	
f Huizhou Bureau of Urban d Administrative Law	49 No.2 Baiyun Road, Danshui Community, Huiyang District	3836909	——	Administrative department	Support	Support	

6.4.4 Statistics and Analysis of Individual Questionnaire Survey Result

The scheme for the public survey (hereinafter referred to as “the Scheme”) was formulated in accordance with relevant provisions of the promulgated Interim Method for Public Participation in Environmental Impact Evaluation (H.F.[2006]No.28) and Notice on Printing and Distribution of Implementation Opinions of Guangdong Province on Public Participation in Environmental Management of Construction Project (Y.H.[2007]No.99).

The number of individual survey questionnaires for the residents living in the surrounding areas of the project was determined according to such factors as proportion of population and distance from the project. As the residents paid fairly close attention to the project (especially the residents of Country Garden Shanhe City), they took the initiative to duplicate and fill in additional questionnaires and submitted them to the project team by mail. Therefore, the project team accepted the additional questionnaires submitted by the residents according to the actual situation and collected statistical data respectively on the questionnaires determined in the Scheme and those filled in by the residents spontaneously.

6.4.4.1 Result of Individual Survey on Residents Living in the Surrounding Area of the Project as Determined in the Scheme

(1) Basic Information on the Interviewed Residents

A total of 490 questionnaires were dispensed to the residents living in the surrounding area of the project, of which 484 effective ones were returned, with the return rate being 99%. Meanwhile, record was kept on the interviewed residents’ name, sex, age, educational background, occupation, phone number and domicile. For the design of individual survey questionnaires and basic information on the interviewed residents, please refer to Attachment 5. For the statistics of basic information, please refer to Fig.6.4-8.

Fig.6.4-8 Statistics of Basic Information on Individual Survey (Survey on Residents Living in the Surrounding Area of the Project)，Surrounded on three sides by mountains, the site faces the Danshui river with a distance of about 300 meters, and about 500 meters away from village and adjacent to a detention house, basically no farmland in nearby regions.

Item	Option	Number	Proportion	Item	Option	Number	Proportion
Occupation	Office Personnel (Including	87	18%	Sex	Male	315	65%

	Teachers)						
	Personnel of Villagers' Committee and Cadres	28	6%				
	Technical Worker	33	7%				
	Farmer	208	43%				
	Other	84	17%		Female	169	35%
	Unspecified	43	9%				
	Within 1 Year	8	2%		Junior High School	190	39%
	Within 3 Years	7	1%		Undergraduate/Junior College	121	25%
Duration of Residence in the Place	Locals	304	63%	Educational Background	Above Undergraduate	8	2%
	Permanent Residents (at least 5 years)	124	26%		Senior High School	79	16%
	Other	3	1%		Primary School and Below	33	7%
	Unspecified	38	8%		Unspecified	53	11%

Fig.6.4-8 shows that the proportion of men in the survey is far higher than that of women. In addition, as the scope of influence resulted by the project is mainly the surrounding villages, a majority of the interviewed subjects are locals and permanent residents who concern about local construction and environmental alteration, which helps to reflect local residents' real intention in the survey.

(2) Statistics and Analysis of Survey Result of the Public opinions

For the statistic result of the survey on surrounding residents' opinions, please refer to Fig.6.4-9.

Analysis is as follows according to the statistic result given in Fig.6.4-9.

① As for the changes in population of the area, 62% of the interviewed residents believed that the population had grown, 9% of them believed that the population had declined, 5% believed that there were no changes in the population, 23% had no ideas, and 1% did not make the option. As for the economic changes in the area in the last two years, 70% of the residents held that there was a growth in the economy, 4% considered that the economy had stepped back, 3% believed that there were no changes, 22% had no ideas, and 1% did not make the option. The above survey results indicated that most of the residents deemed that both the population and economy in the area had grown, which is also the truth.

② After the aforesaid brief introduction, 26% of the interviewed residents said that they knew well about the project, 51% knew a little bit, 21% had no ideas, and 2% did not make the option. The survey result showed that more than a half of the interviewed residents know about the project to a certain degree. They can better express opinions and suggestions about the project. However, some of them still had no ideas about the project. It is suggested that the construction unit should strengthen the publicity, so as to reduce the residents' doubts and worries caused by incomprehension.

③ 44% of the interviewed residents believed that construction of the project would improve the surrounding living and hygienic environment, 14% believed that it would make their living quality decline, 3% held that there would be no influence, 32% still had no ideas, and 7% did not make the option.

④ Among all interviewed residents, 61% supported treatment of municipal solid waste through incineration, 14% did not support the treatment mode, 24% did not know about it (doesn't matter), and 1% did not make the option.

⑤ The environmental issues after project completion that the interviewed residents most concern about are as follows (in order): air pollution, dioxin, malodor, wastewater pollution, noise and other influence. 6 interviewed residents did not make the option.

⑥ On the premise that the project is constructed with high standard, environmental protection actions are seriously implemented, and management in operation period is enhanced, 62% of the interviewed residents supported the project site selection, 13% did not support the project site selection, 24% did not concern about the issue, and 1% did not make the option. The survey result showed that more than a half of the interviewed residents support the project site selection, a small part of them did not support the selection, and the rest of them did not concern about the selection or did not make the option. This type of project is annoying to people, so it is understandable that they oppose the selection of the project location in the area where they live. In the next stage, the project team will pay return visit to the residents opposing the project site selection and further explain and enhance communication, so as to seek for the residents' support as much as possible.

⑦ 48% of the interviewed residents believed that construction of the project would promote economic and social development in the place where the project is located, 12% believed that it would hinder economic development, 2% held that it would not impose any influence, 28% still had no ideas, and 10% did not make the option.

Fig.6.4-9 Statistic Result of the Survey on Surrounding Residents' Opinions

Content	Option	Lanzilong	Shatian Town	Tiantou Village	Xiaowu Village	Yangna Village	Country Garden	Subto Interv Resi
Questionnaires		80	141	68	77	113	5	484
do you think has population in the e?	(1) Increased somewhat	59	118	39	56	23	5	300
	(2) Decreased somewhat	1	17	15	8	2	0	43
	(3) No change	4	3	13	6	0	0	26
	(4) Have no ideas	15	3	0	5	88	0	111
	(5) Make no comment	1	0	1	2	0	0	4
do you think has onomy in the area ne last two years?	(1) Grew	70	140	43	56	24	5	338
	(2) Stepped back	1	0	10	8	0	0	19
	(3) No change	1	0	11	2	1	0	15
	(4) Have no ideas	6	1	4	6	88	0	105
	(5) Make no comment	2	0	0	5	0	0	7
mething about the the above brief	(1) Know well	13	54	25	20	10	5	127
	(2) Know a little bit	60	86	38	46	15	0	245
	(3) Have no ideas	4	1	5	7	86	0	103
	(4) Make no comment	3	0	0	4	2	0	9
ether construction improve the living d you?	(1) Yes, it will improve the living and hygienic environment of the surrounding area.	40	103	22	31	17	0	213
	(2) No, it will make the living quality decline.	11	7	28	17	0	5	68
	(3) No influence	2	11	0	1	0	0	14
	(4) Have no ideas yet	14	15	13	18	96	0	156
	(5) Make no comment	13	5	5	10	0	0	33
ort treatment of waste through	(1) Support	64	131	31	41	30	0	297
	(2) Do not support	0	7	33	22	0	5	67
	(3) Have no ideas, doesn't matter	14	3	4	12	83	0	116
	(4) Make no comment	2	0	0	2	0	0	4
vironmental issue about after this completed? uestion)	(1) Malodor	71	50	36	34	51	4	246
	(2) Dioxin	79	98	52	71	9	5	314
	(3) Air pollution	74	119	53	74	20	5	345
	(4) Wastewater pollution	68	49	27	25	66	4	239

Content	Option	Lanzilong	Shatian Town	Tiantou Village	Xiaowu Village	Yangna Village	Country Garden	Subto Interv Resi
	(5) Noise	2	11	7	3	6	0	29
	(6) Other	0	7	0	1	1	0	9
	(7) Make no comment	0	1	2	3	0	0	6
nion on the project e premise that the ucted with high mental protection sly implemented, n operation period	(1) Support	68	133	29	45	25	0	300
	(2) Do not support	1	5	33	18	0	5	62
	(3) Doesn't matter	11	3	5	9	87	0	115
	(4) Make no comment	0	0	1	5	1	0	7
nether construction promote economic oment in the area s located?	(1) Yes, it will improve the economic and social development in the surrounding area.	41	104	25	40	24	0	234
	(2) No, it will hinder the economic and social development.	8	4	25	14	0	5	56
	(3) No influence	2	3	1	3	0	0	9
	(4) Have no ideas yet	7	17	12	11	89	0	136
	(5) Make no comment	22	13	5	9	0	0	49
general attitude on of the project?	(1) Support	54	120	13	26	25	0	238
	(2) Doesn't matter	0	2	4	13	87	0	106
	(3) Support conditionally	26	15	19	17	1	0	78
	(4) Do not support	0	4	31	16	0	5	56
	(5) Make no comment	0	0	1	5	0	0	6
ture of the house	(1) Self-owned	78	101	60	53	111	5	408
	(2) Leased	0	7	1	1	0	0	9
	(3) Other	0	29	0	10	0	0	39
	(4) Short-term residence	0	1	0	2	0	0	3
	(5) Make no comment	2	3	7	11	2	0	25

⑧ As for the interview residents' general attitude towards project construction, 49% of them supported the construction, 22% did not concern about it, 16% supported the construction conditionally (see Fig.11.4-6 for the specific conditions to support), 12% did not support the construction (see Fig.6.4-10 for the reason for opposition), and 1% did not make the option. This type of project is annoying to people, so it is understandable that they oppose the selection of the project location in the area where they live. In the next stage, the project team will pay return visit to the residents opposing the project site selection and further explain and enhance communication, so as to seek for the residents' support as much as possible.

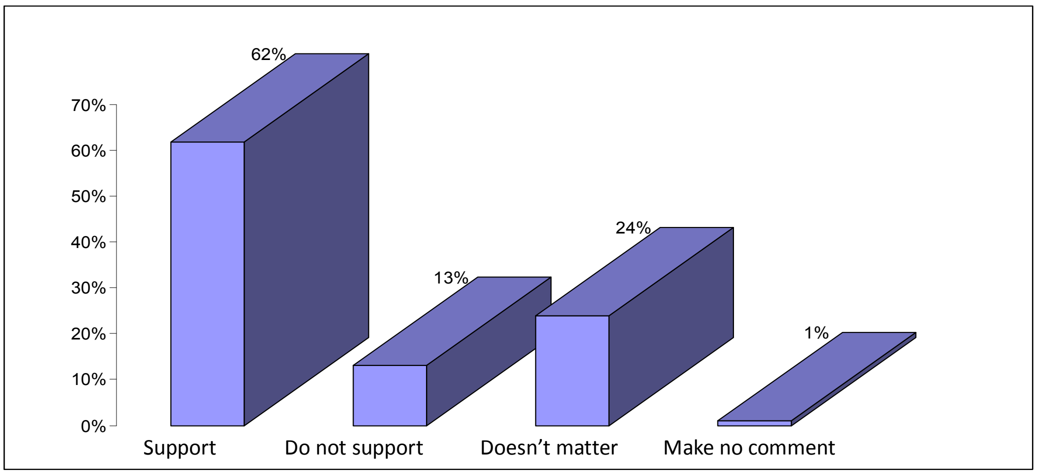


Fig.6.4-10 Statistics of Survey Opinions on the Surrounding Residents' Attitude towards Project Site Selection

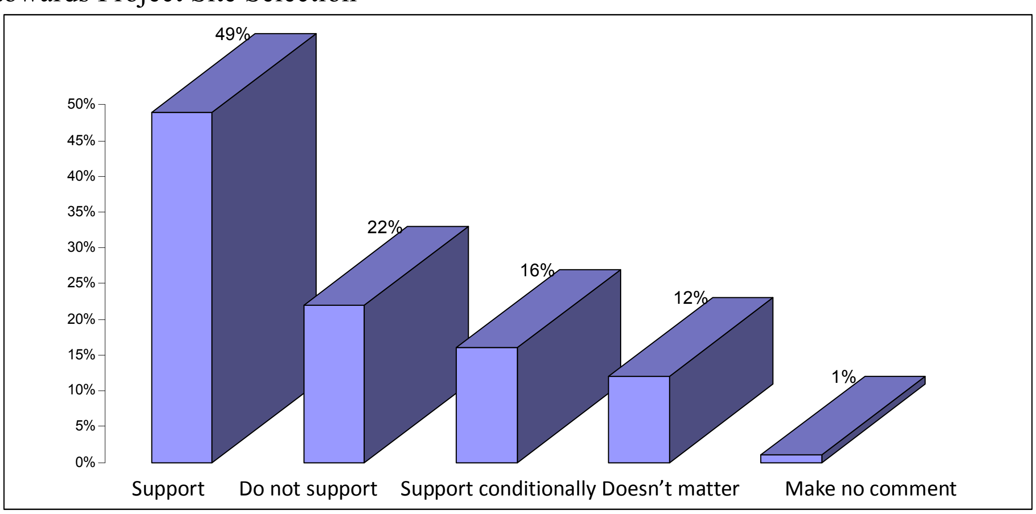


Fig. 6.4-10 Statistics of Survey Opinions on the Surrounding Residents' General Attitude towards Project Construction

⑨ Among the interviewed residents, 84% of them live in their own houses, 2% live in leased houses, 8% live in houses of other natures, 1% live in short-term residence, and 5% did not make the option. The survey result indicated that a majority of the interviewed residents are local permanent residents, which can genuinely reflect the local residents' real attitude towards project construction, so the survey samples are representative.

Fig. 6.4-11 Summarization of Conditions to support Raised by the Interviewed Residents Who Supported Project Construction Conditionally

No.	Conditions to Support	Number of Interviewed Residents	Accept or Not	Reply from Construction Unit
1	High-standard construction, supervision in line with strict requirements, no influence on people's life, no pollution, and promotion of economic growth, e.g. recycling and reutilization	1	Accept	It will implement the project in strict conformity with specifications, high standard and requirements of scientific environmental protection, seriously take various environmental protection measures during project construction and operation, and enhance operation management, so as to avoid the project's influence on the surrounding environment as much as possible.
2	Proper environmental protection and no adverse influence on surrounding environment and people's life	6	Accept	
3	Construction in line with national standard without destruction of the surrounding ecological environment as much as possible	1	Accept	
4	Creation of economic sources and improvement in villagers' life	2	Partially accept	It will strengthen the communication with surrounding residents during project operation, and accept the residents' requirements and opinions on the project in reasonable situation as much as possible, and try its best to seek the residents' opinions and suggestions for the project.
5	In line with Article III Standard for Environmental Protection Measures and Actions	1	Accept	It will implement the project in strict conformity with specifications, high standard and requirements of scientific environmental protection, seriously take various environmental protection measures during project construction and operation, and enhance operation management, so as to avoid the project's influence on the surrounding environment as much as possible.
6	Enhancement of operation	1	Accept	When seriously taking various environmental

	supervision			protection measures, it will enhance operation management, so as to avoid the project's influence on the surrounding environment as much as possible.
7	No hams or slight harms to people	1	Accept	It will seriously take various environmental protection measures. According to the environmental evaluation report, the project's influence on the surrounding environment is slight on the premise that various environmental protection measures are taken.
8	Hope that the waste gas and solid waste generated from the project after it is completed will not influence the surrounding people	1	Accept	
9	The villagers will carry out supervision and management; in case of damage to their interest or health, compensation will be claimed for.	4	Partially accept	Third-party supervision and social supervision will be performed on the project. Villagers will supervise the project as third-party supervisor.
10	Blank	60	--	--
Subtotal		78		

Fig. 6.4-12 Summarization of Opposing Causes of the Interviewed Residents Who Do not Support Project Construction

No.	Reasons for opposition	Number of Interviewed Residents
1	Blank	35
2	Environmental pollution and influence on health	7
3	Generation of malodor	1
4	Firm opposition	1
5	Influence on the offspring's health and hindrance of agricultural production	1
6	Influence on people's livelihood	1
7	Air pollution, noise and dioxin	4
8	Too close to residential area	2
9	Harmful to people and air pollution	1
10	Too close to living area; influence on living quality	1
11	Immature management skills and improper self-management	1
Subtotal		56

6.4.4.2 Survey Result of Individual Questionnaires Added by Residents Spontaneously

(1) Basic Information on the Interviewed Residents

540 individual questionnaires that were spontaneously added and filled in by the

residents were returned. It can be seen from the table of the information on interviewed residents that the residents filling in the additional questionnaires are from Country Garden Shanhe City. For basic information on the interviewed residents, please refer to Attachment 5.

Fig.6.4-13 Statistic Result of the Individual Questionnaires Added by the Residents

Survey Content	Option	Number of Interviewed Residents	Proportion
Number of Returned Questionnaires		540	
1. What change do you think has happened to the population in the area where you live?	(1) Increased somewhat	498	92%
	(2) Decreased somewhat	12	2%
	(3) No change	22	4%
	(4) Have no ideas	6	1%
	(5) Make no comment	2	0%
2. What change do you think has happened to the economy in the area where you live in the last two years?	(1) Grew	445	82%
	(2) Stepped back	17	3%
	(3) No change	56	10%
	(4) Have no ideas	20	4%
	(5) Make no comment	2	1%
3. Do you know something about the project through the above brief introduction?	(1) Know well	455	84%
	(2) Know a little bit	79	15%
	(3) Have no ideas	3	1%
	(4) Make no comment	3	1%
4. Do you think whether construction of the project will improve the living environment around you?	(1) Yes, it will improve the living and hygienic environment of the surrounding area.	1	1%
	(2) No, it will make the living quality decline.	533	97%
	(3) No influence	0	0%
	(4) Have no ideas yet	3	1%
	(5) Make no comment	3	1%
5. Do you support treatment of municipal solid waste through incineration?	(1) Support	1	0%
	(2) Do not support	534	99%
	(3) Have no ideas, doesn’t matter	2	0%
	(4) Make no comment	3	1%
6. What is the environmental issue you most concern about after this project is completed? (multiple-choice question)	(1) Malodor	354	
	(2) Dioxin	384	
	(3) Air pollution	382	
	(4) Wastewater pollution	323	
	(5) Noise	60	

Survey Content	Option	Number of Interviewed Residents	Proportion
	(6) Other	188	
	(7) Make no comment	4	
7. What's your opinion on the project site selection on the premise that the project is constructed with high standard, environmental protection measures are seriously implemented, and management in operation period is enhanced?	(1) Support	3	1%
	(2) Do not support	524	97%
	(3) Doesn't matter	0	0%
	(4) Make no comment	13	2%
8. Do you think whether construction of the project will promote economic and social development in the area where the project is located?	(1) Yes, it will improve the economic and social development in the surrounding area.	2	1%
	(2) No, it will hinder the economic and social development.	495	92%
	(3) No influence	11	2%
	(4) Have no ideas yet	1	0%
	(5) Make no comment	31	6%
9. What's your general attitude towards construction of the project?	(1) Support	0	0%
	(2) Doesn't matter	0	0%
	(3) Support conditionally	0	0%
	(4) Do not support	539	100%
	(5) Make no comment	1	0%
10. What's the nature of the house you live in?	(1) Self-owned	470	87%
	(2) Leased	4	1%
	(3) Other	9	2%
	(4) Short-term residence	0	0%
	(5) Make no comment	57	10%

Analysis is as follows according to the statistic result given in Fig.6.4-7.

① As for the changes in population of the area, 92% of the interviewed residents believed that the population had grown, 2% of them believed that the population had declined, 4% believed that there were no changes in the population, 1% had no ideas. As for the economic changes in the area in the last two years, 82% of the residents considered that there was a growth in the economy, 3% held that the economy had stepped back, 10% believed that there were no changes, 4% had no ideas, 1% did not make the options. The above survey results indicated that most of the residents deemed that both the population and the economy in the area had grown, which is also the truth.

② After the aforesaid brief introduction, 84% of the interviewed residents said that they knew well about the project, 15% knew a little bit, 1% had no ideas, and 1% did not make the option. The survey result showed that more than a half of the interviewed residents know about the project to a certain degree. They can better express opinions and suggestions about the project. However, some of them still had no ideas about the project. It is suggested that the construction unit should strengthen the publicity, so as to reduce the residents' doubts and worries caused by incomprehension.

③ 1% of the interviewed residents believe that construction of the project would improve the surrounding living and hygienic environment, 97% believed that it would make their living quality decline, 1% still had no ideas, and 1% did not make the option.

④ Among all interviewed residents, 99% did not support the treatment mode, and 1% did not make the option.

⑤ The environmental issues after project completion that the interviewed residents most concern about are as follows (in order): dioxin, air pollution, malodor, wastewater pollution, other influence, and noise. 4% of the interviewed residents did not make the option.

⑥ On the premise that the project is constructed with high standard, environmental protection actions are seriously implemented, and management in operation period is enhanced, 1% of the interviewed residents supported the project site selection, 97% of them did not support the project site selection, and 2% did not make the option.

⑦ 1% of the interviewed residents believed that construction of the project would promote economic and social development in the place where the project is located, 91% believed that it would hinder economic development, 2% held that it would not impose any influence, and 6% did not make the option.

⑧ As for the interview residents' general attitude towards project construction, 99% of them did not support the construction (see Fig.6.4-7 for the reason for opposition), and 1% did not make the option. The causes of opposition were summarized as follows:

⑨ Among the interviewed residents, 87% of them live in their own houses, 1% live in leased houses, 2% live in houses of other natures, 1% live in short-term residence, and 10% did not make the option. The survey result indicated that a majority of the interviewed residents are local permanent residents, which can genuinely reflect the local residents' real attitude towards project construction, so the survey samples are representative.

Summarization of the Reasons Why the Residents Do not Support Project Construction

No.	Reasons
1	Incineration of wastes that are not separated according to different types will generate a great deal of toxic gases that are not degradable and will exist in the air for a long time, which will result in people's suffering from cancer.
2	Incineration is not the only way to dispose waste.
3	Wastes should be classified and reused, rather than being incinerated.
4	Follow-up supervision will not be performed on such kind of project. No authorities will take charge even if the project causes grave pollution and lots of complaints are made. The project is too close to the residential area and reservoir.
5	The project site is too close to residential area with dense population, so it should not be constructed in the area.
6	Waste incineration results in the gravest environmental pollution among all waste treatment modes, so it should be replaced by other environment-friendly treatment mode.
7	Construction of the project will influence local economic and social development.

According to the above analysis, residents of Country Garden Shanhe City have fairly similar opinions on the project construction. They consider that the project will generate pollution during the operation period and it will not be properly managed. The project is too close to the environmentally sensitive areas in the residential area, and it will impose influence on the surrounding environment and affect local economic and social development. Therefore, they believe the project site is unreasonable and generally oppose the project construction.

As a response to the aforesaid opposing opinions, the construction unit definitely expressed that it did not accept the opinions for the time being according to the conclusions of various subjects in the environmental evaluation report. The specific feedback opinions are as follows:

(1) The residents consider that the project will generate pollution during the operation period and it will not be properly managed.

Reasonable and effective environmental protection measures will be taken in the project in strict conformity with relevant specifications, high standards and requirements for scientific operation and environmental protection, and discharge pollutants after they reach the required discharge standard. During the construction and operation of the project, the construction unit will seriously implement various environmental protection measures, enhance operation management, take proper risk prevention and emergency actions, establish perfect early warning mechanism and environmental management & monitoring systems, and enhance project supervision and management by the government and the third party.

(2) The project is too close to the environmentally sensitive areas in the residential area, and it will impose influence on the surrounding environment and affect local economic and social development.

During the phase of project site selection, Huiyang Environmental Sanitation Bureau worked with planning, environmental protection, design, state land and geological departments to carry out project site selection according to relevant regulations. However, as most of the places in the area under jurisdiction have been planned or constructed, it was deemed after multi-lateral demonstration that the selection of Lanzilong in Shatian Town as project location is fairly reasonable; the project location conforms to the special urban environment and sanitation planning of Huizhou City.

The project will be implemented in strict conformity with relevant specifications, high standards and requirements for scientific operation and environmental protection. Various environmental protection measures will be seriously implemented and operation management will be enhanced during the construction and operation of the project. It is clearly pointed out in the "12th Five-year Plan" of Guangdong Province for Construction of Municipal Solid Waste Hazard-free Treatment Facilities (Y.F.B.[2012]No.113) that was printed and distributed by Guangdong Provincial People's Government on November 13, 2012 that it is necessary to promote the construction of municipal solid waste hazard-free reclamation and treatment projects in a positive and orderly way when vigorously developing recycling economy; to implement the strategic ideas of the provincial Party committee and provincial government, it is essential to raise the municipal solid waste hazard-free treatment rate in the urban area of Huizhou City to not less than 90% by 2013, so as to attain the goal of "National Ecological City" at an early date. Accordingly, it is urgent to construct this project.

As the project has drawn fairly close attention from the public, it is suggested that the construction unit should further enhance communication and explanation work according to the appeals filed by the interviewed residents, and seek for the residents' understanding and support for the project on the premise that various environmental protection measures and facilities are seriously implemented.

6.4.4.3 Result of Survey on Residents Living along the Waste Collection & Transportation Route

(1) Basic Information on the Interviewed Residents

A total of 85 questionnaires were distributed to the residents living along the waste collection & transportation route of the project, of which 85 effective ones were returned, with the return rate being 100%. Meanwhile, record was kept on the interviewed residents' name, sex, age, educational background, occupation, phone number and domicile.

See the attachments for the design of individual survey questionnaires and the list of basic information on the interviewed residents. See Fig.6.4-14 for the statistics of basic information.

Fig. 6.4-14 Statistics of Basic Information on Individual Survey (Residents Living along the Waste Collection & Transportation Route)

Item	Option	Number	Proportion	Item	Option	Number	Proportion
Occupation	Office Personnel (Including Teachers)	27	32%	Sex	Male	72	85%
	Personnel of Villagers' Committee and Cadres	11	13%				
	Technical Worker	2	2%				
	Farmer	3	4%		Female	13	15%
	Other	24	28%				
	Unspecified	18	21%				
Duration of Residence in the Place	Within 1 Year	60	71%	Educational Background	Junior High School	0	0%
	Within 3 Years	0	0%		Undergraduate/Junior College	43	51%
	Locals	1	1%		Above Undergraduate	18	21%
	Permanent Residents (at least 5 years)	6	7%		Senior High School	6	7%

Item	Option	Number	Proportion	Item	Option	Number	Proportion
	Other	0	0%		Primary School and Below	0	0%
	Unspecified	18	21%		Unspecified	18	21%

The above figure showed that the proportion of men in the survey is far higher than that of women. In addition, as the scope of influence resulted by the project is mainly the surrounding villages, a majority of the interviewed subjects are locals and permanent residents who are concerned about local construction and environmental alteration, which helps to reflect local residents' real intention in the survey.

(2) Statistics and Analysis of Survey Result of the Public opinions

For the statistic result of the survey on opinions of the residents living along the waste collection & transportation route, please refer to Fig. 6.4-15.

Fig. 6.4-15 Statistic Result of the Survey on Opinions of the Residents Living along the Waste Collection & Transportation Route

Question	Option	Number of Interviewed Residents	Proportion
1. Do you know something about the project through the above brief introduction?	（1）Know well	4	5%
	（2）Know a little bit	79	93%
	（3）Do not know	2	2%
	Make no comment	0	0%
2. Do you notice the waste collection & transportation route in the area where you live?	（1）Yes	22	26%
	（2）No	59	69%
	（3）Have no ideas, doesn't matter	4	5%
	Make no comment	0	0%
3. Do you think whether construction of the project will improve the living environment around you?	（1）Yes, it will improve the surrounding environment.	21	25%
	（2）No, it will make the life quality decline.	1	1%
	（3）No influence	0	0%
	（4）Have no ideas yet	63	74%
	Make no comment	0	0%
4. What's the influence resulted by waste collection and transportation on your life? (multiple-choice question)	（1）Malodor	75	
	（2）Overflow or leakage of waste leachate during transportation	20	
	（3）Noise of transportation	4	

Question	Option	Number of Interviewed Residents	Proportion
	vehicles		
	（4）Other	5	
	Make no comment	2	
5. As resident living along the waste collection & transportation route, what's your opinion on the project site selection on the premise that the project is constructed with high standard, environmental protection actions are seriously implemented, and management in operation period is enhanced?	（1）Support	37	44%
	（2）Do not support	0	0%
	（3）Doesn't matter	48	56%
	Make no comment	0	0%
6. What's your opinion on waste collection & transportation route which is an important part of waste treatment?	（1）Agree	34	40%
	（2）Agree conditionally	0	0%
	（3）Doesn't matter	50	59%
	（4）Disagree	0	0%
	Make no comment	1	1%
7. Do you think whether construction of the project will promote economic and social development in the area where the project is located?	(1) Yes, it will improve the economic and social development in the surrounding area.	30	35%
	(2) No, it will hinder the economic and social development.	0	0%
	(3) No influence	1	1%
	(4) Have no ideas yet	53	62%
	Make no comment	1	1%
8. What's your general attitude towards the operation of municipal solid waste incineration plant?	(1) Support	34	40%
	(2) Support conditionally	0	0%
	(3) Doesn't matter	50	59%
	(4) Do not support	1	1%
	Make no comment	0	0%
9. What's the nature of the house you live in?	(1) Self-owned	76	89%
	(2) Leased	0	0%
	(3) Other	5	6%
	(4) Short-term residence	0	0%
	(5) Make no comment	4	5%

Analysis is as follows according to the statistic result given in Fig. 6.4-10.

① According to the brief introduction given above, 5% of the interviewed residents know well about the project, 93% know a little bit, and 2% have no ideas; as for the waste collection & transportation route in the area where they live, 26% of the residents noticed, 69% did not notice, and 5% have no ideas (doesn't matter). The survey result showed that the interviewed residents know about the project to a certain extent and can better express their opinions and suggestions on the project, but most of them did not notice the waste collection & transportation route in the area where they live.

② The survey result indicated that 25% of the interviewed residents believed construction of the project would promote the improvement in the surrounding living environment, 1% held that it would make the life quality decline, and 74% had no ideas yet.

③ According to the interviewed residents, the influences resulted by waste collection and transportation on their life are as follows (in order): malodor, overflow or wastewater leak during transportation, noise of transportation vehicles and other; two interviewed residents did not give the option.

④ 44% of the interviewed residents living along the waste collection & transportation route support the project site selection and 56% of them do not concern about this issue, on the premise that the project is constructed with high standard, environmental protection actions are seriously implemented, and management in operation period is enhanced.

⑤ As for opinions on the waste collection & transportation route, 40% of the interviewed residents agreed upon the route, 59% did not concern about the issue, and one of them did not make the option.

⑥ 35% of the interviewed residents believed construction of the project would promote the local economic and social development, 1% believed there would be no influence, 62% had no ideas yet, and 1% did not make the option.

⑦ As for the interviewed residents' general attitude towards project construction, 40% of them supported the project construction, 59% did not concern about the issue, and 1% (one resident) did not support the project construction.

⑧ Among the interviewed residents, 89% of them live in their own houses, 6% live in houses of other natures, and 5% did not make the option. The survey result indicated that a majority of the interviewed residents are local permanent residents, which can genuinely reflect the local residents' real attitude towards project construction, so the survey samples are representative.

6.4.5 Summarization of Survey Opinions and Construction Unit's Feedback Opinions

According to the survey result of Phase II questionnaires, the construction unit gave the following explanations to public opinions after further research.

(1) Summarization of Group Survey Opinions and Construction Unit's Feedback Opinions

Fig. 6.4-16 Summarization of Group Survey Opinions and Construction Unit's Feedback Opinions

No.	Name of Unit	Opinions or Suggestions	Accepted or Not	Reply from Construction Unit
1	Management Committee of Huizhou Daya Bay Economic and Technological Development Zone	It is suggested to quicken implementation of the project, strengthen management after the project is completed, and make it become a model project.	Accept	--
2	Villagers' Committee of Sanhe Community in Huiyang Economic Development Zone	The air standard should be maintained.	Accept	--
3	Qishan Holiday Resort Development Co., Ltd. in Huiyang District (Country Garden Shanhe City)	It is suggested to attach great importance to opinions of the residents in the community and developmental prospect of the surrounding area, and make decision prudently.	Partially accept	Great importance will be attached to residents' opinions and acceptance of their reasonable appeals. In addition, the project will be finally implemented after environmental evaluation and demonstration in multiple aspects are conducted and relevant legal formalities are gone through.

(2) Summarization of Individual Survey Opinions and Construction Unit's Feedback Opinions

Fig. 6.4-17 Summarization of Individual Survey Opinions and Construction Unit's Feedback Opinions

No.	Opinions or Suggestions	Accepted or Not	Reply from the Construction Unit
1	(1) Do not incinerate waste, so as to avoid air pollution; (2) Do not carry out landfill, so as to avoid pollution of underground water; (3) Sort out waste clearly, turn waste into treasure, and reuse reclaimable plastic and heavy metal.; (4) Turn kitchen waste into fertilizer; (5) Make reference to sustainable waste treatment methods that are adopted by developed countries, so as to benefit the people, rather than sacrificing their interest.	Do not accept for the time being	Waste incineration has been a fairly common and acceptable waste treatment mode in the world. Thousands of waste incineration plants across the world have been completed and put into use. In addition, it can meet the technical requirements for small land use and large pollution reduction and meet the waste treatment demand of Huiyang region.
2	The project is too close to the residential area, so it is suggested that the project site should be changed/it is firmly opposed that a wasteyard is built in Lanzilong, Tiantou Village.	Do not accept for the time being	The project site selection conforms to the requirements of relevant laws, regulations and technical specifications. After relevant environmental protection measures are taken, the impact resulted by the project on the surrounding environment can be controlled to an acceptable level, so the project site will not be changed for the time being.
3	Properly protect the surrounding environment.	Accept	--
4	It is hoped that the project can benefit people as expected.	Accept	--
5	The Waste-to-Energy Project is opposed, for it will seriously affect people's livelihood. It is suggested that the government should cancel the project.	Do not accept for the time being	The project site selection conforms to the requirements of relevant laws, regulations and technical specifications. After relevant environmental protection measures are taken, the influence resulted by the project on the surrounding environment can be controlled to an acceptable level, so the project site will not be changed for the time being. In addition, construction of the project is necessary according to the current status on waste

			treatment in Huiyang region.
6	Construction of the project will affect the environment and air, so it is not supported.	Do not accept for the time being	According to the conclusion of environmental evaluation report, after relevant environmental protection measures are taken, the impact resulted by the project on the surrounding environment can be controlled to an acceptable level
7	Construction of the project will be harmful to the surrounding environment and people's health, so it is not supported.	Do not accept for the time being	According to the conclusion of environmental evaluation report, after relevant environmental protection measures are taken, the impact resulted by the project on the surrounding environment can be controlled to an acceptable level
8	Enhance the quality of project construction.	Accept	The project will be constructed with high standard, environmental protection measures are carefully implemented, and management in operation period is enhanced, so as to avoid the impact resulted by the project on the surrounding environment as much as possible.
9	Strengthen villagers' supervision and management.	Accept	
10	Intensify environmental management.	Accept	
11	Improve waste treatment techniques and reduce air pollution as much as possible.	Accept	
12	Do not discharge waste gases in violation of relevant regulations.	Accept	
13	Implement the project in strict conformity with relevant requirements.	Accept	
14	It is suggested that the gases resulted from waste incineration should be treated well after being discharged.	Accept	
15	It is hoped that the pollution problem can be properly handled after the project is completed.	Accept	

6.5 Return Visit to the Public

According to the statistic result of Phase 2 questionnaires as well as Interim Method for Public Participation in Environmental Impact Evaluation (H.F.[2006]No.28) and Notice on Printing and Distribution of Implementation Opinions of Guangdong Province on Public Participation in Environmental Management of Construction Project (Y.H.[2007]No.99), the construction unit organized return visit to those who held opposition attitude, seriously collected their opinions and suggestions on the project, further explained the issues they worried about, made them better understand project construction through direct communication, explanation and answering questions, and paid return visit to them to understand their attitudes, requirements and suggestions during August 1, 2013 to August 9, 2013.

According to the statistic result of Phase 2 questionnaires, return visit was paid to one group and 60 individuals who are all residents living in the surrounding area of the project. The project team worked with the construction unit to explain to the issues that the residents were worried about, so that they can better understand project construction. The visit is also aimed at understanding the residents' final attitude, requirements and suggestions. It was done by making phone call and filling in return visit questionnaires. The whole process of return visit on phone was recorded by telephone, for the purpose of knowing their final attitude towards project construction.

6.5.1 Result of Return visit to group

The group opposing the project construction is Qishan Holiday Resort Development Co., Ltd. in Huiyang District, Huizhou City (Country Garden Shanhe City), which maintained its original opinions after the return visit. The major reasons are as follows:

1. The project is constructed in BOT mode, which cannot ensure project operation management in later period;
2. Relevant environmental protection formalities of the project need to be improved;
3. It is suggested that the government should enhance the communication with residents and listen to their opinions and suggestions on the project;
4. The project is located in the Class A water source protection region around which is a populated residential area. Construction of the project does not conform to the functions and attributes of the surrounding area;
5. It is suggested that the project site should be changed.

6.5.2 Result of Return visit to individual

The return visit was paid to 62 individuals who are all residents living in the surrounding area of the project. It was done by making phone call and filling in return visit questionnaires. The whole process of return visit on phone was recorded by telephone, for the purpose of knowing their final attitude towards project construction.

During the return visit, the visit to 9 persons failed because no one answered the phone call or due to wrong numbers; 5 persons expressly refused the visit; one could not accept the visit due to business trip in other place. The visit was successfully paid to 48 persons, with the successful return visit rate being 77%.

The return visit enhanced the residents' understanding about the project and made some of them change their original attitudes. Three of them changed their attitude to "support", accounting for 5% of the total residents accepting the return visit; two of them changed to "support conditionally", accounting for 3% of the total; two of them did not support the project location and did not concern about the project construction, accounting for 3%; two of them changed to "doesn't matter", accounting for 3%. 38 persons maintained their original attitude, accounting for 63%. For basic information on the residents receiving return visit and their opinions after the return visit, please refer to Fig. 6.4-18.

5.4-18 Statistics Form of Information on Residents Receiving Return Visit and Their Opinions after the Return Visit

	Sex	Age	Contact Information	Address	Final Opinions on the Project after Return Visit	Reasons to Oppose	Opinions o
	Male	46	15916399155	Hengling Zhangwu	Support conditionally (Supporting condition: the project imposes no influence on the surrounding commerce and people's health.)		It is sugge project sit 15km away Town
	Male	42	15816396882	Hengling Zhangwu	Do not support		
	Male	32	13539925828	Heng'er Villagers' Group, Tiantou Village, Shatian Town	Wrong phone number		
	Male	45	N/A	Youmapu	Unreachable		
	Male	N/A	13631937888	Youmapu	Support		High-standa constructio implementa environmen discharge in
g	Male	61	13433530788	Tiantouwei Village	Doesn't matter		There ar facilities.
	Male	43	15916395187	Tiantou Village	Do not support		The project located in S
g	Male	45	13802476640	Tiantou Village	No phone answering		
g	Male	43	15976132388	Tiantou Heng'er Village	Do not support	Worry about pollution	The projec away from

	Sex	Age	Contact Information	Address	Final Opinions on the Project after Return Visit	Reasons to Oppose	Opinions or
							area anc technology adopted.
	Male	48	13902668767	Tiantou Village	Do not support	Affect economy in the surrounding area and result in air pollution	N/A
	Male	36	13794536990	Tiantou Heng'er Village	Did not accept return visit		
ng	Male	52	13829907896	Tiantou Village	Do not support		1. Landfill major mo constructior should be discharge should be public.
g	Male	47	18026522128	Xiaowu Shanglou Village	Support		High-standa constructior introductior supervisior attention g governmen
	Male	57	13542785198	Xiaowu Xialou Village	Do not support		It is sugge project sh located in but in a rem
	Male	66	15986575181	Xiaowu Village	No phone answering		
	Male	54	13539249259	Xiaowu Niujiaolong	Do not support	Worry about	

	Sex	Age	Contact Information	Address	Final Opinions on the Project after Return Visit	Reasons to Oppose	Opinions o
						environmental pollution	
ng	Male	-	13414673301	Xiaowu Xiawei Group	Do not support	Pollution	The intr Waste-to-E should be e
	Male	41	13829998627	Shuikou Village, Shatian Town	Do not support	Worry about pollution	
	Male	34	13719639536	Xiaowu Village, Shatian Town	Wrong phone number		
di	Female	36	15976234731	Xiaowu Village, Shatian Town	Do not support	Worry about environmental pollution	
	Male	43	13692700892	No.3 Middle Chang'an Road, Shatian Town	Doesn't matter		The project away fror area.
	Male	57	13928388013	Xiaowu Village, Shatian Town	Did not accept return visit		
n	Male	37	13553427755	Xiaowu Village, Shatian Town	Support(supporting condition: environmental protection measures are properly taken and supervision is properly done.)		Supervision enhanced t discharged not result ir
	Female	39	N/A	Xiaowu Village, Shatian Town	Unreachable		
	Male	50	N/A	Changlonggang Group, Tiantou Village			

	Sex	Age	Contact Information	Address	Final Opinions on the Project after Return Visit	Reasons to Oppose	Opinions o
	Female	25	13422933921	Shatian Middle School	Support conditionally (supporting condition: the project is constructed in line with high standard and the discharge standard is strictly implemented.)		Improveme treatment te
	Female	32	13316366940	Shatian Middle School	Do not support		It is sugge project sh away fron area.
	Male	42	13500178249	Shatian Middle School	Unreachable		
g	Male	63	15916395112	Tiantou Village	Do not support		
	Male	50	13923638599	Tiantou Village	Do not support	Worry about influence on the surrounding environment and therefore on economy (depreciation of land value)	
ng	Male	36	13631927148	11 Luling Village under Tiantou Villagers' Committee	Do not support		Proper su public and their opinio
g	Male	43	13068222900	9 Hebei Group under Tiantou Villagers' Committee	Do not support		Reselection site
	Male	40	13719683319	Lizhai Group, Tiantou Village	Do not support		The project located in L

	Sex	Age	Contact Information	Address	Final Opinions on the Project after Return Visit	Reasons to Oppose	Opinions o
	Male	73	13719608726	Qiaobei Group, Tiantou Village	Do not support		It is sugge project sh constructed site.
	Male	62	13631920829	Qiaobei Group, Tiantou Village	Do not support	Worry about environmental pollution, especially dioxin	It is sugges should be landfill at sparsely places.
	Male	48	3810669	Qiaobei Group, Tiantou Village	Do not support project site selection; reserve views on the project.		Reselection site
ng	Male	46	15089292201	Hebei No.10 Group, Tiantou Village	Do not support		Reselection site; relocat to a more re
	Male	39	13531742777	Hebei Group, Tiantou Village	Do not support	Worry about pollution that will affect the economy of Shatian Town	The project far away fr area and res
	Female	28	13610449327	Chizhuhu Group, Tiantou Village	Do not support		The protection should be discharge conform standard.
	Male	63	13669532865	Tiantou Village	Do not support	Issue concerning people's health	
	Male	45	18927357679	Tiantou Village	Do not support		Understand opinions

	Sex	Age	Contact Information	Address	Final Opinions on the Project after Return Visit	Reasons to Oppose	Opinions or
ei	Female	-	13422982292	Tiantou Village	Do not support		
	Male	50	13542726665	Heng'er Villagers' Group, Tiantou Village	Do not support	The project is too close to residential area, which will affect the growth of crops and people's personal safety.	Reselection site
	Male	46	13680869882	Xiacun Group, Tiantou Village	Do not support	Worry about immature techniques and issue concerning later operation	Selection treatment landfill
u	Male	51	13802476099	Xiacun Group, Tiantou Village	Do not support project site selection; do not concern about project construction.		It is sugges should be landfill, fo should con standard.
	Male	45	13509073457	Chizhuhu Village, Tiantou Village	Did not accept return visit		
	Male	45	15917777136	Zhangwu Village	Do not support	Worry about unauthorized discharge by operation company	The project away fror area.
g	Male	-	15875268777	Lizhai Group, Tiantou Village	Do not support	Worry about pollution which will affect the economy	It is sugge project sit changed.
	Male	50	N/A	Longgangcun Group, Tiantou Village	Do not support		
g	Female	65	13622781368	Changlonggang Group, Tiantou Village	Do not support	Worry about pollution	
	Female	49	15019807131	Changlonggang	Do not support	Worry about air pollution	

	Sex	Age	Contact Information	Address	Final Opinions on the Project after Return Visit	Reasons to Oppose	Opinions o
				Group, Tiantou Village		which will affect people's health	
	Female	64	3343133	Changlonggang Group, Tiantou Village	Left for Fujian		
	Male	48	13502211815	Tiantoushang Village	Do not support		
	Male	50	13502218444	Tiantoushang Village	Do not support	Worry about impact on economy in the surrounding area which will result in difficulty in house leasing	The projec located in populated p
g	Male	50	13802472116	Tiantoushang Village	Do not support		
an	Female	45	13058089504	302, 21 Street, Qifengtai, Country Garden Shanhe City	Do not support	Waste classification is not carried out in China.	The project away fron area.
g	Female	71	13691867696	23-3-101 Fengyitai, Country Garden Shanhe City	Do not support		Waste class
	Male	36	18719181988	Country Garden, Danshui Sanhe Development Zone	Do not support	Worry about air pollution, pollution by dioxin and pollution of water head site	1. Waste should be The project changed; should be mode of wa
n	Female	32	15019217168	402, Building 7, 24 Street, Fengyigu,	Do not support	No confidence in the existing waste treatment	1. The proj be change

	Sex	Age	Contact Information	Address	Final Opinions on the Project after Return Visit	Reasons to Oppose	Opinions or
				Country Garden		technology	should be landfill sh major mo treatment.
tu	Female	55	15014984239	402, Building 9, 24 Street, Fengyigu, Country Garden	Wrong phone number		
	Male	55	13536346697	Tiantouwei Group, Tiantou Villagers' Committee, Huiyang District, Shatian Town	Did not accept return visit		

6.6 Summary

The samples in the public survey comply with relevant provisions of the promulgated Interim Method for Public Participation in Environmental Impact Evaluation (H.F.[2006]No.28) and Notice on Printing and Distribution of Implementation Opinions of Guangdong Province on Public Participation in Environmental Management of Construction Project (Y.H.[2007]No.99). The scope of the survey subjects covers all environmentally sensitive areas in the vicinity that are influenced by air pollution caused by the project. The subjects include villagers, workers, pedestrians, enterprises and public institutions in the environmentally sensitive areas. A majority of the subjects are local permanent residents who are highly representative. The return rate of the questionnaires is high. The survey result is objective, just and considerably representative.

The survey result showed that construction of the project is understood and supported by most of the residents in the surrounding area of the project; on the premise that the project is constructed with high standard, environmental protection measures are seriously implemented, and management in operation period is enhanced, 85% of the 21 interviewed groups support the project site selection, 10% of them (2 groups) support the project site selection conditionally, and 5% of them (1 group) does not support the project site selection. As for general attitude towards the project construction, 90% of the interviewed groups support the project construction, 5% of them (1 group) support the project construction conditionally, and 5% (1 group) does not support the project construction. On the premise that the project is constructed with high standard, environmental protection measures are seriously implemented, and management in operation period is enhanced, 62% of the 484 interviewed residents living in the surrounding area of the project support the project site selection, 13% of them do not support the project site selection, 24% do not concern about the issue, and 1% did not give the option. As for general attitude towards the project construction, 49% of the interviewed groups support the project construction, 22% of them do not concern about the issue, 16% support the project construction conditionally, 12% do not support the project construction, and 1% did not give the option. 1% of the 540 residents who filled in the additional questionnaires printed by them spontaneously support the project site selection, 97% of them do not support the selection, and 2% did not give the option. As for general attitude towards the project construction, 99% of the interviewed residents do not support the project construction, and 1% of them did not give the option. On the premise that the project is constructed with high standard, environmental protection measures are seriously implemented, and management in operation period is enhanced, 44% of the 85 interviewed residents living along the waste collection & transportation route support the project site selection, and 56% of them do not concern about this issue. As for opinions on waste collection & transportation route, 40% of the interviewed residents agree with the route, 59% do not concern about the issue, and one of them did not give the option. As for general attitude towards the project construction, 40% of the interviewed residents support the project construction, 59% of them do not concern about this issue, and 1% of them (one resident) does not support the project construction.

The survey result of return visit showed that the group opposing the project site selection and project construction-- Qishan Holiday Resort Development Co., Ltd. in Huiyang District, Huizhou City (Country Garden Shanhe City) maintained its original opinions after the return visit. The return visit to individuals enhanced the residents' understanding about the project and made some of them change their original attitudes. 5% of them changed their attitude to be "support", 3% changed to be "support conditionally" , 3% did not support the project location and did not concern about the project construction, and 3% changed to be "doesn't matter". 38 persons maintained their original attitude, accounting for 63% of the residents receiving return visit.

According to the foregoing, it can be seen from the public's final attitude towards the project that there is one group opposing the project, accounting for 4.8% of the total survey subjects (21 groups), and there are 51 persons who oppose the project (the individuals who did not successfully accept the return visit are deemed to maintain their original attitudes), accounting for 10.5% of the total (484 persons). In addition, as the project has drawn fairly close attention from residents living in the surrounding area of the project, 540 questionnaires were spontaneously sent back by the residents, most of whom did not support project site selection and project construction and suggested that the construction unit should enhance communication with them; the public concerns about the waste gases, malodor and wastewater pollution as caused by project construction and operation, and worries about the management during project operation period. They required the construction unit to properly implement environmental protection measures to avoid environmental destruction. There are also lots of residents who required the construction unit to accept the supervision by environmental protection department and local residents.

According to the public opinions and suggestions, the construction unit committed that it would take reasonable and effective environmental protection measures to ensure pollutants are discharged in line with relevant standard. During construction period, it will carry out strict management to ensure construction quality and ensure that various pollution control measures are operated stably and pollutants are discharged in line with relevant standard. Meanwhile, it will take proper risk control and emergency measures, establish complete early warning mechanism and complete environmental management and monitoring systems, enhance supervision and management of pollutant discharge, and strive to minimize the impact resulted by this project on the surrounding environment. In addition, it would introduce third-party supervision and social and environmental supervision during project operation period to enhance communication with the public (i.e. village leaders, villagers and other relevant stakeholders) affected by the project by conducting quarterly meetings/visits and discuss their concerns with the project management of the factory area. Summary of quarterly meetings will be included in the annual report to ADB.

Construction of the project aims to regulate waste treatment means and reduce the adverse influence resulted by unregulated waste disposal on urban and surrounding environment. Therefore, the project will play a positive role in the reduction of the gross volume of discharged pollutants in the area and help to improve living environment of Huiyang region and realize harmonious development. That is the reason why construction of the project is necessary. However, as the project has drawn close attention from the public, it is suggested that the construction unit and local administrative department should further enhance communication with and explanation to the local residents and eliminate their worries, so as to minimize the possible dissatisfaction. In addition, the construction unit should, when strictly implementing the environmental protection measures and requirements set forth in the report, introduce third-party supervision, social supervision and other means to enhance the publicity and communication with relevant local units and the public, so as to make them further understand the project and reduce their unnecessary worries. The enterprise should consider local residents' opinions and demands in different aspects during project operation, and ensure that the public's economic and environmental interests are not damaged to a reasonable extent. Meanwhile, the enterprise should give priority to the consideration of local residents' employment, get along well with the residents, and seek their understanding and support for the project through taking practical actions, so as to lay a solid foundation for continuous progress in project construction.

Chapter VII 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.

Basic steps for resolving complaints are as follows and illustrated in Figure A.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, HPMO, or HEPB. 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 respond 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 HPMO 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 HPMO and HEPB. On receiving complaints by the HPMO or HEPB, the party receiving the complaints must notify the other party and document the complaint in writing in a Complaint Register. The HPMO must immediately inform the HPMO Environmental Specialist of a complaint and to agree on a course of action. The HPMO and AEPB 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 HPMO should document the complaint and resolution process in its Complaint Register, with quarterly reporting to Dynagreen and HPMO.

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 HPMO (which will be received by the HPMO Environment or Social Specialist). Upon receiving the complaint, HPMO must deal with it within 14 calendar days. Once a complaint is documented and put on file, HPMO through Dynagreen will immediately notify ADB. After discussing the complaint and potential solutions among ADB, HPMO, the LIEC, the contractor, and the affected person, HPMO 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 HPMO 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 HPMO 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.

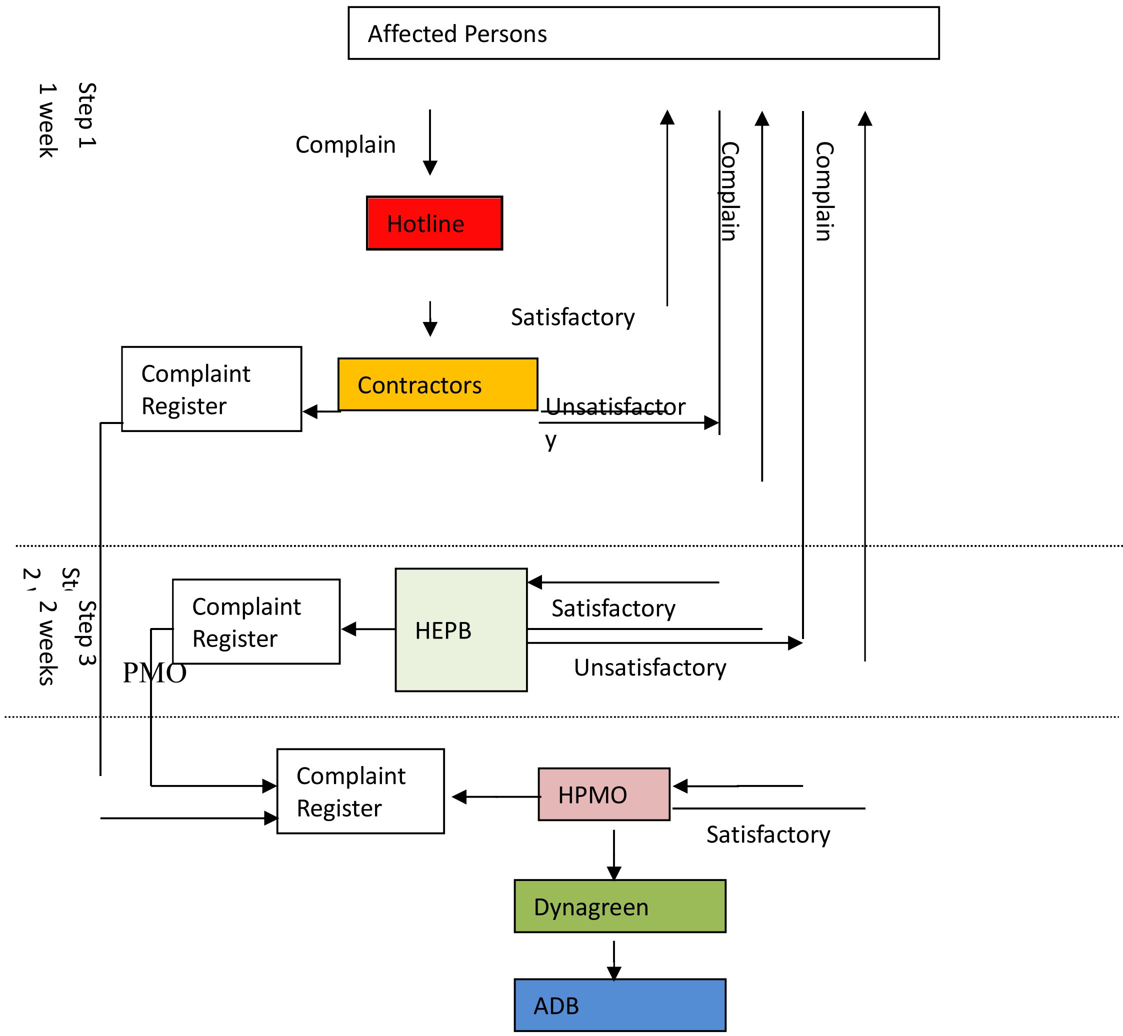


Figure A.1: Proposed Grievance Redress Mechanism

Chapter VIII Environmental Management Plan and Environmental Monitoring System

Environmental management refers to enhancing environmental protection and coordination of production and economy for mutual development by means of technology, economy and law. For Huizhou Waste-to-Energy Plant, enhancement of the management of environmental protection goal can promote the improvement on production technology and technical level, reduction of waste and operation cost, and establishment of favorable image among the public. A detailed Environmental Management and Monitoring Plan is also attached as Annex A.

8.1 Environmental Management Organization and Its Responsibilities

8.1.1 Environmental Management Organization

To effectively protect environment and avoid pollution accident, the factory area or its superior competent department should have management organization in charge of environmental protection and full-time environmental management personnel that mainly take charge of environmental management work during project construction and operation period, including test, daily supervision, handling of environmental pollution accident as well as coordination and solving relation-related issues with environmental protection department and the public in the surrounding area.

The environmental protection work in the factory area should be supervised and managed by the district-level and municipal environmental protection bureaus. In addition to department building, the plant should establish a comprehensive environmental management system for mutual coordination, work division and mutual cooperation among various departments such as departments of incineration power generation and wastewater treatment under the leadership of the persons in charge of environmental protection. Various production workshops should also have part-time environmental protectors, so as to flexibly combine professional environmental management with the public's management.

During project construction period, the organization should take charge of handling and supervising environmental matters as well as design, construction and implementation of enterprise's environmental protection measures. During project operation period, the organization should also take charge of environmental management work and environmental issues that occur during project operation.

8.1.2 Responsibilities of Environmental Management Organization

To effectively protect the environment, the factory area has specially-assigned personnel who are in charge of environmental protection management in the project. The organization's responsibilities are as follows.

① Establish and improve environmental protection rules and regulations to define environmental protection responsibility system and reward & punishment methods; determine environmental goal management in the factory area, and conduct supervision and assessment on the workshops, departments and operating posts of incineration power generation and wastewater treatment.

② Carry out design, construction and operation of environmental protection facilities and conduct environmental protection on the construction site during project construction period; keep environmental protection archives, including environmental evaluation report, inspection and acceptance check report on environmental protection project, pollution source monitoring report, records on environmental protection equipment and operation, transfer records on dangerous solid wastes, and other environmental statistic data; regularly compile environmental protection reports and annual work report on environmental protection, and submit them to the superior and local environmental departments. Report to the local environmental protection department especially in case of furnace shutdown or failure inspection and repair; regularly submit data on incinerator operation to local environmental protection department.

③ To improve the quality of environmental protection work, it is necessary to enhance professional training of environmental management personnel, environment supervisors and part-time environmental protection personnel, and assign certain amount of expenditure to ensure implementation of the training; organize staff's environmental protection test and properly popularize environmental protection.

④ Properly carry out coordination and management of environmental protection facilities and major production equipment, so that installation of pollution control facilities matches major production equipment, and pollution control facilities are operated, inspected and maintained together with major production equipment. When pollution control facilities fail, environmental management organization should take actions immediately together with production department to avoid worsening of pollution; take charge of handling pollution accidents.

⑤ Cooperate to properly carry out comprehensive utilization of wastes, supervision on hazardous solid wastes, clean production, and control on total volume of discharged pollutants.

8.2 Environmental Management Plan

Work out feasible environmental pollution control methods and actions according to the unattended control actions and measures mentioned in the report: properly carry out environmental education and publicity, enhance environmental awareness of managerial personnel and operators at various levels, improve employees' sense of responsibility for environmental pollution control to spontaneously abide by and execute various environmental protection rules and regulations; regularly maintain environmental protection facilities to ensure normal operation of such facilities and avoid pollution accidents; strengthen communication and contact with environmental protection management department, and actively accept the management, supervision and guidance by environmental protection authority. Meanwhile, it is suggested to carry out evaluation on environmental impact after the project is completed and put into production, conduct tracking, monitoring and verifying evaluation on environmental impact and the effectiveness of preventive measures after project implementation, and propose remedial schemes or measures as well as methods and systems for realizing harmony between project construction and environment.

8.3 System and Plan for Environmental Monitoring in Construction Period

8.3.1 Suggestions on Construction Management

(1) Setup of Management Organization

In order to effectively protect environmental quality of the place where the project is located and relieve the impact resulted by various pollutants on the surrounding environment during the construction period, the construction unit should enhance environmental management during the construction period and set up an organization consisting of 2 to 3 persons which is in charge of environmental protection management work in construction period.

(2) Environmental Management Measures

① The owner should enter into a contract with the construction unit, which prescribes environmental protection requirements during construction period and requires construction unit to strictly follow the requirements and carry out civilized construction, thus ensuring that environmental protection measures can be implemented during construction period.

② As ground excavation is required during construction period, which will inevitably result in soil erosion to a certain extent, the enterprise should take preventive actions to avoid large-scale soil erosion and reduce environmental impact.

③ The construction unit should avoid as much as possible the pollution caused by fugitive dust resulted from excavation, bulldozing and landfill. during construction period as well as the pollution caused by secondary fugitive dust.

④ Construction with heavy construction machinery and transportation vehicles should be carried out in daytime as much as possible, rather than in nighttime, so as to reduce the influence resulted by the noise of construction and transportation on the local residents; if construction in nighttime is required (e.g. continuous placing of concrete), formalities for construction during nighttime should be completed according to relevant management requirements; notice should be made to the surrounding residents; and the influence resulted by noise generated from nighttime construction shod be reduced as much as possible.

⑤ The owner should commission qualified monitoring department or environmental protection supervising engineer to supervise the construction unit, so that it will implement various environmental protection measures that should be taken during construction period.

⑥ The enterprise is responsible for cooperating with local environmental protection authority to carry out environmental monitoring and supervision on environmental impact during construction period, so as to ensure that environmental protection measures are implemented perfectly and continuously during the construction period. Environmental monitoring should include: quality of surface water influenced by runoff in the area where the project is located; noise and air quality in the surrounding area of the construction site. The enterprise should also work with the superior environmental protection department and regularly conduct inspection on the construction site.

8.3.2 Plan for Environmental Monitoring in Construction Period

The plan for environmental monitoring in construction period was worked out according to characteristics of the project and environmental requirements. It can be adjusted according to the actual situation of project operation.

(1) Analysis on Environmental Monitoring Demand

There are many aspects of environmental impact that occur during construction period, including impact on atmospheric environment caused by fugitive dust and exhaust gas emitted by construction machinery and vehicles, influence on water environment caused by drainage of domestic wastewater by constructors and drainage of wastewater by construction machinery and vehicles, and impact on ecological environment caused by soil erosion resulted from construction activities. To control such impact, it is necessary to conduct environmental monitoring.

(2) Environmental Monitoring Plan

The main items of environmental monitoring during construction period include fugitive dust, noise, soil erosion, wastewater and waste oil. In view of the temporary nature of construction activities, environmental monitoring can be only conducted during construction period. It is suggested that it should be carried out once every six months. The monitoring plan is take reference of the similar project -Panyu WTE project in Guangdong province, but according to the practical situation, the internal monitoring will be run every month.

(3) Deployment of Monitoring Personnel and Setup of Laboratory

The construction unit should have at least one full-time employee who is in charge of patrolling and keeping record on generation of various pollutants during construction period, and immediately reporting to the construction unit and environmental monitoring department in case of abnormality. The factory area construction department should inspect the environmental protection work done by the construction unit at any time.

As the construction is temporary, environmental monitoring can be done by a qualified environmental monitoring department through entrustment.

8.4 System and Plan for Environmental Monitoring in Operation Period

Environmental monitoring refers to setting up frequent environmental monitoring points and monitoring items with the aim of protecting environment and people’s health according to the special characteristics of the surrounding environment, and controlling the environmental quality during operation, improving the benefit of environmental protection, accumulating data on daily environmental quality, and executing environmental monitoring work, which helps to improve environmental benefit, effectively offset unexpected environmental impact, immediately take effective measures, and minimize the losses caused by environmental pollution incident.

Environmental monitoring plan mainly includes pollution factors in the project, the areas impacted, environmentally sensitive areas, and monitoring means. When environmental monitoring plan is determined, all-around planning, reasonable arrangement and optimization of distribution points should be carried out under the principle of practicality, economy and prioritized monitoring of main pollutants.

The environmental monitoring factors during operation project mainly include flue gas, wastewater, noise and solid waste, of which monitoring of flue gas should be the priority. The plan for environmental monitoring is worked out according to characteristics of the project and environmental requirements. It can be adjusted according to the actual situation of project operation.

Monitoring will be conducted in the factory area according to the environmental monitoring plan and submit monitoring data on temperature of flue gas, dust volume, SO_2, HF, HCl, NO_2, CO, heavy metal and dioxin. as obtained through air monitoring as well as documents on operation and utilization effect of flue gas treatment facilities and wastewater drainage facilities. to the competent environmental authorities, so that the district-level and municipal environmental authorities can be aware of the control on environmental pollution caused by waste treatment plant and operation of the plant at any time.

8.4.1 Atmospheric Environment Monitoring Plan

The factory area should include environmental protection work into management work and make environmental protection work the responsibility of every department in the factory area. Environmental protection work should be deployed and arranged in a reasonably and uniformly. It is required that the enterprises should attach importance to both terminal treatment of pollution and whole-process control of production, and both reduction of pollution sources and comprehensive utilization, so that environmental pollution can be prevented. Environmental management after completion of the factory area mainly focuses on flue gas generated from incineration and malodour of waste storage pool as well as odor produced by wastewater treatment.

Disposal of air pollutants should conform to Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2001), and the total volume of discharged pollutants must meet the total volume control standard that is calculated on the basis of the design standard. Meanwhile, the requirements for “standard-conforming discharge and total volume control” should be met; the concentration of H_2S, NH_3 and flue gas in production workshop should meet the requirements of Limited Value of Occupational Contact with Hazardous Factors in Working Place (GBZ2-2002); the noise in workshop should meet the requirements of Design Standard for Noise in Industrial Enterprises.

Atmospheric environment monitoring plan should include the following aspects according to the characteristics of the project and environmental requirements.

(1) Online Monitoring of Incineration Zone

It is necessary to install online flue gas monitoring apparatus which can automatically monitor and continuously record flue gas discharge, and to announce the monitoring data to the society via the large electronic screen in environmental park, so as to ensure the emitted gases conform to the emission standard.

The monitoring items include volume of emitted waste gases, temperature of flue gas, internal temperature of incinerator, soot, SO_2, NO_2, HCl and oxygen content.

The automatic monitoring result should be shared via network with the local environmental protection authority; the dosage of activated carbon must be measured.

The pressure difference of bag filter should be monitored regularly during project operation. If abnormality is found, replacement should be done immediately.

The amount of dioxin in flue gas should be measured in the initial stage of project operation and after incinerator is examined and reused. In addition, the amount of dioxin should be monitored for one time before trial operation of the project.

(2) Online Monitoring of Malodour in Factory Area

In view that waste storage pits in domestic waste incineration power generation plants impose considerable influence on the surrounding environment in case of accidental discharge, to which the public has remarkable response. Therefore, it is required that an online malodour testing system (online malodour electronic nose) should be set in the southern part of the factory area, which can carry out automatic real-time monitoring of malodour discharge from the factory area and announce the data to the public via the large electronic screen in the environmental park, so as to ensure that the emitted gases conform to the emission standard. Meanwhile, the automatic monitoring result should be shared via network with the local environmental protection authority. If any abnormality is found, it should be immediately handled and the influence of malodour should be minimized by various means (e.g. use of deodorizer).

The monitoring items include concentration of malodour, H_2S and NH_3.

(3) Regular Monitoring of Factory Area

The owner should commission a qualified monitoring department to conduct regular monitoring on the factory area regularly according to the requirements of environmental protection management department after the project is completed.

The monitoring items include flue gas, malodour, H_2S and NH_3.

Monitoring frequency: once a quarter

(4) Regular Monitoring Outside Factory Area

① Location of monitoring spots: Lanzilong Village, Huangsha Village, Country Garden

② Monitoring items: flue gas, SO_2, NO_2, HCl, Pb, H_2S, NH_3 and dioxin

③ Monitoring time and frequency of air background: monitoring for one time before trial operation of the project

④ Monitoring time and frequency of ambient air quality: at least once a year

8.4.2 Monitoring Plan for Surface Water Environment

(1) Monitoring point: rainwater that is separated from wastewater, the brook in front of the factory, and sandy land water

(2) Online monitoring items: pH, CODCr, BOD_5, ammonia nitrogen, SS, lead, cadmium, Hg, water temperature and flow

Regular monitoring items: pH, COD_{Cr}, BOD_5, ammonia nitrogen, SS, Hg, Cd and Pb.

(3) Monitoring Frequency

① Rainwater outlet: online monitoring. Fluid level gauge, electric valve, flowmeter, pH controller and sensor are adopted to conduct real-time monitoring on rainwater drainage process via computer monitoring system, and to automatically collect on-site data and conduct statement statistics.

② The brook in front of the factory and sandy land water: at least twice a year during low flow period and average flow period. Each time of monitoring should be carried out for two days under normal operation conditions with a frequency of once a day.

8.4.3 Monitoring Plan for Underground Water Environment

(1) Monitoring point: the existing 5 monitoring points should be fully used.

(2) Water quality monitoring items: pH, total hardness, dissoluble total solid, permanganate index, nitrate, nitrite, NH3-N, Pb, Cd, Hg and total coliform.

(3) Monitoring frequency: at least once a quarter. If any index is found over the standard during monitoring, the monitoring frequency should be increased until the monitoring result becomes normal.

(4) Underground Water Monitoring Management

To ensure that underground water monitoring is managed in an effective and orderly way, it is necessary to stipulate corresponding regulations to define responsibilities and to take scientific management measures and technical measures.

From the management perspective:① The environmental protection management department in the factory area should dispatch specially-assigned personnel to take charge of underground water pollution control and management; ② Commission qualified monitoring agency to take charge of underground water monitoring and duly analyze and coordinate original data and compile monitoring report according to relevant requirements; ③

Establish underground water monitoring data management system which is linked to environmental protection management system in the factory area; ④ Carry out classification according to the actual situation as well as nature, category, influential scope and influential degree. of accident, and work out contingency plan according to the potential threats in environmental pollution accident happening in the factory area.

From the technical perspective: ① Duly coordinate and report monitoring data and relevant forms in strict conformity with the requirements of Technical Specifications for Monitoring of Underground Water Environment (HJ/T 163-2004); ② Once the monitoring data on the quality of underground water is found to be abnormal in daily monitoring, it is necessary to check the data as soon as possible to ensure they are reliable, and report the verified data to safety and environmental protection department in the factory area. The specially-assigned personnel should analyze the data, pay close attention to operation of production facilities, immediately be informed of abnormalities in the production in factory area, the abnormal equipment and the causes, enhance monitoring frequency and intensity, and duly analyze the change of the quality of underground water; ③ Regularly compile monitoring report on underground water; ④ Regularly inspect and maintain production devices, pipelines, flanges, valves and pipes. in the key pollution control area.

8.4.4 Solid Waste Monitoring Plan

(1) Monitoring items: volume and destination of slag (including reclaimed scrap metal), fly ash, residual sludge after wastewater treatment and other wastes

(2) Monitoring method: fill in waste volume statement every day and explain the destination and reclamation of wastes; conduct quarterly solvent extraction test on slag and fly ash to determine the ingredients and analyze the concentration of heavy metals (including Cd, Pb, Ni, As, Hg, Cr, Cr6+, Cu, Zn, Be, Ba), so as to facilitate the implementation of corresponding treatment measures and keep records in this regard.

8.4.5 Noise Monitoring Plan

(1) Monitoring items: equivalent continuous Class A sound level

(2) Monitoring task: monitoring on major noise source and noise in the factory area

(3) Monitoring time and frequency: twice a year; two days per round, respectively in daytime and nighttime

8.4.6 Soil and Plant Monitoring Plan

(1) Location of monitoring spot: monitoring on soil and plants at two monitoring spots—Lanzilong and Huangsha Village

(2) Monitoring items: 8 indexes including pH, Zn, Cu, Pb, chromium, cadmium, Hg and dioxin.

(3) Monitoring time and frequency of soil and plant background: one time before trial operation of the project

(4) Regular monitoring time and frequency of the quality of soil and plant environment: once a year; once a round

8.4.7 Wastewater Monitoring

The drainage outlet of the leachate treatment plant in this project is equipped with online monitoring apparatus, for the purpose of monitoring SS, COD_{Cr}, BOD_5, ammonia nitrogen and pH, so as to duly adjust technical parameters and make the discharged water reach the environmental protection requirements, thus realizing online monitoring of environmental protection.

8.4.8 Deployment of Monitoring Personnel and Setup of Laboratory

Deployment of monitoring personnel and setup of laboratory may be carried out as fundamental work. The factory area will provide the incineration plant with environmental monitoring and experimental analysis services. The factory area should be equipped with at least two specially-assigned employees who are in charge of environmental monitoring and experimental analysis work in the factory area. The laboratory should be equipped with some regular analyzing apparatus, so as to meet the analytic demand of regular monitoring items of wastewater and waste gas. As for unconventional items such as dioxin, they can be analyzed by qualified agency through entrustment.

8.5 Suggestions on Waste Outlet Standardization

Setup of waste outlet in this project must meet the standardized requirements on waste outlet as raised by the environmental supervision authority.

(1) Wastewater Outlet

The project is equipped with only one waste outlet (It is located at the southern side of the environmental park, being adjacent to the location of Changlonggang civil sewage pipeline).

(2) Waste Gas Outlet

Waste gas outlet must have required height and meet the requirements for facilitating sampling and monitoring as provided in Technical Code for Pollution Source Monitoring. Exhaust chimney should be fitted with permanent sampling hole; sampling & monitoring platform should be installed; the sampling hole should be jointly determined by the municipal environmental supervision team and municipal environmental supervision center.

(3) Fixed Noise Source

Fixed noise should be disposed in line with relevant regulations; signboard should be set at noise environmentally sensitive area at the boundary and the spot where the noise imposes the greatest influence on the ambient environment.

(4) Requirements for Signboard Setup

Environmental protection logos are made by National Environmental Protection Administration through designating a fixed agency. The municipal environmental supervision authority should place order for the logos to National Environmental Protection Administration according to the situation of enterprises' waste discharge. Distribution maps of enterprises' waste outlets are made by the municipal environmental supervision detachment. Ordinary pollutant outlets (sources) should be fitted with hinting signboards; outlets of toxic and hazardous pollutants should be fitted with warning signboards.

Signboards should be set at a high-profile place near the waste outlet (sampling spot), with its upper side being 2 meters above the ground. If there is building within 1 meter from the waste outlet, planar signboard should be set; if not, vertical signboard should be set.

Relevant facilities used to standardize waste outlets (e.g. figure signboard, metering equipment and monitoring equipment) belong to environmental facilities. Waste discharge units must be responsible for carrying out daily maintenance of the facilities. Any unit or individual shall not dismantle such facilities without authorization.

8.6 Introduction of Third-party Supervision and Environmental and Social Supervision

It is suggested that third-party supervision and social supervision should be introduced, so as to ensure the channel of information exchange between the incineration plant and the surrounding residents.

Third-party supervision should be undertaken by a third-party supervision organization that is independent from the government and enterprise.

Social supervision should be carried out with the surrounding village and residential quarter divided as a unit. Representatives should be elected and form a social supervision group which will conduct investigation in the factory area regularly or irregularly.

In addition, the construction unit should set an open day and allow the public (i.e. village leaders, villagers and other relevant stakeholders) to visit the site and discuss their concerns with the project management of the factory area at least once a quarter. Every quarter, Project Management will update the surrounding villages on status of environmental indicators (noise, traffic, dust, etc) and actions on concerns raised by them.

8.7 List of Daily Monitoring Indexes

The indexes of daily monitoring on pollution source and environmental quality during project operation are as shown in Fig. 8.7-1 and Fig. 8.7-2.

Fig. 8.7-1 List of Pollution Source Monitoring Indexes

Pollution Source	Monitoring Means	Monitoring Items	Frequency of monitoring	Responsible group	Budget RMB/YEAR
Production flue gas	Online monitoring	Temperature of flue gas, volume of flue gas, soot, HCl , SO_2, NO_2 and CO; simultaneous monitoring of furnace temperature, oxygen content and dosage of activated carbon	Daily	Environmental protection Bureau	Within RMB60000
Pollutant with flue gas characteristics	Sampling monitoring	Pb, Cd, Hg and dioxin	Quarterly	Environmental protection Bureau	Within RMB60000
Pollutant with malodour characteristics	Online monitoring and sampling monitoring	Concentration of malodour, H_2S and ammonia	Daily	Environmental protection Bureau	RMB20000
Regular	Online	Volume of wastewater and	Daily	Environmental	RMB20000

monitoring of waste outlet	monitoring	COD_{cr}		protection Bureau	
Monitoring of waste outlet	Sampling monitoring	pH, BOD_5, NH3-N, SS, Pb, Cd, Hg, and water volume	Quarterly	Environmental protection Bureau	RMB60000
Noise in factory area	Field monitoring	Leq（A）	Quarterly	Environmental protection Bureau	RMB500
Industrial solid waste	Field survey	Volume and treatment of slag and fly ash; situation of comprehensive utilization of slag	Quarterly	Environmental protection Bureau	RMB50000

Fig. 8.7-2 List of Environmental Quality Monitoring Indexes

Environmental Medium	Monitoring Means	Monitoring Spot	Monitoring Frequency	Monitoring Items	Responsible Group	Budget
Ambient air	Sampling monitoring at downwind environmentally sensitive area	The nearest downwind environmentally sensitive area	At least once a year	Soot, SO_2, HCl, H_2S, ammonia, NO_2, Pb, Cd, Hg and dioxin	Environmental protection Bureau	Total RMB60000/year
		Spot where concentration of ground-level pollutant is greatest			Environmental protection Bureau	

	Online monitoring at factory boundary	Factory boundary	Real-time	Concentration of malodour, H_2S and ammonia	Environmental protection Bureau	
	Sampling monitoring at factory boundary	Factory boundary	Quarterly	Dust, malodour, H2S and NH3。	Environmental protection Bureau	
Underground water	Sampling monitoring	Factory area	Quarterly	pH, permanganate index, ammonia nitrogen, Hg, As, Cd and fluoride	Environmental protection Bureau	RMB20000/year
Surface water	Sampling monitoring	The brook in front of the factory and sandy land water	At least twice a year	pH, CODcr, BOD_5, NH3-N, SS, Pb, Cd and Hg	Environmental protection Bureau	RMB10000/year
	Online monitoring	Rainwater outlet	Real-time	pH, COD_{Cr}, BOD_5, ammonia nitrogen, SS, lead, cadmium, Hg, water temperature and flow	Environmental protection Bureau	
Soil in the fly ash solidification ground	Sampling monitoring	Fly ash solidification ground	At least once a year	pH, Hg, As, Cd, Pb, Cr, and dioxin	Environmental protection Bureau	RMB50000/year
Soil in the	Sampling	Upwind	At least	Hg, Cd, Cr, Pb, As	Environmental	

ambient environment	monitoring at one spot in upwind direction and another spot in downwind direction	direction of the factory site	once a year	and dioxin	protection Bureau	
Crops	A place 1km away from the chimney	Downwind direction; spot where concentration of ground-level pollutant is greatest	At least once a year	Hg, Cd, Cr, Pb, As and dioxin	Environmental protection Bureau	RMB20000/year

8.8 Risk Control Measures

8.8.1 Site Selection, Master Plan Layout and Preventive Measures for Building Safety

(1) Project Site Selection

It can be seen from the analysis in Chapter II that the project site selection conforms to the requirements of Technical Code for Municipal Solid Waste Incineration Project (CJJ90-2009), Notice on Further Enhancement of Evaluation Management of Environmental Impact by Biomass Power Generation Projects (H.F.[2008]No.82) and Environmental Protection Planning During "12th Five-year Plan" Period of Huizhou City (2007-2020) as well as relevant requirements of laws and regulations on air and water pollution control.

In the master plan layout, sufficient firefighting safety distance is left in the layout of various production areas, devices and buildings; the road design meets the passage requirements of fire vehicle.

Layout is arranged according to the direction of sound source as well as the shielding effect of building and absorption of greening plants; the production and management areas are isolated from operation areas in various treatment centers via the greening belt to reduce the harm of noise.

Alarm signboards are set up at every dangerous spot in line with the national standards—Safety Signs and Guidelines for the Use of Safety Signs.

(2) Master Plan Layout

In the master plan, roads and greening belts are arranged to reasonably separate various functional zones under the principle of land saving, compact layout and convenience of construction and production management. For the master plan layout of the project, please refer to Attachment 6.

The master plan layout is designed in consideration of meeting the requirements of process flows, reasonably using land, fully combining with the natural environment of the existing land, making the transport route and various pipelines unobstructed and short, and meeting the production and fire safety requirements.

The main workshop is arranged in the center of the factory area. Waste unloading hall, waste storage pit, boiler room, flue gas treatment room and chimney are arranged in order from the northeast to the southwest; vehicle & machine room, control room and power distribution room. are arranged at the eastern side of the main workshop; approach bridge is arranged at the northwest side of the main workshop; integrated water pump room and cooling tower are arranged at the southwest side of the main workshop; wastewater treatment station is at the west side of the main workshop. At the northeast corner of the ground is a complex building which is in upwind direction in summer and consists of dining room and temporary shift dormitory. There is a fairly large greening belt between the complex building and the main workshop. The layout enables full use of the ground, featuring integral and reasonable layout and short pipelines.

(3) Roads and Greening in Factory Area

The factory is installed with two entrances—pedestrian entrance at the southern side of the factory area and logistic entrance at the northern side, for the purpose of clean-dirty flows separation. Garbage trucks enter factory via logistic entrance and then enter waste unloading hall for waste unloading to waste storage pit after they are weighed on the weighbridge. The pedestrian entrance is for the passage of managerial personnel and office personnel.

Roads in the factory area are urban concrete roads. The surrounding area of the main building is designed with circular road, which can, while meeting the production process flows, ensure smooth transportation and short distance to avoid unnecessary turns. In addition, firefighting road and transportation roads are properly combined, so that fire engines can swiftly reach every building in the factory area.

The width of the main road in the factory area is 7 meters, secondary road is 4 meters, and waste transportation road is 9 meters.

Every inch of land are considered in greening layout. Both sides of roads, open areas around buildings and slopes are fully used for greening, with lawn and evergreen trees as the main greening vegetation, so that greening can accompany buildings when guiding traffic and beautifying space. Top priority is given to the greening square in front of the complex building. Evergreen trees and shrubs are planted together with flowers and grass, so as to decorate water scenery and create a lively, spacious and comfortable environment.

8.8.2 Fire and Explosion Prevention Measures for Diesel fuel Pipeline

(1) Diesel fuel pipeline must be made of metal material that is resistant to pressure, acid & alkali erosion and shock and have long service life.

(2) Design, manufacture, installation and maintenance of equipment, pipeline, valve and flange. of diesel fuel system should be carried out in line with relevant codes, specifications and standards to ensure they are watertight and free of leakage. In case of leakage, it should be immediately handled. Pipeline must undergo tightness test and be

fitted with toxic gas testing and alarming apparatus.

(3) Test leakage with fire is forbidden; using high-temperature or bright light instrument to examine diesel fuel pipeline is forbidden.

(4) When gas cut-off and pressure reduction for laying of diesel fuel pipeline are required, the height of diesel fuel bleeder should be 2 meters higher than the height of pipeline; when diesel fuel is discharged, it should be ensured that there is no fire in the prescribed downwind area.

(5) Pipeline system should be fitted with reliable grounding and static eliminating devices.

(6) The places using gas should be fitted with reliable ventilation device.

(7) Low-pressure alarm signal device should be set.

(8) Entry of automobiles and motor vehicles. into Class A production area is forbidden.

(9) Strict fire using examination & approval system should be implemented.

(10) There should be no regulation-violating structures and facilities above the underground diesel fuel pipeline.

(11) In case of fire caused by leakage of pipeline, it is necessary to first spray water and cool the pipeline to prevent increase of leak due to pipeline distortion, and cut off the gas source.

(12) Completeness of firefighting facilities should be ensured in line with the provisions of fire control law.

(13) Diesel fuel pipeline should meet the requirements of Quality Inspection and Evaluation Standard for Industrial Metal Pipeline Works (GB50184-1993).

(14) Laying of diesel fuel pipeline should conform to the requirements of Fire Prevention Code of Petrochemical Enterprise Design (GB50160-1992; Edition 1999) and Fire Prevention Code for Crude Oil and Natural Gas Engineering Design (GB50183-1993); laying of cable should conform to Code for Design of Cables of Electric Engineering (GB50217-1994).

(15) In case of fire in diesel fuel pipeline, inflammable or toxic substances left after fire is put out should be discharged via pipeline into fire control pool and then into biochemical treatment facilities for treatment.

8.8.3 Risk Control Measures for Flue Gas Purifying Facilities

Limestone that does not react completely in half-dry reaction tower may enter dust catcher along with flue gas. If bag-type dust catcher is adopted as dedusting equipment, part of the substances that do not react will attach to bag filter and react again with acidic gas penetrating the bag filter, thus further improving the deacidification efficiency and the utilization rate of hydrated lime.

Domestic and overseas operation of bag-type dust catcher with half-dry reaction tower has quite a lot of experience and the system operation is reliable.

Heavy metal enters dust catcher in the form of solid, liquid and gas. When flue gas is cooled down, the gas will transform into catchable solid or liquid particles. Therefore, the lower the temperature of waste incineration flue gas purifying system is, the better the purifying effect of heavy metal will be.

Municipal solid waste contains lots of chlorine and organic substances. Therefore, the flue gas generated from boiler usually contains dioxin substances (PCDD and PCDF) and other organic pollutants. Firstly, incineration control technique should be preferentially adopted to avoid generation of dioxin. The following measures should be taken in the process:

(1) Fully stir and blend waste during incineration to ensure uniform and complete combustion;

(2) Control flue gas to stay in furnace for at least 2 seconds at the temperature of over 850℃, so as to ensure full decomposition of dioxin;

(3) Shorten the stay time of flue gas at a temperature of 300-500℃ as much as possible, so as to reduce regeneration of dioxin substances;

Moreover, necessary control measures should be taken in the follow-up process, namely, spraying activated carbon into flue gas pipeline after the reaction tower to absorb dioxin in flue gas, and then make it enter bag-type dust catcher to ensure full absorption. Half-dry purifying process should be adopted. Activated carbon spraying device should be installed on the pipeline in front of dust catcher. Dry activated carbon should be sprayed into the pipeline in front of the dust catcher via spraying draught fan in aerodynamic form, so as to remove heavy metal and dioxin substances via absorption through the contact of bag filter and flue gas.

8.8.4 Fire and Explosion Prevention Measures Adopted in Process and Device

(1) Fire Prevention Measures Adopted in Workshop

According to the functions and architectural characteristics of the main workshop, the workshop is fitted with indoor fire hydrant and portable fire extinguisher, so as to meet the demand of fire control in workshop. The fire hydrant is fitted with manual alarm device; the upper part of the waste hopper is installed with water spraying device. The feed port of boiler is specially fitted with firefighting nozzle which is used as automatic firefighting facility at the feed port; the power distribution room and the main control room are also installed with portable gas extinguisher to avoid occurrence of electrical fire.

(2) Safety and Preventive Measures for Electric Shock, Fire and Explosion

The neutral line direct grounding system-- TN-S (or TN-C-S) system is adopted as power distribution system for low-voltage factory. Leakage protection device is adopted in socket circuit and mobile electric equipment.

Emergency lighting is installed in important places; evacuation indicator light and exit signal lamp are installed in evacuation passage and exit. 36V safe voltage is adopted for portable light used for inspection and repair as well as light fittings used in tunnel and other moist places. Safe voltage not higher than 36V is adopted for power supply to light fittings that are installed at places less than 2.4 meters above the ground and light fittings for the boilers.

Import buildings (structures) such as main workshop, chimney and cooling tower are fitted with lightening arrester. Large-sized metal equipment and pipelines should be grounded and a grounding grid should be formed by beams, poles and steel bars in foundation, for the purpose of avoiding thunder strike.

All metal parts of electric equipment that are not live normally should be grounded.

Explosion-proof exhauster should be adopted in rooms containing explosive, corrosive and hazardous gases. The explosive, corrosive and hazardous gases are not used in the project.

8.8.5 Measures for Handling Emergency Machine Shutdown and Accident during Production

Automatic control system with programmable logic controller (PLC) as the master control system is used in power plant. Parameters needed by safe operation are set up for inspection, alarm and control of the system, which monitors the combustion of incinerator in an all-around way, including temperature, pressure, flow and liquid (feed) level of the main equipment as well as operation of rotating equipment. With the remote transfer and on-site apparatus, meters and controllers, operators can be informed of the operation at any time, which can ensure long-term safe operation of the power plant.

When the control system finds that certain equipment fail, it will send the order of emergency shutdown to immediately stop the operation of the failing equipment. The corresponding information on shutdown will be transmitted via PLC to the corresponding operating station, so that operators can handle the issue. All automatic controls are finished in PLC control station. If the master controller fails, the backup controller will automatically put into operation and ensure normal operation of the system. The master control room is also equipped with backup panel which is fitted with emergency button and a few of regular apparatus. That is, the protective measures for apparatus control system in the power plant in emergencies can ensure equipment and personnel safety in case of grave accident.

8.8.6 Hazardous Substances Generated from Production Process and Preventive Measures

(1) Waste will emit malodour during storage and transportation, which will pollute the surrounding air and harm the physical and mental health of the operators. To improve the workers' working conditions and reduce environmental pollution, the following measures are taken during design.

① The waste unloading platform is installed with automatic door which opens automatically when garbage truck dumps waste and closes automatically after the dumping is finished, which can avoid emission of the majority of malodour from the waste tank. The unloading platform should be duly cleaned with water.

② Air-proof measures are taken for waste feeding equipment, so as to reduce outflow of dust and malodour.

③ The exhaust inlet of draught fan sucks malodour above the waste pool into incinerator and negative pressure is maintained to avoid outflow of malodour.

④ Slight negative pressure is maintained in the incinerator, waste heat boiler and flue by draught fan.

⑤ Boiler room and flue gas purification room are equipped with ventilators which can keep the air around the boiler fresh.

⑥ The waste in the waste pool should be stirred and mixed to avoid anaerobic fermentation and reduce generation of malodour.

⑦ For production posts that are harmful to operators' health, remote operation should be conducted.

⑧ Air supply system via centralized air conditioning is adopted in the central control room and PLC cabinet room, which can ensure positive pressure in the rooms and avoid inflow of malodour.

(2) The following solutions should be taken in places with hazard of dust.

① Incinerator, waste heat boiler, reaction tower and dust catcher are operated under negative pressure, to avoid leakage of dust, soot and harmful gases generated from combustion.

② Fly ash is transported out by enclosed scraper conveyor.

③ Unloading of calcium oxide and activated carbon is conducted in air-proof condition. The air used for unloading is emitted to the atmosphere after going through dust catcher, so that dust will not be dispersed into the air in the workshop.

(3) There may be leakage of acid and alkali fluid in the chemical liquid preparation workshop, so anti-corrosion measures should be taken for the floor and wall, and forced ventilation device should be installed.

8.8.7 Preventive Measures for High-temperature and High-pressure Equipment and Facilities

The incinerators, key equipment of flue gas purification facilities, steam turbines and other equipment belonging to pressure container that are adopted in the project are all internationally or domestically advanced equipment, which can ensure the avoidance of explosion accident during construction, installation and operation as long as relevant operational regulations are not violated.

Boiler operators should operate equipment in strict conformity with relevant codes. Regular examination of pressure containers, pressure test as well as training and assessment of the operators should conform to Safety Supervision Code for Steam Boiler stipulated by State Labour Bureau and Safety Technology Supervision Code for Pressure Container stipulated by Ministry of Labour and Personnel.

Moreover, high-temperature pipelines and equipment are covered with insulating layer, which not only can save energy, but also avoid scald of operators.

8.8.8 Layout of Inflammable, Explosive and Dangerous Chemical Storage Room and Preventive Measures

(1) For inflammable and explosive storage rooms, double detection means—smoke sensor and flame sensor should be installed to enhance the fire prevention measures.

(2) The dosing room is equipped with pre-treatment chemical filling device, mixed ion exchanger resin regeneration device, demineralzed & ammoniating device, boiler phosphate adding device, chemical adding device for adjusting pH value of waste liquid, and device for adding corrosion inhibitor to recycled water. Mechanical ventilating device is adopted. The door and window of chemical adding room are designed to open outward. The two separate exits used as ventilating passages during normal operation can be used as safety exits in case of accident. Anti-corrosion measures are taken for the ventilating device. The chemical liquid

preparation room is fitted with anti-leakage device and chemical cleaning device. The chemical preparation room is equipped with mechanical ventilation device for which anti-corrosion measures are taken.

8.8.9 Preventive Measures for Falling from High Altitude

All places at height that may result in personnel falling, such as high corridor, platform, ladder, hole for hoist, examination & repair place and basic platform of steam turbine, should be fitted with railings. Silos, gutters, pools and hole for hoisting should be fitted with covers or grilles. Railings should be installed around the waste pool to avoid accidental falling of workers.

8.8.10 Preventive Measures for Dangers Caused by Hoisting Machinery

Hoisting equipment should be marked with hoisting tonnage and should be fitted with overload limiter, hoisting controller, stroke limiter, buffer and automatic interlocking device, so as to ensure safety. Layout of equipment in workshop and working place should confirm to safety requirements. In addition, the supervision on hoisting operation should be enhanced to avoid personal injury.

The motor, auxiliary equipment and pulley of elevator should be installed in special-purpose elevator room. Only authorized maintenance, inspection and rescue personnel can access the motor, auxiliary equipment and pulley of elevator. A passage with constant lighting that leads to the elevator room should be built. The elevator room is equipped with necessary power supply for ventilation, lighting and examination & repair, so that maintenance personnel can carry out maintenance of the elevator facilities. The elevator shaft is fitted with ventilating hole, exhaust hole and necessary access hole.

As cranes have to operate in high-temperature and dusty environment, they are fitted with enclosed driver’s cab which is set at one end of the non-conductive bare slide wire, so as to reduce the risk of electric shock. Platform ladder is installed outside the driver’s cab, so that driver can enter and leave the cab safely.

8.8.11 Anti-risk Measures for Air-proof Negative-pressure Operation of Waste Storage Pit

Waste storage pit is of reinforced concrete structure and semi-underground. It covers an area of 57x22.4m^2 and can accommodate 6900 tons of waste, which can meet the requirements for storing waste for six days. The air in waste storage pit is sucked to incinerator with draught fan, so as to control outflow of malodour and accumulation of methane, and maintain the negative pressure of waste storage pit.

The malodour of waste is fairly grave when boiler is shut down due to accident or examination & repair. The vented gas from waste storage pit must undergo deodorization treatment, with the air exchanging frequency being 1 to 1.5 times per hour. Activated carbon absorption device is used for deodorization to eliminate the influence resulted by malodour on the ambient environment.

To ensure negative pressure of draught fan, the waste unloading platform is installed with automatic door which opens automatically when a garbage truck dumps waste and closes automatically after the dumping is finished, which can avoid emission of most of malodour from the waste tank.

When the negative pressure device in waste storage pit fails, it is necessary to immediately close the unloading door, open the forced ventilation accident response system, and spray deodorizer, so that waste gas will be discharged after being absorbed by activated carbon and the impact resulted by malodour on the ambient environment can be reduced.

The greatest probability for failure in negative pressure of waste storage pit happens during trial operation period. Therefore, it must be ensured that the forced ventilation accident response system can be effectively used when the negative pressure of waste storage pit fails. This mechanism is easily neglected by the manufacturer. It should be included in the monitoring system and job training content.

In view that waste storage pits in domestic waste incineration power generation plants have considerable impact on the surrounding environment in case of accidental discharge, to which the public has adverse response. Therefore, it is required that an online malodour testing system (online malodour electronic nose) should be set in the southern part of the factory area, which can carry out automatic real-time monitoring of malodour discharge from the factory area and announce the data to the public via the large electronic screen, so as to ensure that the emitted gases conform to the emission standard. If non-conformance with standard is found, equipment should be immediately examined and repaired and the influence by malodour should be minimized through spraying deodorizer or by other means.

8.8.12 Preventive Measures for Risks Caused by Dioxin

Mixing of industrial waste with municipal solid waste that is to be disposed in incinerator is forbidden, especially industrial waste containing high content of chlorine, such as composite leather, cable sheath, and chemical castoff. Meanwhile, metal castoff containing copper should be forbidden from entering the waste storage pit. When the content of such kind of waste is found to be high, the waste should be immediately grabbed to another place with grab bucket, and then removed out of the waste storage pit, and finally transported to special-purpose waste incineration plant or landfill for treatment.

When the temperature of secondary combustion chamber is lower than 850℃, the distributed control system (DCS) control room will send audible and visual alarm to remind operators of temperature control procedures. When necessary, combustible gas will be injected into the combustion chamber, so as to raise the temperature of secondary combustion chamber and avoid incomplete decomposition of dioxin. Audible and visual alarm will stop only when the temperature exceeds 850℃.

When the content of oxygen at the flue gas outlet is lower than 6%, the DCS control room will send audible and visual alarm to remind operators of adjusting oxygen content and raising the power of blower. When necessary, DCS will activate automatic control mode and raise the frequency of blower frequency converter, so as to avoid incomplete decomposition of dioxin due to low content of oxygen. Audible and visual alarm will stop only when the content of oxygen is higher than 6%.

The activated carbon storage tank should be installed with feed level testing device which will be displayed on DCS. When the feed level is low, the DCS control room will send audible and visual alarm to remind operators of filling activated carbon. Audible and visual alarm will stop only when the feed level is higher than the alarm level.

8.8.13 Preventive Measures for Risks Caused by Incinerator Shutdown

As the fly ash generated from waste incinerator is fairly fine, which has fairly complex pores and has considerable adsorptivity, it may absorb dioxin in flue gas. Therefore, soot blowing should be enhanced immediately after the incinerator is shut down. When it is decided to shut down incinerator, soot blowing device should be activated to blow the parts where ash easily deposits, such as heating surface of boiler, convection tubes, superheater and economizer, so as to blow the ash from these places to dust catcher for ash collection by bag filter. When boiler begins to cool down, blow it every 3 to 4 hours until it completely shuts down, which can reduce the possibility that dioxin is carried by low-temperature flue gas into the air when the boiler is started next time.

8.8.14 Firefighting and Fire Alarm System

In the design of master plan, the danger of fire in workshop belongs to Type D. The fire resistance class of building should not be lower than Class II. The fire separation distance should meet the requirements of 3.4.1, 3.4.4 and 4.5.1 of Code of Design on Building Fire Protection and Prevention.

The building is built mainly of reinforced concrete poles and light-steel roofing structure. The danger of fire in workshop belongs to Type D, and the fire resistance class of building is Class II. The main body of the building belongs to high-rise industrial building which is equipped with anti-smoke escape stairway and fire-resistant wall which is built in line with relevant regulations. The fire control and safe evacuation meet the requirements of Code of Design on Building Fire Protection and Prevention (GB50016-2006).

The domestic water supply system and fire water supply system are independent from each other. Fire water supply system mainly consists of regular firefighting water system, automatic sprinkler system, detection & alarm system and mobile fire extinguishing system.

A fire alarm system for the whole factory is installed, which consists of intelligent fire alarm controller, intelligent temperature/smoke detectors, location monitoring module, control module, alarm buttons, and alarm bells. The fire control center is set in communication room which is equipped with intelligent fire alarm controller and firefighting linkage cabinet.

Fire alarm detectors, alarm buttons and alarm bells are installed in corresponding zones of the factory area in accordance with relevant regulations. After intelligent fire alarm controller receives alarm signals, the alarming place and time will be displayed on the screen and the records will be printed. Firefighting equipment can also activated by the intelligent fire alarm controller via firefighting linkage cabinet according to relevant requirements.

Fire hydrant buttons and alarm bells are installed besides all indoor fire hydrants in the factory area. Fire service pump will be activated when the button of fire hydrant is pressed, and the location of the button of fire service pump will be displayed by the fire alarm controller. The firefighting linkage cabinet is fitted with manually/automatically controlled fire pump and can display the state of operation or failure.

In view of the special nature of waste power generation plant, it should be taken into account that waste pool, leachate gutter, collecting pool, buffer pool and other places where inflammable gases are possibly concentrated are equipped with explosion-proof inflammable gas detector which links with the draught fan.

8.8.15 Preventive Measures for Water Drainage of the Project

8.8.15.1 Setup of Drainage System

(1) Drainage System

Drainage in the factory area is separated by clean flow and dirty flow. A total of four systems are established: primary rainwater collection & drainage system, rainwater drainage system, production & domestic water drainage system, and waste leachate collection & drainage system. The wastewater after treatment by the systems will be reused, so as to achieve zero discharge of wastewater from the factory.

Rainwater: drainage of rainwater is realized by using rainwater outlet, rainwater inspection well, rainwater pipeline and rainwater gutter. Rainwater on the roof is collected by rainwater drain and then discharged via vertical rainwater pipe and drainage pipe into outdoor rainwater well, rainwater outlet and rainwater gutter. Outdoor rainwater and rainwater on roads are collected via rainwater outlet and rainwater gutter and then discharged out of the factory via rainwater pipe and rainwater gutter, and finally discharged to river and waterway by the elevation difference.

The factory area is equipped with one underground primary rainwater collection pool (effective volume V= 130m^3). Rainwater is discharged to primary rainwater collection pool via dedicated pipeline, and then overflows to rainwater pipe in the factory area 15 minutes later. The primary rainwater collection pool is fitted with a booster pump. If the pollution of the primary rainwater is fairly slight, the rainwater can be reused via booster pump as greening water in factory area. If the pollution is fairly grave, the rainwater can be transported by booster pump via pressure pipe to the wastewater treatment system in the factory area for centralized treatment.

The waste leachate and other wastewater resulted from production in the project are all reused after being treated with different treatment processes.

(2) Firefighting Water Collection System

If an accident occurs, firefighting water will be directed to firefighting pool and adjusting pool in leachate treatment station and then reused after it is disposed with wastewater treatment system and reaches relevant standard.

8.8.15.2 Analysis on Wastewater Discharge in Accident and Emergency Storage Capacity

(1) Waste Leachate

In case of normal operation, wastewater resulted from production and daily wastewater is further treated after it is treated with wastewater treatment facilities in the factory area and reaches Class II standard. The treated water is totally reused. The sludge resulting from wastewater treatment facilities are transported to dump pit and finally disposed through incineration, without discharge of wastewater.

Given the largest volume of waste leachate resulted from similar projects in Guangdong region is 15% to 20% of the waste volume, the volume of waste leachate resulted from this project is 240m^3/d. The total designed capacity of leachate treatment project in the factory area is 500 t/d. A 300m³/d leachate treatment system was constructed at the primary stage, so it can be ensured that leachate can still be totally disposed when the volume of leachate reaches maximum value.

The designed capacity of the adjusting pool in waste leachate treatment station is $3600m^3$, which can accommodate various wastewater including leachate that is accumulated for nearly 8 days. It can be ensured that when accident happens in the wastewater treatment station, leachate and other wastewater is not discharged outside, which can avoid negative impact on the quality of surface water. Meanwhile, in order to effectively control possible overflow accident caused by enormous increase in leachate resulting from rainfall, the leachate adjusting pool is proposed to be fitted with a cover, so as to ensure rainwater does not enter leachate adjusting pool in rainy days.

(2) Preventive Actions for Firefighting Water Drainage at the Time of Fire

According to the feasibility analysis on the project, the source of firefighting water in the factory is recycled water from wastewater treatment plant in the downtown area of Huiyang. The capacity of the firefighting water storage pool is approximately $2000m^3$. It can be ensured that firefighting water is not used for other purposes in normal operation so that it can meet firefighting requirements.

Firefighting water from fire monitor in waste pool is discharged to the firefighting pool in leachate treatment station. For the sake of environmental protection, it is suggested that other firefighting water should be also discharged to the firefighting pool in leachate treatment station. The capacity of the firefighting pool in leachate treatment station is $3600m^3$, which can accommodate wastewater resulted from firefighting water. The adjusting pool in leachate treatment station which has a capacity of $3600m^3$ can be used in extreme situations. Accordingly, it is unlikely that dangerous substances are overflowed to the ambient environment along with firefighting water.

(3) Emergency Stop and Rescue Procedure and Recovery Actions

① Close rainwater drainage outlet in factory area to avoid direct discharge of leachate and firefighting water;

② Conduct post-accident emergency monitoring, mainly on the pollution indexes of wastewater outlet in the project;

③ Conduct post-accident summarization and announcement.

8.8.16 Risk Prevention Actions for Transportation System

The probability of accidental waste falling during transportation is very low, but the local influence is considerable, which includes the influence on road traffic, grave influence on environmental sanitation of roads and emission of malodour, and influence on the environment of the surrounding area. Therefore, accidental waste falling must be prevented.

Preventive and emergency measures include:

(1) Compaction and enclosure must be ensured during waste collection and transportation to avoid exposure, falling and leakage.

(2) In case of accident, it is necessary to take emergency measures, prevent fire from approaching the site, immediately report to local environmental sanitation department, and immediately clear the site of accident, so as to control and reduce the impact on the ambient environment.

(3) It is necessary to arrange motor vehicle drivers to take part in weekly safety activity, so as to constantly enhance their awareness and responsibility as well as their professional level.

(4) Drivers must conduct examination and maintenance before driving vehicles. Priority must be given to the examination of actuator, steering equipment, horn, indicator light, direction light, illumination, brake and tyre screw. to see whether they are safe and reliable. Driving vehicles when being sick is forbidden. Drivers must also conduct frequent examination and maintenance during driving or before going off duty. Transportation with excessive weight, width, length or height is forbidden. Drivers must focus their mind during driving, drive carefully, and maintain proper driving speed. The number of passengers in driving cab should not exceed the limit. Bringing hazardous articles onboard is forbidden.

8.8.17 Environmental Monitoring and Emergency Monitoring of Environmental Risks

(1) Daily Monitoring

The project should be equipped with professional environment monitoring station which is in charge of monitoring pollution source and environment.

(2) Emergency Monitoring

The project implements shift system for environmental risk. The company’s monitoring station has an emergency duty room where there are employees on duty 24 hours per day all the year round.

The project is equipped with emergency monitoring equipment and personnel who can receive at any time the information on pollution accidents from the company’s general control center, various department, various workshops and the public, immediately execute emergency monitoring scheme, dispatch monitoring and analyzing personnel, and cooperate with the company's environmental protection department to investigate and handle pollution source in environmental accident.

In case of urgent pollution accident, the company's monitoring station should, after receiving alarm, carry necessary monitoring facilities for air and water quality. to the site and monitor air and water body, and conduct sampling in downwind and downstream places within a certain range. The monitoring station should also conduct high-frequency emergency monitoring on affected site (at least once an hour) according to the type of accident, and select items to monitor and monitor pollution at any time according to situation of the accident, so as to provide basis for command emergency response.

As for monitoring that cannot be done by the company itself, the company should commission local environmental monitoring station to do the monitoring, immediately report to local competent environmental protection authority, commission environment monitoring station in the district to monitor pollution impact, declare beforehand the pollutants that may be discharged in accident, and assist monitoring station to work out emergency monitoring plan that is suitable for accidents that may happen in the company.

Chapter IX Conclusion

Construction of the project conforms to national industrial policy. Selection of project location complies with relevant planning of Guangdong Province and Huizhou City and meets the requirements of Notice on Further Enhancement of Evaluation Management of Environmental Impact by Biomass Power Generation Projects (H.F.[2008]No.82). The project location is legal.

Mature and effective waste gas treatment processes are taken in the project. The discharge standard for atmospheric pollutants is strict, so the project will not impose evident influence on the surrounding environment in normal operating conditions. When the environmental protection processes fail, it is necessary to take actions to minimize the influence.

From the perspective of environmental protection, construction of the project will not change environmental functions of the area on the premise that various pollution control processes mentioned in the report are implemented, so construction of the project is allowed, which will help to improve the condition of local environment.

As the project receives relatively high public attention, it is suggested that (i) third-party monitoring and social supervision should be introduced to regularly monitor any social and environmental concerns and recommend corrective actions, and (ii) communications and continued consultations between incineration plant management and the surrounding residents and other stakeholders should be enhanced, so as to minimize and address public dissatisfaction factors that may occur.

Annex A – Detailed Environmental Management and Monitoring Plan for the Huizhou Waste-to-Energy Project

People's Republic of China

Prepared by the Dynagreen Environmental Protection Group Co., Ltd to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgement as to the legal or other status of any territory or area

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A. Introduction

1. This Environmental Management Plan (EMP) is developed for the Huizhou 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.

B. Institutional arrangements and responsibilities for EMP implementation

4. The Dynagreen Environmental Protection Group Co., Ltd has established Huizhou 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, subcontractors and suppliers, and be responsible for construction supervision and quality control, including their monitoring of labor conditions of contractors and subcontractor workers and their compliance with the national albor laws and relevant core labor standards.

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; (iii) compliance with the national labor laws and relevant ILO core labor standards 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 their subcontractors, and that all contractors, subcontractors, and project agencies comply with the EMP.

(iv) Implement the Grievance Redress Mechanism

(v) Prepare and submit annual and semi-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, subcontractors, collection, storage and analysis of the monitoring data, and preparation of the annual environmental monitoring reports.

7. The Huizhou Environmental Monitoring Station (HEMS) (under the Huizhou 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. HEMS 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 and social impacts 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[4], 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 HEMS 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.

[4]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.

- 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 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 (including their subcontractors) 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

Phase	Responsible Agency	Environmental Responsibility
		measures to comply with relevant core labor standards; implement mitigation measures; conduct frequent noise and dust monitoring around construction sites.
	HEMS (contracted by environmental and social unit)	Undertake internal environmental monitoring; submit quarterly monitoring results to environmental and social unit,HEPB.
	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 EMP compliance review; support environmental and social unit in preparing quarterly project progress reports and semi-annual environment monitoring reports
	HEPB	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
	HEMS (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, HEPB.
	HEPB	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; HEMS =Huizhou Environment Monitoring Station; HEPB =Huizhou Environmental Protection Bureau; environmental and social unit = Huizhou Project Management Office; E&S officer = Environmental and social officer.

C. 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 HEMS, 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 Huizhou 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 Huizhou Environmental Monitoring Station to conduct project impact monitoring during construction.	environmental and social unit	ADB	environmental and social unit
			Contract Huizhou 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	HEPB, 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; HEMS= Huizhou Environment Monitoring Station; HEPB = Huizhou Environmental Protection Bureau;environmental and social unit = Huizhou Project Management Office; E&S officer = Environmental and social officer.; O&M = operation & maintenance; PME = powered mechanical equipment; TSP = total suspended particles.						

D. Monitoring and reporting

12. Three types of project monitoring will be conducted under the EMP.[5]

(i) Project readiness monitoring. To be conducted by the E&S officer.

(ii) Project impact monitoring. To be conducted by:(a) the Huizhou Environmental Monitoring Station (HEMS) under the Huizhou 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

[5]In addition to project-specific monitoring, Huizhou 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 HEMS 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	HEMS (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	HEMS (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; HEMS= Huizhou Environment Monitoring Station; HEPB = Huizhou Environmental Protection Bureau; environmental and social unit = Huizhou 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、COD_{cr}、BOD_5、SS、NH_3-N、Hg、Cd, Pb	Once every shift	Internal	Included in O&M budget
	Sampling	Plant wastewater outlet	1	pH、COD_{cr}、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

	One at 300m northwest of the plant One at 800m southeast of the plant	2	Dioxin			O&M budget
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[6]

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
(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

[6] 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)
(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 HEMS), 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 HEPB, 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	HEMS,	HEPB, 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	HEPB	Once; within 3 months of completion of physical works
Operational Phase				
Internal environmental monitoring	Environmental monitoring report (first year of operation)	HEMS	HEPB, environmental and social unit	Quarterly

Reports		From	To	Frequency
			Dynagreen	
	Environment progress and monitoring report	Dynagreen	ADB	Annual

Notes: ADB = Asian Development Bank; HEMS= Huizhou Environment Monitoring Station; HEPB = Huizhou Environmental Protection Bureau; environmental and social unit = Huizhou Project Management Office

E. 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, HEPB	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, HEPB	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, HEPB	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; HEPB = Huizhou Environmental Protection Bureau; environmental and social unit = Huizhou 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.

F. 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.

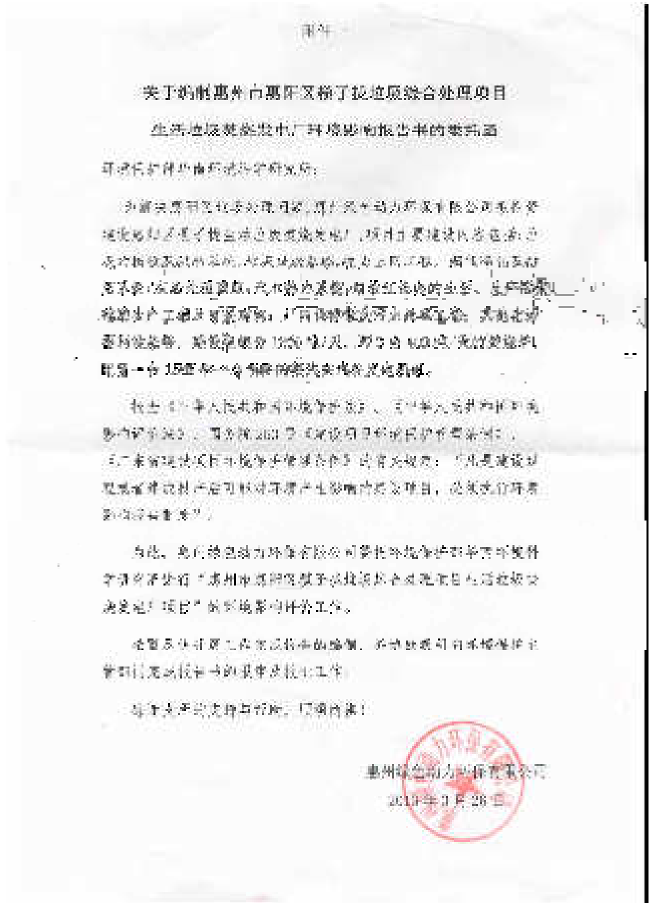
26. Future Public Consultation Plan. Plans for public involvement during construction and operation stages were developed during project preparation. These include public participation in (i) monitoring impacts and mitigation measures during the construction and operation stages; (ii) evaluating environmental 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.

G. 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

Attachment 1. Letter of authorization for the project



Main idea: The project with daily average treatment of municipal solid wastes 1,200t, equipped with 3x400t/d mechanical grate boilers and 2 straight condensing turbine generator sets (1*15MW+1*9MW).

According to the Environmental Protection Law of PRC, Environmental Impact Assessment Law of PRC, Administrative Regulations for Environmental Protection in Construction Project (Decree No. 253 of the State Council) and Management Regulation of Guangdong Province on Environmental Protection Management for Construction Projects: "Environmental impact report system shall apply to all construction projects that may cause environmental impact during construction or after putting into operation ".

For this purpose, Huizhou Dynagreen Environmental Protection Co., Ltd. commissioned South China Institute of Environmental Sciences. MEP to conduct environmental impact assessment on the Huizhou Waste-to-Energy Project.

Attachment 2. Project approval document

粤发改资环函〔2013〕257号

关于惠州市惠阳区榄子垅垃圾综合处理项目一期工程的复函

惠州市发展改革局：

你局《关于上报核准惠州市惠阳区榄子垅垃圾综合处理项目一期工程前期工作的请示》（惠市发改〔2013〕19号）及相关材料收悉。经审核，该项目是按照BOT和BT模式由社会投资建设的项目，根据现行的《广东省企业投资项目核准暂行办法》（粤府〔2005〕119号）、《固定资产投资项目节能评估和审查暂行办法》（国家发展改革委令第6号）、《关于印发重大项目社会稳定风险评估暂行办法的通知》（粤发改重点〔2012〕1095号）等相关规定，应先办理规划选址、用地预审、环评审批、节能评估、社会稳定风险评估等前置手续，并编制项目申请报告，再按规定办理核准手续。

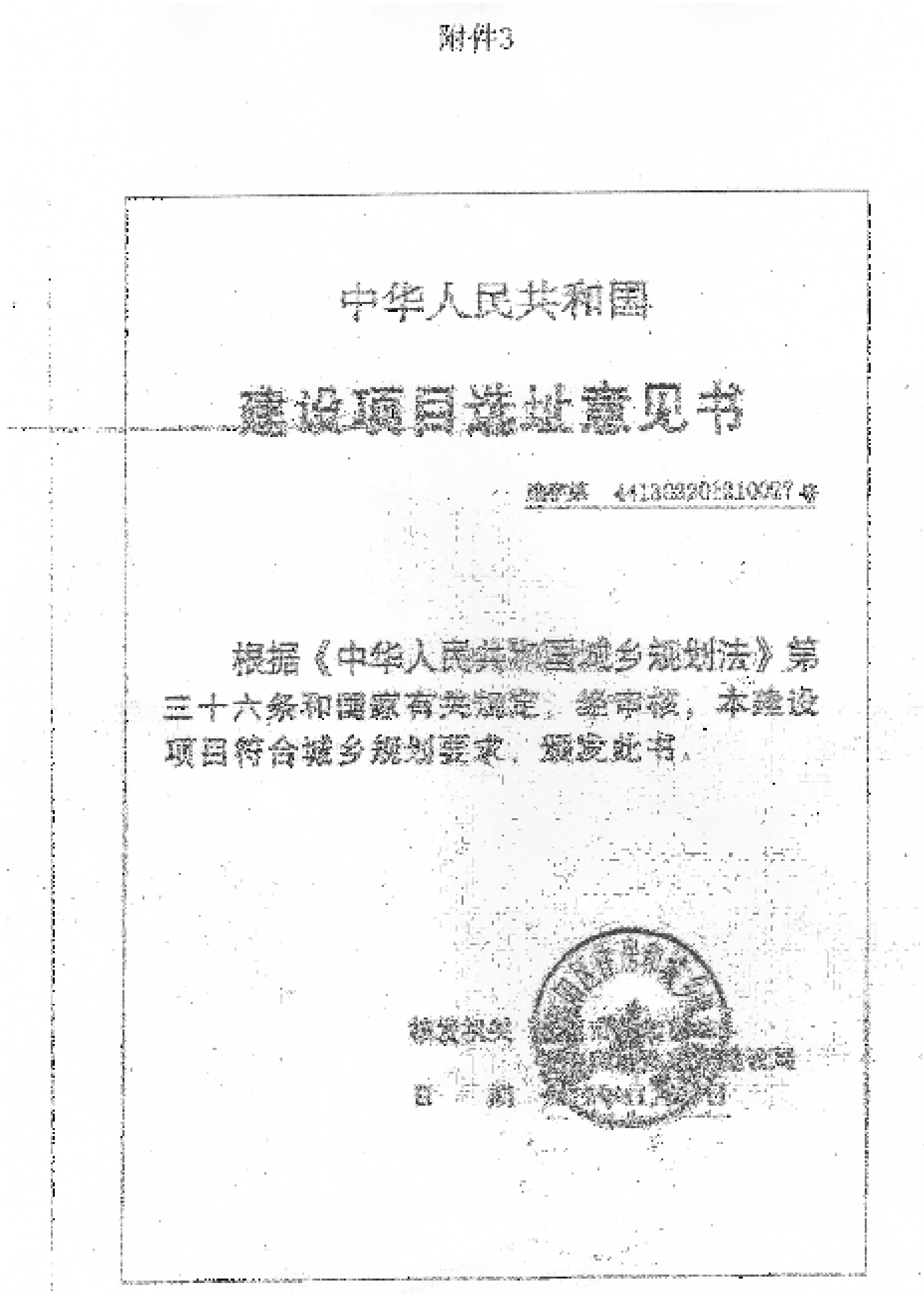
请你局督促项目业主抓紧做好前期工作，待完成上述前置手续后再按规定履行项目核准手续。

广东省发展改革委

2013年1月10日

Main idea: The Huizhou project is BOT and BT combination project and it is in accordance with the Interim Measures for enterprise investment projects approval in Guangdong Province([2005] No. 119), the Interim Measures of fixed assets investment projects assessment and review(NO.6) and the Interim Measures of Development and Reform Commission of Guangdong on Social Stability Risk Assessment for Major Projects ([2012] No. 1095);

Attachment 3. Basic analysis report on wastes of Huizhou, January and April of 2013



附件3

中华人民共和国

建设项目选址意见书

选字第 441302201310027 号

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，颁发此书。

核发机关

日 期

Main idea:

According to the Urban and rural planning law of the People's Republic of China, NO.36, the project comply with the requirements of the Urban and rural plan, the cerficate is issued.

Attachment 4. Photos of the south，east，north and west of the project

East

South

West

North

Attachment 5. Part of individual and organization questionnaire form

被访团体基本情况					
被访单位名称：（加盖公章）	惠州市惠阳区沙田镇人民政府				
联系地址：	沙田镇向西路8号				
联系人：	张文新		联系电话：	13829999829	
单位性质：	村委	行政管理部门 ✓	国企	私企	其他
调查内容及选项（标注可多选的题目可选择一个或以上选项，其余请作单项选择）					
1、通过简介，您对本项目是否有所了解？	（1）非常了解 ✓	（2）知道一点	（3）不了解		
2、贵单位是否赞成采用焚烧方式处理生活垃圾？	（1）赞成 ✓	（2）不赞成	（3）不了解，不清楚		
3、在本项目采用高标准建设，认真落实环保措施和加强运营期管理的前提下，贵单位对本项目选址的意见为：	（1）支持 ✓	（2）有条件支持，条件为：			
	（3）无所谓	（4）不支持，原因为：			
4、本项目建成后，贵单位最关注的环境问题是什么？（可多选）	（1）臭气	（2）二噁英 ✓	（3）空气污染 ✓	（4）废水污染	
	（5）噪声扰民	（6）其他：			
5、贵单位对本项目建设所持的总体态度为：	（1）支持 ✓	（2）无所谓			
	（3）有条件支持，条件为：				
	（4）不支持，原因为：				
6、贵单位对本项目的建设有何意见或建议？（可另附纸）	无				

Attachment 6. The General Layout of the project

Attachment 7. The map location of the project （the middle one is the project site）

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) 700 (application of sulfur, sulfur dioxide, sulfuric acid and other sulfur compound)	15 20 30 40 50 60 70 80 90 100	1.6 2.6 8.8 15 23 33 47 63 82 100	3.0 5.1 17 30 45 64 91 120 160 200	4.1 7.7 26 45 69 98 140 190 240 310	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)
2		1700 (generation of nitric acid, nitrogenous fertilizer and explosives) 420 (nitric acid application and so on)	15 20 30 40 50 60 70 80 90 100	0.47 0.77 2.6 4.6 7.0 9.9 14 19 24 31	0.91 1.5 5.1 8.9 14 19 27 37 47 61	1.4 2.3 7.7 14 21 29 41 56 72 92	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)

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 20 30 40	Emission forbidden	0.60 1.0 4.0 6.8	0.87 1.5 5.9 10	The point of highest concentration outside the boundary.	Invisible
		80 (glass fiber dust, quartz dust, mineral cotton dust)	15 20 30 40	Emission forbidden	2.2 3.7 14 25	3.1 5.3 21 37	Set a reference point in the upwind direction of fugitive emission source; set	2.0 (the concentration difference between the

							monitoring point in the downwind direction)	reference point and monitoring 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	Emission forbidden	0.60 1.0 3.4 5.9 9.1	0.90 1.5 5.2 9.0 14	The point of highest concentration outside the boundary.	0.50

			70 80		13 18	20 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	0.55 0.93 3.1 5.4 8.2 12	The point of highest concentration outside the boundary.	0.30

					11 15	17 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 30	Emission forbidden	0.18 0.31	0.28 0.46	The point of highest	0.030

			40 50 60 70 80		1.0 1.8 2.7 3.9 5.5	1.6 2.7 4.1 5.9 8.3	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 19	Emission forbidden	0.91 1.5 5.0 8.9 14 19	1.4 2.3 7.8 13 21 29	The point of highest concentration outside the boundary.	0.75

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

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 Facilities

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;

Attachment 22: primary air monitoring and supplementary air monitoring data

表 1 SO_2 小时平均浓度监测结果单位：mg/m^3

监测日期	7#填埋场拟建址	2#[illegible]	3#长龙湾	4#[illegible]村	9#[illegible]园	10#[illegible]
3 月 19 日	0.009~0.024	0.009~0.021	0.008~0.024	0.015~0.025	0.011~0.023	0.005~0.025
3 月 20 日	0.009~0.023	0.011~0.024	0.009~0.022	[illegible]	0.008~0.023	0.009~0.025
3 月 21 日	0.01~0.022	0.005~0.022	0.009~0.024	0.008~0.024	0.01~0.023	0.009~0.025
3 月 22 日	0.013~0.02	0.009~0.02	0.01~0.022	0.009~0.025	0.011~0.02	0.009~0.02
3 月 23 日	0.008~0.019	0.011~0.02	0.009~0.018	0.009~0.024	0.008~0.017	0.011~0.018
3 月 24 日	0.01~0.023	0.011~0.022	0.01~0.021	0.011~0.019	0.008~0.017	0.01~0.02
3 月 25 日	0.007~0.018	0.008~0.023	0.01~0.024	0.01~0.023	0.01~0.02	0.011~0.022
质量标准（mg/m^3）	0.50					
达标与否	达标	达标	达标	达标	达标	达标

表 2 NO_2 小时平均浓度监测结果单位：mg/m^3

监测日期	7#填埋场拟建址	2#[illegible]	3#长龙湾	4#[illegible]村	9#[illegible]园	10#[illegible]
3 月 19 日	0.025~0.062	0.025~0.05	0.023~0.034	0.029~0.056	0.027~0.052	0.025~0.042
3 月 20 日	0.025~0.061	0.023~0.029	0.029~0.036	0.03~0.07	0.025~0.06	0.019~0.036
3 月 21 日	0.022~0.038	0.02~0.029	0.025~0.032	0.02~0.063	0.028~0.057	0.025~0.031
3 月 22 日	0.023~0.052	0.024~0.032	0.029~0.034	0.025~0.052	0.023~0.05	0.023~0.052
3 月 23 日	0.025~0.035	0.024~0.028	0.029~0.033	0.025~0.056	0.026~0.034	0.025~0.023
3 月 24 日	0.025~0.052	0.023~0.034	0.028~0.035	0.028~0.044	0.025~0.055	0.025~0.052
3 月 25 日	0.02~0.034	0.023~0.031	0.029~0.033	0.029~0.051	0.026~0.054	0.025~0.031
质量标准（mg/m^3）	0.20					
达标与否	达标	达标	达标	达标	达标	达标

表 3 CO 小时平均浓度监测结果单位：mg/m^3

监测日期	7#填埋场拟建址	2#[illegible]	3#长龙湾	4#[illegible]村	9#[illegible]园	10#[illegible]
3 月 19 日	1.5~4	2~5.8	1.8~3.4	2.2~4.5	0~2.5	2~3.8
3 月 20 日	1.4~2.5	1.5~2.6	1.9~3.8	1.2~3.5	0~2.2	1.8~3.6
3 月 21 日	1.8~3.2	1.5~3.9	2~4.2	2.4~4.3	1.5~2.8	1.3~3.6
3 月 22 日	1.6~2.9	1.9~2.6	1.9~4.1	2.4~4.9	1.5~2.8	1.8~4
3 月 23 日	1.2~2.9	1.8~2.5	1.6~3.8	2.1~4.4	0.9~2.4	1.8~3.5
3 月 24 日	1.4~2.9	1.9~4	2~4.2	2.6~5	0.4~3	2.2~4
3 月 25 日	1.2~3.1	2.1~4	1.4~3.3	2.4~4.2	1.2~2.3	1.8~3.6
质量标准（mg/m^3）	10					
达标与否	达标	达标	达标	达标	达标	达标

表 4 H_2S 一次浓度监测结果单位：mg/m^3

监测日期	7#填埋场拟建址	2#[illegible]	3#长龙湾	4#[illegible]村	9#[illegible]园	10#[illegible]
3 月 19 日	0.005~0.006	0.004~0.004	0.004~0.007	0.005~0.007	0.003~0.004	0.005~0.008
3 月 20 日	0.004~0.006	0.003~0.005	0.004~0.007	0.005~0.007	0.004~0.006	0.004~0.006

监测日期	7#[illegible]	3#[illegible]	5#[illegible]	6#[illegible]	9#[illegible]	10#[illegible]
3月21日	0.004~0.005	0.004~0.005	0.004~0.007	0.005~0.007	0.005~0.007	0.004~0.006
质量标准 (mg/m³)	0.01					
达标与否	达标	达标	达标	达标	达标	达标

表5　NH_3一次浓度监测结果单位：mg/m³

监测日期	7#[illegible]	3#[illegible]	5#[illegible]	6#[illegible]	9#[illegible]	10#[illegible]
3月19日	0.092~0.107	0.095~0.113	0.088~0.126	0.104~0.114	0.095~0.116	0.095~0.127
3月20日	0.107~0.145	0.119~0.143	0.106~0.131	0.107~0.112	0.102~0.147	0.103~0.125
3月21日	0.116~0.145	0.114~0.144	0.114~0.134	0.105~0.134	0.116~0.142	0.106~0.134
质量标准 (mg/m³)	0.20					
达标与否	达标	达标	达标	达标	达标	达标

表6 臭气1小时平均浓度监测结果单位：mg/m³

监测日期	7#[illegible]	3#[illegible]	5#[illegible]	6#[illegible]	9#[illegible]	10#[illegible]
3月23日	<10~14	<10~25	<10~17	<10~17	<10	<10~21
3月24日	<10~13	<10~25	<10~17	<10~14	<10	<10~20
3月25日	<10~11	<10~25	<10~13	<10~17	<10	<10~21
质量标准	20（无量纲）					
达标与否	达标	部分超标	达标	达标	达标	部分超标

表7 甲硫醇1小时平均浓度监测结果单位：mg/m³

监测日期	7#[illegible]	3#[illegible]	5#[illegible]	6#[illegible]	9#[illegible]	10#[illegible]
3月23日	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]
3月24日	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]
3月25日	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]	2.7×10[illegible]
质量标准 (mg/m³)	0.0007					
达标与否	达标	达标	达标	达标	达标	达标

表8　SO_2日均浓度监测结果单位：mg/m³

监测日期	7#[illegible]	3#[illegible]	5#[illegible]	6#[illegible]	9#[illegible]	10#[illegible]
3月19日	0.011	0.012	0.011	0.012	0.013	0.012
3月20日	0.011	0.012	0.013	0.012	0.012	0.011
3月21日	0.013	0.011	0.011	0.012	0.013	0.011
3月22日	0.012	0.012	0.011	0.011	0.013	0.010
3月23日	0.012	0.012	0.012	0.010	0.011	0.011
3月24日	0.012	0.012	0.011	0.011	0.011	0.012
3月25日	0.013	0.012	0.012	0.012	0.012	0.011
浓度范围	0.011~0.013	0.011~0.012	0.011~0.013	0.010~0.012	0.011~0.013	0.010~0.012
质量标准 (mg/m³)	0.15					

达标与否	达标	达标	达标	达标	达标	达标

表9 NO_2 日均浓度监测结果单位：mg/m³

监测日期	7#[illegible]旧址	3#大湖	8#长龙村	6#肖屋村	5#[illegible]花园	10#[illegible]仔
3月19日	0.023	0.024	0.024	0.025	0.026	0.027
3月20日	0.027	0.025	0.026	0.027	0.025	0.023
3月21日	0.025	0.027	0.026	0.025	0.027	0.028
3月22日	0.027	0.025	0.027	0.027	0.028	0.025
3月23日	0.029	0.026	0.026	0.028	0.028	0.027
3月24日	0.030	0.028	0.028	0.030	0.027	0.027
3月25日	0.026	0.025	0.029	0.030	0.025	0.027
浓度范围	0.023~0.030	0.024~0.028	0.024~0.029	0.025~0.030	0.025~0.028	0.023~0.027
质量标准（mg/m³）	0.08					
达标与否	达标	达标	达标	达标	达标	达标

表10 PM_{10} 日均浓度监测结果单位：mg/m³

监测日期	7#[illegible]旧址	3#大湖	8#长龙村	6#肖屋村	5#[illegible]花园	10#[illegible]仔
3月19日	0.074	0.073	0.072	0.065	0.072	0.069
3月20日	0.071	0.072	0.07	0.067	0.071	0.069
3月21日	0.071	0.071	0.071	0.066	0.071	0.067
3月22日	0.071	0.07	0.072	0.065	0.072	0.069
3月23日	0.073	0.071	0.074	0.066	0.073	0.067
3月24日	0.071	0.069	0.067	0.068	0.073	0.067
3月25日	0.072	0.07	0.072	0.069	0.072	0.071
浓度范围	0.071~0.074	0.069~0.073	0.07~0.074	0.065~0.069	0.071~0.073	0.067~0.071
质量标准（mg/m³）	0.15					
达标与否	达标	达标	达标	达标	达标	达标

表11 TSP 日均浓度监测结果单位：mg/m³

监测日期	7#[illegible]旧址	3#大湖	8#长龙村	6#肖屋村	5#[illegible]花园	10#[illegible]仔
3月19日	0.116	0.113	0.118	0.108	0.117	0.12
3月20日	0.115	0.113	0.112	0.107	0.117	0.118
3月21日	0.114	0.113	0.11	0.104	0.12	0.119
3月22日	0.115	0.111	0.113	0.107	0.12	0.117
3月23日	0.113	0.109	0.113	0.102	0.118	0.118
3月24日	0.117	0.113	0.114	0.107	0.118	0.117
3月25日	0.113	0.113	0.101	0.106	0.117	0.116
浓度范围	0.113~0.116	0.109~0.109	0.11~0.118	0.104~0.107	0.117~0.12	0.116~0.12
质量标准（mg/m³）	0.30					
达标与否	达标	达标	达标	达标	达标	达标

表12 SO_2 和 NO_2 小时平均浓度监测结果统计与评价表（mg/m³）

监测日期	NO_2	SO_2
	鲤鱼岗	鲤鱼岗
4月21日	0.002L~0.014	0.007L~0.009
4月22日	0.005~0.031	0.007L~0.01
4月23日	0.010~0.044	0.007L
4月24日	0.016~0.033	0.007L
4月25日	0.008~0.050	0.007L
4月26日	0.020~0.049	0.007L
4月27日	0.026~0.053	0.007L
浓度范围	0.002L~0.050	0.007L~0.01
最大浓度占标率(%)	25.00	6.67
超标率(%)	0	0

注：结果带"L"表示未检出，其数值为该项目检出限，其占标率用检出限的一半代替，下同。

表 13 SO_2、NO_2 和 PM_{10} 日平均浓度监测结果统计与评价表（mg/m³）

监测日期	NO_2	SO_2	PM_{10}
	鲤鱼岗	鲤鱼岗	鲤鱼岗
4月21日	0.005	0.005	0.043
4月22日	0.013	0.003L	0.040
4月23日	0.012	0.003L	0.045
4月24日	0.024	0.003L	0.046
4月25日	0.020	0.003L	0.039
4月26日	0.029	0.003L	0.044
4月27日	0.019	0.003L	0.049
浓度范围	0.005~0.029	0.003L~0.005	0.039~0.049
最大浓度占标率(%)	36.25	3.33	98.00
超标率(%)	0	0	0

表 14 H_2S、NH_3、甲硫醇和臭气浓度小时平均浓度监测结果统计与评价表

（单位：mg/m³，臭气浓度除外）

监测日期	H_2S	NH_3	甲硫醇	臭气浓度
	猴子拔	猴子拔	猴子拔	猴子拔
4月24日	0.001L	0.023~0.130	0.2L	10L
4月25日	0.001L	0.026~0.119	0.2L	10L
4月26日	0.001L	0.015~0.084	0.2L	10L
最大浓度占标率(%)	5.00	65.00	14.29	25.00
超标率(%)	0	0	0	0

表 15 HCL 小时、日平均浓度监测结果统计与评价表（单位：mg/m³）

小时平均浓度范围						
监测日期	猴子拔	黄沙村	老屋	鲤鱼岗	田头村	肖屋村
4月13日	0.005L	0.005L	0.005L	0.005L	0.005L	0.005L
4月14日	0.005L	0.005L	0.005L	0.005L	0.005L	0.005L
4月15日	0.005L	0.005L	0.005L	0.005L	0.005L	0.005L
最大浓度占标率(%)	5	5	5	5	5	5
超标率(%)	0	0	0	0	0	0
日均浓度范围						
4月24日	0.005L	0.004	0.023	0.005L	0.029	0.005L

4月25日	0.003L	0.005L	0.005	0.003L	0.007	0.004
4月26日	0.004	0.025	0.003L	0.025	0.026	0.030
最大浓度占标率(%)	26.67	26.67	20	33.33	40.0	46.67
超标率(%)	0	0	0	0	0	0

注：HCl 小时浓度于 2014 年 4 月 13~15 日检测。

表 16　Hg 日平均浓度监测结果统计与评价表（单位：mg/m³）

监测日期	榄子垅	黄沙洞	老屋	[illegible]	田头村	[illegible]
4月24日	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L
4月25日	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L
4月26日	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L	$0.01*10^{-3}$L
最大浓度占标率(%)	3.57	3.57	3.57	3.57	3.57	3.57
超标率(%)	0	0	0	0	0	0

表 17　Pb 日平均浓度监测结果统计与评价表（单位：μg/m³）

监测日期	榄子垅	黄沙洞	老屋	[illegible]	田头村	[illegible]
4月24日	$30.2*10^{-3}$	$33.5*10^{-3}$	$44.3*10^{-3}$	$28.6*10^{-3}$	$40.7*10^{-3}$	$29.7*10^{-3}$
4月25日	$33.5*10^{-3}$	$35.3*10^{-3}$	$32.5*10^{-3}$	$32.9*10^{-3}$	$37.6*10^{-3}$	$39.9*10^{-3}$
4月26日	$19.3*10^{-3}$	$16.5*10^{-3}$	$29.4*10^{-3}$	$13.9*10^{-3}$	$28.7*10^{-3}$	$15.2*10^{-3}$
最大浓度占标率(%)	3.35	2.24	2.95	2.19	2.71	3.66
超标率(%)	0	0	0	0	0	0

表 18　Cd 日平均浓度监测结果统计与评价表（单位：μg/m³）

监测日期	榄子垅	黄沙洞	老屋	[illegible]	田头村	[illegible]
4月24日	$0.36*10^{-3}$	$0.79*10^{-3}$	$0.67*10^{-3}$	$0.93*10^{-3}$	$0.81*10^{-3}$	$0.64*10^{-3}$
4月25日	$0.74*10^{-3}$	$0.66*10^{-3}$	$1.22*10^{-3}$	$0.29*10^{-3}$	$0.73*10^{-3}$	$1.53*10^{-3}$
4月26日	$0.12*10^{-3}$	$0.81*10^{-3}$	$0.16*10^{-3}$	$0.66*10^{-3}$	$0.29*10^{-3}$	$0.90*10^{-3}$
最大浓度占标率(%)	6.43	5.37	9.71	6.64	5.39	10.53
超标率(%)	0	0	0	0	0	0

表 19　二噁英日平均浓度监测结果统计与评价表（单位：pg-TEQ/m³）

监测日期	榄子垅	黄沙洞	老屋
4月24日	0.157	0.162	0.281
占标率(%)	26.17	26.92	46.81
超标率(%)	0	0	0

注：从保守出发，二噁英日均浓度标准取 0.6 pg-TEQ/m³，即日本的年均浓度标准。

Translation of attachment 22

Table 1 monitoring result of hourly concentration of SO_2: mg/m^3

monitoring date	7#proposed landfill site	3#Hantangyou	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	0.009~0.024	0.009~0.021	0.008~0.024	0.016~0.025	0.011~0.025	0.009~0.023
3/20	0.009~0.023	0.011~0.024	0.009~0.022	0.009~0.025	0.009~0.023	0.009~0.025
3/21	0.01~0.022	0.009~0.022	0.009~0.024	0.008~0.024	0.01~0.025	0.009~0.023
3/22	0.013~0.02	0.009~0.02	0.01~0.022	0.009~0.023	0.011~0.02	0.009~0.02
3/23	0.008~0.019	0.011~0.02	0.009~0.018	0.009~0.023	0.009~0.017	0.011~0.018
3/24	0.01~0.022	0.011~0.022	0.01~0.021	0.011~0.019	0.009~0.017	0.01~0.02
3/25	0.007~0.018	0.009~0.022	0.011~0.024	0.01~0.023	0.01~0.02	0.011~0.022
quality standard （mg/m^3）	0.50					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 2 monitoring result of hourly concentration of NO_2 : mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	0.023~0.033	0.026~0.03	0.027~0.034	0.023~0.034	0.027~0.032	0.025~0.033
3/20	0.025~0.031	0.025~0.029	0.023~0.029	0.023~0.03	0.025~0.03	0.017~0.026
3/21	0.022~0.038	0.02~0.029	0.022~0.032	0.02~0.033	0.022~0.032	0.025~0.031
3/22	0.025~0.032	0.024~0.032	0.025~0.034	0.025~0.032	0.025~0.033	0.023~0.032
3/23	0.025~0.035	0.024~0.029	0.028~0.033	0.025~0.034	0.026~0.034	0.025~0.033
3/24	0.025~0.032	0.025~0.034	0.028~0.033	0.028~0.034	0.025~0.033	0.025~0.032
3/25	0.02~0.034	0.025~0.031	0.023~0.033	0.025~0.031	0.026~0.034	0.025~0.031
quality standard （mg/m^3）	0.20					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 3 monitoring result of hourly concentration of CO： mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	1.5~3	2~3.8	1.8~3.4	2.2~4.5	1~2.5	2~3.8
3/20	1.4~2.5	1.5~3.6	1.9~3.8	1.8~3.5	1~2.2	1.8~3.4
3/21	1.8~3.1	1.8~3.9	2~4.2	2.4~4.9	1.2~2.8	1.8~3.6
3/22	1.6~2.9	1.9~3.6	1.9~4.1	2.4~4.9	1.5~2.8	1.8~4
3/23	1.2~2.9	1.8~3.5	1.6~3.8	2.1~4.4	0.9~2.4	1.8~3.5
3/24	1.4~2.9	1.9~4	2~4.2	2.4~5	1.4~3	2.2~4
3/25	1.2~3.1	2.1~4	1.4~3.9	2.4~4.8	1.2~2.9	1.8~3.6
quality standard （mg/m^3）	10					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 4 monitoring result of hourly concentration of H_2S： mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	0.005~0.006	0.004~0.006	0.004~0.007	0.005~0.007	0.005~0.006	0.005~0.006
3/20	0.004~0.006	0.004~0.005	0.004~0.007	0.005~0.007	0.004~0.006	0.004~0.006
3/21	0.004~0.008	0.004~0.006	0.004~0.007	0.005~0.007	0.005~0.007	0.004~0.006
quality standard （mg/m^3）	0.01					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 5 monitoring result of hourly concentration of NH_3： mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	0.092~0.107	0.087~0.113	0.086~0.126	0.104~0.116	0.095~0.118	0.099~0.123
3/20	0.107~0.145	0.119~0.143	0.102~0.131	0.107~0.118	0.102~0.147	0.109~0.125
3/21	0.116~0.145	0.114~0.144	0.114~0.134	0.109~0.134	0.116~0.142	0.106~0.134
quality standard （mg/m^3）	0.20					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 6 monitoring result of hourly concentration of odor: mg/m3： mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/23	＜10~14	＜10~25	＜10~17	＜10~17	＜10	＜10~21
3/24	＜10~13	＜10~25	＜10~17	＜10~14	＜10	＜10~20
3/25	＜10~11	＜10~23	＜10~13	＜10~17	＜10	＜10~21
quality standard	20（dimentionless）					
results	not excess	partly excess	not excess	not excess	not excess	partly excess

Table 7 monitoring result of hourly concentration of merthanthiol： mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/23	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}
3/24	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}
3/25	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}
quality standard （mg/m^3）	0.0007					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 8 monitoring result of daily concentration of SO_2： mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	0.011	0.012	0.011	0.012	0.013	0.012
3/20	0.011	0.012	0.013	0.012	0.012	0.011

3/21	0.013	0.011	0.011	0.012	0.012	0.011
3/22	0.012	0.012	0.011	0.011	0.012	0.010
3/23	0.012	0.012	0.012	0.010	0.011	0.011
3/24	0.012	0.012	0.011	0.011	0.011	0.012
3/25	0.012	0.012	0.012	0.012	0.012	0.011
range	0.011~0.013	0.011~0.012	0.011~0.013	0.010~0.012	0.011~0.013	0.010~0.012
quality standard（mg/m^3）	0.15					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 9　monitoring result of daily concentration of NO_2：mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	0.023	0.024	0.024	0.025	0.026	0.027
3/20	0.027	0.025	0.026	0.027	0.025	0.025
3/21	0.025	0.027	0.026	0.025	0.027	0.026
3/22	0.027	0.025	0.027	0.027	0.026	0.025
3/23	0.029	0.026	0.028	0.028	0.028	0.027
3/24	0.030	0.028	0.029	0.030	0.027	0.027
3/25	0.028	0.028	0.028	0.028	0.028	0.027
range	0.023~0.030	0.024~0.028	0.024~0.029	0.025~0.030	0.025~0.028	0.025~0.027
quality standard（mg/m^3）	0.08					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 10　monitoring result of daily concentration of PM_{10}：mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	0.074	0.073	0.072	0.065	0.072	0.069
3/20	0.071	0.072	0.07	0.067	0.071	0.069
3/21	0.071	0.071	0.071	0.066	0.071	0.067
3/22	0.071	0.07	0.072	0.065	0.072	0.069
3/23	0.073	0.071	0.074	0.066	0.072	0.067
3/24	0.071	0.069	0.071	0.068	0.073	0.07
3/25	0.072	0.07	0.072	0.069	0.072	0.071
range	0.071~0.074	0.069~0.073	0.07~0.074	0.065~0.069	0.071~0.073	0.067~0.071
quality standard（mg/m^3）	0.15					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 11　monitoring result of daily concentration of TSP：mg/m^3

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/9	0.118	0.118	0.118	0.105	0.117	0.12
3/20	0.115	0.113	0.112	0.107	0.117	0.118
3/21	0.114	0.113	0.11	0.104	0.12	0.119
3/22	0.115	0.111	0.113	0.107	0.12	0.117

monitoring date	7#proposed landfill site	3#Dalong	8#Changlonggang	6#Xiaowucun	9#Huiyang biguiyuan	10#Ailingzhai
3/23	0.113	0.109	0.113	0.105	0.118	0.118
3/24	0.117	0.113	0.114	0.107	0.118	0.117
3/25	0.115	0.112	0.111	0.106	0.117	0.116
range	0.113~0.118	0.109~0.118	0.11~0.118	0.104~0.107	0.117~0.12	0.116~0.12
quality standard（mg/m^3）	0.30					
results	not excess	not excess	not excess	not excess	not excess	not excess

Table 12 monitoring result assessment of hourly concentration of SO_2 and NO_2

（mg/m^3）

monitoring date	NO_2	SO_2
	Liyuzhai	Liyuzhai
4/21	0.003L~0.014	0.007L~0.009
4/22	0.007~0.031	0.007L~0.01
4/23	0.011~0.044	0.007L
4/24	0.016~0.032	0.007L
4/25	0.008~0.050	0.007L
4/26	0.020~0.049	0.007L
4/27	0.006~0.035	0.007L
range	0.003L~0.050	0.007L~0.01
Maximum concentration account for the standard(%)	25.00	6.67
Excess ratio(%)	**0**	0

Table 13 monitoring result assessment of daily concentration of SO_2、NO_2 and PM_{10}

（mg/m^3）

monitoring date	NO_2	SO_2	PM_{10}
	Liyuzhai	Liyuzhai	Liyuzhai
4/21	0.008	0.003	0.043
4/22	0.013	0.003L	0.049
4/23	0.018	0.003L	0.048
4/24	0.024	0.003L	0.049
4/25	0.026	0.003L	0.039
4/26	0.023	0.003L	0.044
4/27	0.018	0.003L	0.049
range	0.008~0.026	0.003L~0.003	0.039~0.049
Maximum concentration account for the standard(%)	32.50	6.00	98.00
excess ratio(%)	0	0	0

Table 14 monitoring result assessment of hourly concentration of H_2S、NH_3、merthanthiol and odor

（mg/m^3）

monitoring date	H_2S	NH_3	甲硫醇	臭气浓度
	Lanzilong	Lanzilong	Lanzilong	Lanzilong
4/24	0.001L	0.023~0.130	0.2L	10L

4/25	0.001L	0.036~0.119	0.2L	10L
4/26	0.001L	0.015~0.084	0.2L	10L
Maximum concentration account for the standard(%)	5.00	69.50	14.29	25.00
excess ratio(%)	0	0	0	0

Table 15 monitoring result assessment of hourly and daily concentration of HCL

（mg/m^3）

hourly averagerange						
monitoring date	Lanzilong	Huangshacun	Laowu	Liyuzhai	Tiantoucun	Xiaowucun
4/13	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L
4/14	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L
4/15	0.003L	0.003L	0.003L	0.003L	0.003L	0.003L
Maximum concentration account for the standard(%)	6	6	6	6	6	6
excess ratio(%)	0	0	0	0	0	0
日均 range						
4/24	0.003L	0.004	0.003	0.003L	0.009	0.003L
4/25	0.003L	0.003L	0.003	0.003L	0.007	0.004
4/26	0.004	0.003	0.003L	0.005	0.005	0.007
Maximum concentration account for the standard(%)	26.67	26.67	20	33.33	60.0	46.67
excess ratio(%)	0	0	0	0	0	0

note：supplementary monitoring of hourly concentration of HCL is carried out on 13-15 April, 2014

Table 16 monitoring result assessment of daily concentration of Hg（mg/m^3）

monitoring date	Lanzilong	Huangshacun	Laowu	Jinjubaohuqu	Tiantoucun	Xiaowucun
4/24	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L
4/25	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L
4/26	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L	$0.01*10^{-3}$ L
Maximum concentration account for the standard(%)	3.57	3.57	3.57	3.57	3.57	3.57
excess ratio(%)	0	0	0	0	0	0

Table 17 monitoring result assessment of daily concentration of Pb（$\mu g/m^3$）

monitoring date	Lanzilong	Huangshacun	Laowu	Liyuzhai	Tiantoucun	Xiaowucun
4/24	$50.2*10^{-3}$	$33.5*10^{-3}$	$44.3*10^{-3}$	$28.0*10^{-3}$	$40.7*10^{-3}$	$29.7*10^{-3}$
4/25	$33.5*10^{-3}$	$33.5*10^{-3}$	$32.3*10^{-3}$	$32.8*10^{-3}$	$37.6*10^{-3}$	$39.9*10^{-3}$
4/26	$19.3*10^{-3}$	$16.8*10^{-3}$	$29.4*10^{-3}$	$15.9*10^{-3}$	$20.7*10^{-3}$	$15.2*10^{-3}$
Maximum concentration account for the standard(%)	3.35	2.24	2.95	2.19	2.71	2.66
excess ratio(%)	0	0	0	0	0	0

Table 18 monitoring result assessment of daily concentration of Cd（μg/m^3）

monitoring date	Lanzilong	Huangshacun	Laowu	Liyuzhai	Tiantoucun	Xiaowucun
4/24	$0.90*10^{-3}$	$0.78*10^{-3}$	$0.68*10^{-3}$	$0.93*10^{-3}$	$0.81*10^{-3}$	$0.64*10^{-3}$
425	$0.74*10^{-3}$	$0.60*10^{-3}$	$1.22*10^{-3}$	$0.59*10^{-3}$	$0.73*10^{-3}$	$1.53*10^{-3}$
4/26	$0.12*10^{-3}$	$0.51*10^{-3}$	$0.16*10^{-3}$	$0.06*10^{-3}$	$0.29*10^{-3}$	$0.28*10^{-3}$
Maximum concentration account for the standard(%)	**6.43**	5.57	8.71	6.64	5.79	10.93
excess ratio(%)	**0**	0	0	0	0	0

Table 19 monitoring result assessment of daily concentration of dioxin (pg-TEQ/m^3）

monitoring date	Lanzilong	Huangshacun	Laowu
4/24	0.157	0.162	0.281
占标准(%)	26.18	26.92	46.91
excess ratio(%)	0	0	**0**