Constructional Project Environmental Impact Assessment Report

(Trial Implementation)

Project name: Caofeidian 50,000t/day Seawater Desalination Project

The owner (Seal): Norway Aqualyng AS.

Date of Compilation: November 5, 2008

Compiled by Ministry of Environmental Protection of the People's Republic of China

Instruction for compilation of Constructional Project Environmental Impact Report

Constructional Project Environmental Impact Assessment Report shall be compiled by the company with the appropriate qualification for assessment of environmental impact.

1. Project Name - the name in the project proposal, 30 words or less (two English characters are considered as one Chinese character).

2. Location - the detail address of project. For highway and railway, the start and end location shall be specified.

3. Category of Industry - Filled based on national standards.

4. Total Investment - it refers to total investment of the project.

5. Main Objectives of Environmental Protection - it refers to the residential community, schools, hospitals, and famous scenic sites, protective zones of cultural relic and historic sites, water sources and ecologically sensitive spots in the neighborhood of project site. The protective objectives, characteristics, scale and distance to factory boundary, etc. shall be specified.

6. Results and Suggestions— based on analysis, give out the conclusion on clean production, up to standard discharge (emission) and total discharge (emission) control; validate the effectiveness of pollution control measures; illustrate the impact on the environment; put forth the

conclusion on environmental feasibilities of constructional project and advices on lessening environmental impact.

7.Preliminary examination advices – filled by competent authorities; this item can be left blank if not available.

8. Examination and approval comments –replied by competent administrative dept. in charge of environmental protection of the project.

建设项目环境影响评价资质证书

机构名称：河北奇正环境科技有限公司
住　　所：河北省石家庄市裕华西路116号
法定代表人：耿造火
证书等级：乙
证书编号：国环评证乙　字第　1231　　号
有效期：至2010年5月15日
评价范围：环境影响报告书类别 — 乙级：化工石化医药***
环境影响报告表类别 — 一般项目环境影响报告表***

此件仅供挪威阿科凌控股有限公司曹妃甸5万吨/日海水淡化工程项目使用，翻印无效。
编号 HBOZ2008-094

二〇〇七年十月二十三日

Qualified Certificate for Environmental Impact Assessment of Construction Project

Name of Entity: Hebei Qizheng Environmental Technology Co., Ltd.
Address: No. 116, Yuhua West Road, Shijiazhuang, Hebei
Legal Representative: Geng Zaohuo
Class of Certificate: Class B
Certificate No.: GHPZ B Z No. 1231
Expiry Date: May 15, 2010
Assessment Range: Environmental Impact Report- Class- B:-chemical industry, petrification and medicine***
Type of Environmental Impact Report—general project environmental impact report

This Certificate, only use for Caofeidian 500,000 Tons/Day Sea Water Desalination Project of Norway Aqualyng Holding Ltd. will be invalidated if reprinted.
No.: HBOZ2008-094

State Environmental Protection Administration (Seal)
October 23, 2007

Assessment Entity: Hebei Qizheng Environmental Technology Co., Ltd. (Common Seal)
Legal Representative: Geng Zaohuo (Seal)
Project Manager: Zhou Hongwei
Name of Project: Caofeidian 500,000 Tons/Day Seawater Desalination Project of Norway Aqualyng AS.
Type of Document: Environmental impact assessment report

Name	Profession	Title	Certificate No.	Duty
Zhou Hongwei	Environmental protection	Engineer	HPSZZ No B12310090900	Director
Sun Dongya	Environmental protection	Engineer	HPGZZ No B12310020	Complier
Pang Liangjun	Environmental protection	Engineer	HPGZZ No B12310017	Reviewer

Signature of Appraisers

Name	Certificate No.	Duty	Signature
Zhou Hongwei	HPSZZ No B12310090900	Director	Zhou Hongwei
Sun Dongya	HPGZZ No B12310020	Complier	Sun Dongya
Pang Liangjun	HPGZZ No B12310017	Reviewer	Pang Liangjun

Reviewed by the EIA Engineer Professional Qualification Registration Office of State Environmental Protection Administration, Zhou Hongwei is capable of being engaged in environmental impact assessment and relevant business, and therefore granted to be registered.

Professional Qualification Certificate No.: 0006363

Registration Certificate No.: 1312310090900

Validity Period: from November 9, 2007 to November 9, 2010

Working Company: Hebei Qizheng Environmental Technology Co., Ltd.

Registration Type: Traffic-based environmental impact assessment
State Environmental Protection Administration (Seal)

November 9, 2007

Reregistered Record Table

Date	Validity Period				Signature
	Extended to	D	M	Y	
	Extended to	D	M	Y	
	Extended to	D	M	Y	

Brief Introduction to this Project

Project name	Caofeidian 50,000t/day Seawater Desalination Project				
The owner	Norway Aqualyng AS.				
Legal representative	Bai Yu		**Contact person**	Bai Yu	
Address	Caofeidian Xingang Industrial Zone, Tangshan City, Hebei Province				
Tel.	13801959350	**Fax**		**P.C.**	063200
Project Location	To the north of Huarun Power Plant, Caofeidian Xin-gang Industrial Zone, Tangshan. Geographic coordinate of the center of the project is 38º58′43.97″N and 118º30′08.51″E.				
Examination and approval authority			**Approval document number**		
Construction category	Newly-constructed■ Reconstruction and expansion□ Technical upgrading□		**Category and code of industry**	D4690, other water treatment, utilization and distribution	
Land use (m^2)	21417		**Green land area (m^2)**	2000	
Total Investment (10,000 Yuan)	34911	**Including investment on environmental protection (10,000 Yuan)**	35	**Rate of environmental protection investment in total investment**	0.1%
Evaluation cost (10,000 Yuan)		**Predicted date for production**	January, 2011		

Project scope and scale :

In year 2006, the National Development and Reform Commission (NDRC) compiled the Beijing-Tianjin-Hebei Regional Planning Report - Planning on Energy Sources. In order to accelerate the economic development of cities in Beijing-Tianjin-Hebei region, give full play to the support role of energy sources, the NDRC has strategically analyzed the present situation and constraint factors of energy sources based on advices on development plan in 11th 5-year Plan and identified the main factors to constrain the development of cities in Beijing-Tianjin-Hebei region, including reserves depletion of local coal resources, lack of water resources, limited environmental carrying capacity and scarce land resources. So the Norway Aqualyng AS has decided to invest 349110000 RMB Yuan to construct a seawater desalination plant to the north of Huarun Power Plant. The desalination plant, which uses ultrafiltration and reverse osmosis technology to desalinate seawater, is intended to supply fresh water to Huarun Power Plant, other enterprises within the development zone and local community. The establishment of 50,000t/day seawater desalination project will also provide concentrated brine (produced from seawater desalination process) to Nanpu Salt factory for chlorine-alkali industry. This will realize cyclic economy and save the increasingly precious surface and underground water resources. According to Overall Planning of Caofeidian Xingang Industrial Zone, Tangshan City (2006-2020), the project is located on Category II industrial land, and Planning Bureau of Caofeidian Industrial Zone, Tangshan has issued the written comments for site pre-selection of the project.

According to Industrial Restructuring Directory (Rev. 2005), Caofeidian 50,000t/day Seawater Desalination Project falls in the category under encouragement, because it belongs to environmental protection, energy conservation and comprehensive utilization project, and conforms national industrial policies.

(1) Project name: Caofeidian 50,000t/day Seawater Desalination Project.

(2) Construction category: newly-constructed.

(3)The owner: Norway Aqualyng AS.

(4) Location: the project is located in Caofeidian Industrial Zone, adjacent to the north of Huarun Power Plant, 1km away from No. 1 Basin Wharf in the west and 1.5km from Waste water Treatment Plant of south part in the north. Geographic coordinate of the center of the project is 38º58′43.97″ N and 118º30′08.51″ E. See Attached Drawing I for geographic location of the project and Attached Drawing II for circumferential relationship.

(5) Land use: the project covers an area of 21417m^2, including greening land of 2000m^2, which accounts for 9.3% of total land use.

(6) Total investment and investment on environmental protection: a total investment of 349.11 million Yuan, including an investment of 0.35 million Yuan on environmental protection, which accounts for 0.1% of the total investment.

Funding source: 244.38 million Yuan bank loan and 104.74 million Yuan funded by Aqualyng.

(7) Project scale and product indexes

The design capacity of the project is 50,000t/day, and product indexes conform to Drinking Water Sanitary Standard (GB5749-85).

(8) Included works

All the construction work in this project will be newly-built ones, with a total building area of 5006.5m^2, including main workshop, office building and auxiliary facilities.

Table 1 List of included works of this project

Works	Description	Building area (m^2)	Structural type
Main works	Main workshop	1920	Framed
	Clean water basin	1000	RC
	Clarification tank	552.5	RC
	Product water tank	5000m^3	
Auxiliary works	Office building	900	Brick and concrete
	Warehouse and auxiliary workshop	400	Brick and concrete
	Auxiliary clarification workshop	234	Brick and concrete
Environmental protection works	sedimentation tank and neutralization tank		

(9) consumption of raw materials and auxiliary materials

Consumption of raw materials and auxiliary materials are listed in Table 2.

Table 2 Consumption of raw materials and auxiliary materials

Item	Chemicals	Active composition	Method of package or storage	Concentration (%)	Annual consumption (t)
1	Antiscalant	Antiscalant	Liquid, in barrel	100	24
2	Flocculant	Ferric chloride	Solid, in bag	100	24
3	Disinfectant	NaClO	Liquid, in barrel	13	363
4	Reducing agent	Sodium bisulphate	Solid, in bag	100	86
5	Post treatment chemicals	$CaCO_3$	Solid, in bag	100	190

6	pH adjustment	Sulphuric acid	Liquid, in barrel	98	447
7	Cleaning reagent	,Muriatic acid	Liquid, in barrel	35	34
8	Cleaning reagent	Sodium hydroxide	Solid, in bag	50	14

(10) Main production equipment

Main production equipment during construction are listed in Table 3.

Table 3 List of Main production equipment

Item	Equipment name	Specification	Quantity	Unit	Remark
1	Feed pump	Flow rate: 980t/h, flow rate:10m	6	Nos.	(5 for use and 1 for standby)
2	Clean water pump	Flow rate: 950t/h, lift head: 25m	6	Nos.	(5 in for use and 1 for standby)
3	Sodium hypochlorite disinfection system		1	Nos.	
4	Continuous ultrafiltration system	Capacity for single unit: 840m^3/h, filter precision: 0.02 μm	5	Nos.	
5	Ultrafiltration system backwash pump	Flow rate: 350t/h, lift head: 30m	5	Nos.	
6	$NaHSO_3$ dosage system	Metering pump: flow rate: 37L/h, lift head: 0.5Mpa	5	Nos.	
7	Antiscalant dosing system	Metering pump: flow rate: 6L/h, lift head: 0.5MPa	5	Nos.	
8	Reverse osmosis feed water tank	60m^3	5	Nos.	
9	RO feed water pump	Flow rate: 840t/h, lift head: 30m	5	Nos.	
10	High pressure pump	Flow rate: 429t/h, lift head: 630m	5	Nos.	
11	Energy recovery unit	Type: pressure exchange type, Model: PX-220	55	Nos.	
12	RO membrane stack	Capacity: 417m^3/h, recovery rate: 50%, and design water temperature: 18℃	5	Nos.	
13	Booster pump	Flow rate: 405t/h, lift head: 40m	5	Nos.	
14	RO cleaning system	RO cleaning pump quantity:2, flow rate: 900t/h, lift head: 40m	1	Nos.	
15	pH adjustment system	Metering pump: flow rate: 37L/h, lift head: 0.5MPa	1	Nos.	
16	Product water tank		4	Nos.	
17	Product water pump	Flow rate: 420t/h, lift head: 20m	5	Nos.	

(11) inlet and outlet water quality indexes of seawater desalination system

Table 4 Inlet and outlet water quality indexes of seawater desalination system

Item	Parameter	Unit	Design indexes of inlet water	Design indexes of product water
1	pH value		7~8.5	6.5~ 8.5
2	Turbidity	NTU		≤0.1
3	Total dissolved solid	mg/L	<38000	≤1000
4	Fe	mg/L	<0.35	≤0.3
5	Temperature	^{o}C	5~32	
6	Chemical oxygen demand (COD)	mg/L	<11	
7	Sulphate (SO_4)	mg/L	<4512	≤250
8	Chloride	mg/L	<19400	≤250
9	Water flow	T/d	117000	50000

(12) Personnel quota and working system of the project

There are 20 fixed staff for the project, including 3 managers, 5 in charge of equipment maintenance and 12 working at workshop.

Except during equipment maintenance, 24h continuous four-shift working system is adopted.

(13) General Plan

Buildings (structures) in seawater desalination plant include main workshop (consisting of control room, chemical dosing room, filtration room, pump room, distribution room, storehouse, etc.), clean water tank, clarification tank, and other related facilities. The enclosing wall of the plant shall be constructed with brick-concrete masonry for the lower part and cast iron rail for the upper part to achieve an aesthetic appearance. Because of few facilities and simple plan layout, based on the technological requirements of RO seawater desalination equipment, the plan layout shall be designed to be as follows: an 8m wide fire passage is set around main structures or buildings and other areas are used as green land. Roads in the plant adopt concrete structure pavement, with a width of 8m or 4m. See Attached Drawing III for the plane layout of the plants.

(14) Heating supply

Heating of the project in the winter shall be supplied by Caofeidian Industrial Zone Heating Supply Company, a subsidiary of Tangshan Heating Power Group.

(15) Power supply

Installed power of this project is 8333KW, total power consumption is 10667KW, and power is connected from Caofeidian power network.

(16) Water supply and drainage

①Water supply: Instead of constructing a new seawater intake, the Project shares the same seawater intake located in No. 1 Basin Wharf with Huarun Power Plant. The Project has a design raw water flow of 114,000m^3/d, which is completely used as feed water for seawater desalination system. It production capacity is 50000m^3/d, among which 0.6m^3/d is used for membrane cleaning, 1.6m^3/d is used for employees' living water, 3m^3/d is used for greening in the plant area, and the remaining 49994.8m^3/d which temporarily stored in product water tank in the plant is delivered to outside points of use.

②Drainage: wastewater generated by this project includes 3000m^3/d from pretreatment process, which will be returned to pretreatment process after sedimentation, 14000m^3/d concentrated brine from continuous ultrafiltration process and 50000m^3/d concentrated brine from RO process, which are delivered to Nanpu Salft Factory via common concentrate brine pipe with Huaren Power Plant. In addition, membrane elements require cleaning after running for a certain period of time (generally once every half year to one year). During cleaning process, 100m^3 cleaning solution will be prepared, with chemical concentration of several percentage. The alkaline cleaning waste water generated is about 0.6m^3/d, which after the regulation of PH value in neutralization tank, is discharged. 1.3m^3/d of domestic wastewater will be discharged after treated in septic tank.

See figure 1 for the water balance of proposed project.

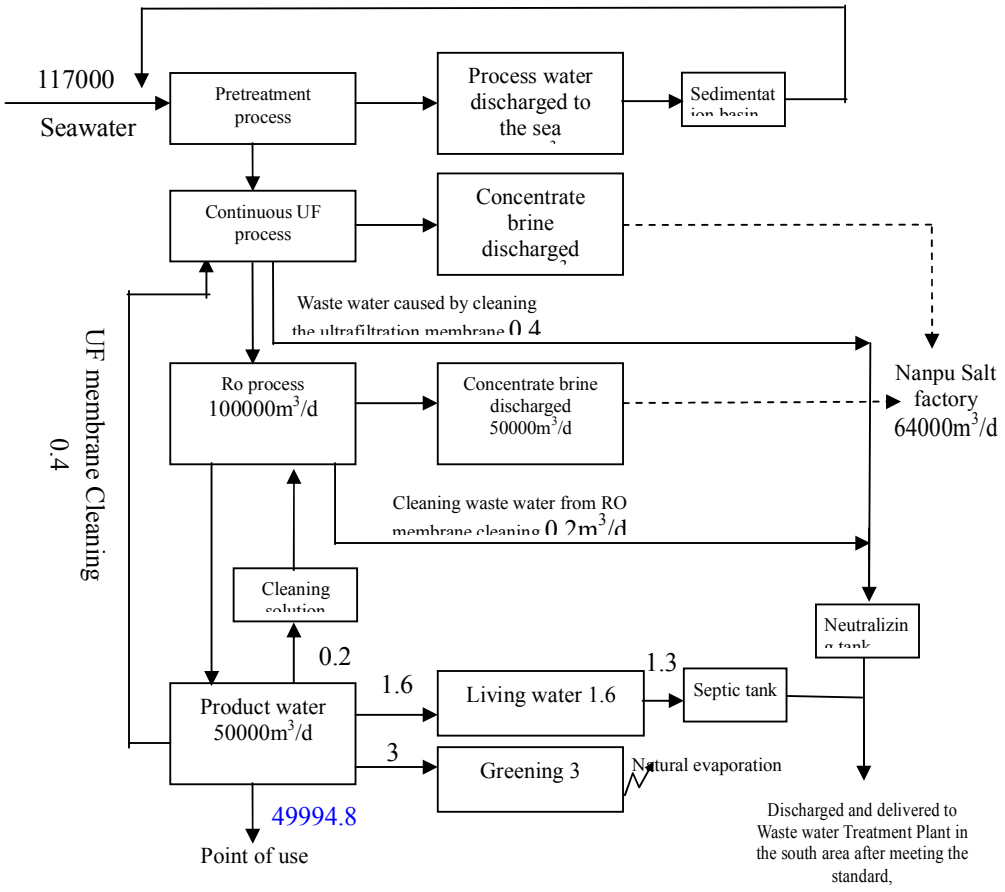


Figure 1 Water Supply and Drainage Balance of Proposed Project (unit: m^3/d)

Based on the Environmental Impact Report on China Resources (Caofeidian) Power Plant (2×300MW coal-fired units) Project, the cooling water discharge from Huarun Power Plant is 807,20m^3/h (1,937,300m^3/d), which is discharged from drainage ditch of the plant to open channels to in industrial zone , and finally to the Bohai Sea through the Wave Absorption River. The seawater desalination system of the Project, which utilizes RO technology, is very sensitive to the temperature of seawater, and the system is unable to operate if the temperature of seawater is less than 5℃. Therefore, the proposed project uses cooling water from the power plant in winter and raw seawater in other seasons as feed water, and the cooling discharge of Huarun Power plant will supply full capacity for the Project in winter.

(17) Construction schedule

The project construction period is two years and the project is scheduled to be put into production in January, 2011.

Pollution background and major environmental issues related to this project:

None

Brief Introduction to Natural Environment and Social Environment of the Project

Brief introduction to natural environment (landform, topography, geology, weather, climate, hydrology, vegetation, biodiversity, etc.):

Geographic location

Caofeidian is one strip sand island, located at 38°55′ N and 118°38′ E, 18km away from the southern sea coast of Tangshan. The strike of sand island is NE-SW. It has an area of about 4km^2 in high water time and about 20km^2 in low water time. There is one large shallow beach between continental coastlines and it has a water depth of about 2.00m in high water time and about 0.00m in low water time. Caofeidian Island is about 20km away from continental coastline. It has an area of about 4km^2 in high water time and about 20km^2 in low water time. Through land route, it is 55km away from Wangtan Port Area, 65km away from Tianjin New Port, and 230km away from Beijing. Through water route, it is 33 sea miles away from Wangtan Port Area, 38 sea miles away from Tianjin New Port, and 92 sea miles away from Qinghuangdao Port. The port area is 60km away from Tanggang Highway and 75km away from Luannan Railway Station.

The proposed project is located in Caofeidian Industrial Zone, Nanbao Town, Luannan County, Tangshan City, Hebei, with No.1 Basin Wharf 1km away in the west. It is to the north of Huarun Power Plant and 2.5km away from the nearest sensitive point, namely the planned comprehensive service area, to its north. Geographic coordinate of the center of the project is 38º58′43.97″ N and 118º30′08.51″ E. See Attached Drawing I for geographic location of the project, and Attached Drawing II for circumferential relationship.

Landform and topography

The Caofeidian region is the coast of Luanhe Delta Plain with double strand lines: the inside continental strand line is fluvial and marine plain developed along the front of old Luanhe Delta, and there are many salt fields and tidal flats along the coast; the strike of outside island strand line is the same as that of continental strand line and the sand beach consists of Getuo, Yantuo and Caofeidian Cay. The Caofeidian Cay consists of 12 cays, with the largest one locating at southwest. At the peak, there are

few of psammophytes, and the area between inside and outside strand lines is shallow beach; in the low tide time, part of shallow beach will appear with flat ground. The max. water depth of tidal creek in the east and west is 2-5m, and the Caofeidian Cay locates at the turning point of strand line at the north of Bohai Bay.

Weather and climate

The climate of Caofeidian region is continental monsoon climate and possesses obvious characters of warm and semi-humid monsoon climate. The extremely highest temperature is 36.3℃, the extremely lowest temperature is -20.9℃, and the annual mean temperature is 11.4℃. The max. annual precipitation is 934.4mm, the max. daily precipitation is 186.9mm and the mean annual precipitation is 554.9mm. The precipitation mainly happens in Summer, with the precipitation in Jun.-Sep. of about 408mm, accounting for 74% of the total precipitation in one year. The max. thickness of snow cover is 190mm, the max. depth of frozen ground is 0.7m, and the annual duration of sunshine is 2798.2h.

The site belongs to monsoon climate, so the seasonal change of wind is obvious. The annual mean wind speed is large because of impact of marine climate, and the heavy wind days are more than those in inland and plain. The predominant wind direction is SSW, and wind direction frequency is 10.1%; the secondary predominant wind direction is WSW, and the wind direction frequency is 8.67%; annual frequency of calm wind is 2.53% and the annual mean wind speed is 4.6m/s. In the atmospheric stability, the frequency of neutral atmosphere is the largest and is 65.16%, the frequency of stable atmosphere is 16.98%, and of the unstable atmosphere is 17.87%, so the condition of atmospheric turbulence is favorable to the diffusion of pollutant.

The impact of typhoon (tropical cyclone) to this area is low, with a frequency of once every 3 years. Sometimes, there are two typhoons appear in one year, and the happening months are generally July and August (based on statistics). The wind speed of typhoon (tropical cyclone) may reach 25m/s, causing significant increase of water in the coastal area nearby.

The fog with visibility lower than 1km in Caofeidian is 9d in one year, and often appears in Nov.-Feb. in next year. In this period, days with fog account for 77% total fog days of the year; the longest lasting time of fog is 3d. The annual mean relative humidity is 66%, with Jul. having the highest relative humidity of 79%; and Nov. having the lowest relative humidity of 60%.

Features of sediment

The Caofeidian Cay is the residual cay at old Luanhe River Mouth. According to historical research and determination for geological age of shell on the Cay, the coast of the Cay was located on the present position before 2500 years, and the strike of strand line was controlled by structural line of NE, NW and EW strike zones. The sediment age of front stratum is old, and majority of earth under surface layer is dense or mid-dense, sandwiched with silty clay bed. The anti-corrosion of the Cay and slope of deep pool is strong, and the formation cause of furrow and stratum lithology is the foundation of stable landform of furrow. Based on the historical data, in the last 100 years, the position of main body of the Cay and deep pool, and the ridgeline and average height of slope are stable. The alluvial variation range of inside shallow is 4~6cm, and the landform of furrow is fit for the marine dynamic.

In this sea area, the sediments are mainly moved by tidal current, and the action of wave is weak. The sand on the bed is coarse sand, and the sand from other source is little; the transport amount along the coast is small, and so there is no accumulative landform and the alluvial landform is not obvious. The deep pool in the south of Caofeidian with a depth of 20-30m is one part of central deep pool of Bohai, and it locates at the main passage of tidal current extending to Bohai Bay and is the tidal-current deep pool. The dynamic of tidal current is strong, and so the bench and pool can keep stable for a long time.

Hydrogeology

The Caofeidian Industrial Zone belongs to coastal water system in the east of Hebei, and the main rivers in the system are Douhe River, Shahe River, Xiaoqinglonghe River, Xiaojimenhe River and Shuanglonghe River. The Caofeidian sea area is mainly controlled by tidal wave system in south Bohai. Because of the intervene action of coastal reflected tidal wave, the tidal wave is standing wave and the type of tide is abnormal semi-diurnal tide, so there are two flood tide time and two of ebb tide time within a day. The characteristic value of actual tide (the tide level is based on theoretical deep): max. tide level is 3.90m; the min. tide level is -0.39m; the average high-tide level is 2.52m and average low tide level is 0.98m; the average tide gap is 1.54m.

The Caofeidian region is the coast of Luanhe Delta Plain with double strand lines: the

inside continental strand line is fluvial and marine plain developed along the front of old Luanhe Delta; the strike of outside island strand line is the same as that of continental strand line and the strand line is sand beach. The Caofeidian Cay, locating at the south end, consists of 12 cays, and the largest one of them locates at southwest, with elevation of 3m (calculated from the theoretical min. tide level in the local). The area between inside and outside strand lines is shallow barrier lagoon. The Caofeidian Cay is located at the turning point of strand line at the north bank of Bohai Bay and close to deep pool with depth of -20~ -30m in Bohai Bay. The rear area of proposed port area, located at shallow bench, connects with front edge of old Luanhe Delta in the north and connects with Caofeidian Cay in the south, crossing two landforms including shallow bench and lagoon from north to south.

Ecological Environment

(1) Features of ecological environment of Caofeidian

The coastal area in the south of Tianshan is located at the north bank of Bohai Bay, and can be divided into four ecosystems based on the landforms and with boundary of Daqinghe River, include delta ecosystem at Luanhe River Mouth and Daqinghe River Mouth, coastal ecosystem and offshore ecosystem.

In this area, there are some ecosystems with important society, economic and ecological value, and these ecosystems are the objectives of ecological protection, control and recovery. The delta ecosystem at Luanhe River Mouth is the important transient migration area and aquaculture area which main products are clam and Cyclina sinensis; the bench between Laomigao and Langwokou, extending to Jingtang port area has large landscape and ecological value, where ecological tourism can be developed. The Shijiutuo and Yuetuo Island and surrounding tidal flats are the habitat of birds; the shelterbelts on the seashore are the important ecosystem in these areas, and can decrease natural hazard and stabilize local ecological environment. The reed wetland ecosystem on the sea shore is the important continental wetland ecosystem, and is also the habitat for living beings and has large landscape and ecological value. The important ecosystems mentioned above are far away from the proposed Caofeidian Industrial Zone.

The Tanghai Wetland and Nature Reserve for Birds, covering an area of 110km^2, is

30km from the planning area of Caofeidian port. So the proposed port area planning will pose no impact on the function of the wetland, which is highlighted by the local governments.

(2) Ecological environment features of Caofeidian port area

At first, the weed such as reed distributes on Caofeidian Island by strips or belts, and sometimes the sea bird will call on the Island. The Island has no inhabitant, and the marine lives visiting the Island with tides are starfish, sea urchins, and hermit crab and sea shells. At present, the Island is in the planning area of Caofeidian Industrial Zone, and sea reclamation works has been under progress.

In May 1990, the total biomass in intertidal zone is 102.3g/m^3, with density of 368.6/m^2 , among which, the biomass of mollusks, shellfishes, bivalves mollusks and monohull mollusks is 7.55g/m^3, 22.6g/m^3, 67.7g/m^3 and 3.1g/m^3 respectively; in August, 1990, the total biomass in intertidal zone is 68.9g/m^3, with density of 243.7/m^2, among which the biomass of mollusks, shellfishes, bivalves mollusks and monohull mollusks is 2.6g/m^3, 20.2g/m^3, 39.2g/m^3 and 5.4g/m^3 respectively. Compared with these in 1980s, the biomass and density decreased largely.

According to the survey made in Apr. 2004, at sea area closing to south of Caofeidian Island and shallow bench closing to north of the Island, the phytoplankton has 10 families 11 genus 21 species, and are all the diatom (no dinoflagellate). The difference on species of plankton in the area under survey is small. The dominant species of phytoplankton is Melosira sulcata (Her.) Kutzing, and the Rhizosolenia stolterfothii, Skeletonema costatum and Rhizosolenia setigera also take ascertain predominance in the group. The dominance of phytoplankton in Caofeidian sea area is not obvious, and the distribution is even and in normal scope. The constitution of zooplankton in Caofeidian sea area shows the species of zooplankton in the north sea area are simple, and the amount of individual is large; the constitution and amount of species are normal. The species of benthos are not abundant, and there are only 5 genus 23 species. The dominant species is annelid such as Sternaspidae and malacanthus and the dominant species of biomass are annelid such as Perinereis aibuhitensis and clamworm.

Brief introduction of social environment (socioeconomic structure, education, culture,

cultural relics protection, etc.):

The Caofeidian Island and sea area surrounding is subordinate to Luannan County, and its coastal continent is subordinate to Tanghai County. The surrounding continent is undeveloped tidal flat with no inhabitant. There are three main residential areas including Linquebao, Gaoshangbao and Zuidong. The main marine industries in Caofeidian and surrounding areas are marine oil and gas industry, sea salt industry, aquaculture and fishery. The Jidong Oil Field, locating at Luannan County and originally subordinating to Dagan Oil Field, has been engaged in oil exploration and development from the seacoast of Caofeidian since 1980s, and now the scale of production reaches 90×10^4t in crude and 20×10^4m^3 in natural gas in one year. In the neighbor of Caofeidian, there is a fishery base including small fishing ports such as Zuidong, Liuzan and Baigezhuang. Only the Shijiutuo can develop seasonal tourism.

The traffic condition of Caofeidian is very convenient, with railway network connecting with national main lines such as Jingshan Railway, Jingqin Railway and Daqin Railway. The highway network consisting of the Jingshen Expressway, Tangjin Expressway and Tanggang Expressway connects the area with national expressway network. There are also 11 national and provincial highways, which allow transport of iron ore transportation to users in North China, thus saving railway transport costs. The Caofeidian port area is located in the middle belt of ports surrounding the Bohai and the distance between it to any other ports is suitable, so the water transship condition is convenient. In the Bohai economic circle, the economic hinterland of Caofeidian port area faces to Jingjinji economic zone, and can extend to Northwest China, so the economic location is excellent. The Caofeidian port area is located at the suitable position in Bohai economic circle and layout of east deepwater ports.

Introduction of waste water treatment plant at the southern part of Caofeidian

According to the general layout, separate storm water sewer system is used. It is planned that two Waste water Treatment Plants are constructed respectively on the north bank and the south bank of the Wave Absorption River. The two plants are located to the north of Huarun Power Plant and to the east of chemical and bonded manufacturing zone respectively.

The Waste Water Treatment Plant of southern part of Caofeidian is 1.6km to the north of Huarun Power Plant, with design treatment capacity of 100000m^3/d and covering an area of 6.76hm^2. The treatment processes are follows: the secondary biochemical treatment uses improved A/A/O process; the tertiary treatment uses active sand filter

basin, and liquid chlorine is used for disinfection process. The service scope of Waste Water Treatment Plant of southern part of Caofeidian covers the production and domestic wastewater from south industrial zone that is located at the south bank of Wave Absorption River, Diantuo District, eastern part of No.1 Basin Wharf, eastern part of Gangdao and southern part of comprehensive service area. The Environmental Protection Bureau of Hebei has issued reply on the environmental impact assessment of the waste water treatment plant, which is scheduled to be put in to use in Mar. 2009.

According to the general layout, the waste water from Caofeidian Industrial Zone, after advanced treatment, will be used as reclaimed water for road flushing , green land irrigation, and other purposes. So the quality of effluent water from Waste Water Treatment Plant of southern part of Caofeidian shall meet the water quality for road flushing and green land irrigation as stipulated in *Water Quality Standard for Urban Miscellaneous Water Consumption* (GB/T18920-2002) and Grade I Class A standard stipulated in *Pollutant Drainage Standard of Urban Waste Water Treatment Plant* (GB/T18918-2002). The indexes of influent and effluent water are represented in Table 5.

Table 5 Requirements of Influent and Effluent Waste Water for Waste water Treatment Plant in Caofeidian Industrial Zone

Index	Unit	Influent water quality	Effluent water quality
pH	--	6.5~ 8.5	6~ 9
COD	mg/L	350	50
BOD	mg/L	150	10
SS	mg/L	200	10
Ammonia nitrogen	mg/L	30	5
Petroleum hydrocarbons	mg/L	--	1
Animal and vegetable oils	mg/L	--	1

The proposed project is located in the service area of Wastewater Treatment Plant of southern part of Caofeidian. The membrane cleaning waste water generated and the sewage, after pH adjustment and treatment in septic tank respectively, are discharged and transported to the Waste water Treatment Plant in the south area of Caofeidian Industrial Zone for further treatment.

Investigation of Pollution Source in Caofeidian Area

At present, Caofeidian Industrial Zone is at the early stage of construction, and main pollution sources are associated with construction activities of ports, wharfs and roads, and main pollutants are construction dust and noises.

At present, only the ore terminal in Caofeidian Port Area has been put into production, other projects such as Shougang Group, Huarun Power Plant, assembly and manufacture base of No. 22 Metallurgical Construction Corporation Limited., coal port in Caofeidian, crude oil port of Chian Petroleum and Chemical Corporation are still under construction. The environmental impact assessment has been passed for under-construction project and the reply has been issued.

According to the Environmental Impact Report on Ore Terminal in Caofeidian Port Area, the discharge of pollutants caused in the Project is as follows: TSP: 327t/a; flue dust of boiler: 27.59t/a; SO_2: 31.38t/a; COD: 9.6t/a; petroleum hydrocarbons: 0.9t/a.

According to the survey, the Ore Terminal in Caofeidian Port Area has set up new environmental protection facilities such as treatment facilities for domestic waste water and waste water containing dust, oily water separator, desulfurization and dust removal facilities for boiler, dust proof and removal system for loading, unloading and transport machineries, as specified by the Environmental Impact Assessment Report. But up to now, the Project doesn't pass the environmental protection acceptance on completion of construction project.

Environmental Quality Conditions

Status Quo of Regional Environmental Quality and Major Environmental Problems of Proposed Project (atmosphere, surface water, underground water, acoustic environment, ecological environment, etc.)

(1) Status quo of air quality

According to monitoring results on status quo of environmental quality conducted by Tangshan Environmental Monitoring Center in May 2007, as provided in the Environmental Impact Assessment Report on Assembly and Manufacture Base of No. 22 Metallurgical Construction Corporation Limited, the max. hour concentration of SO_2 in monitoring point is 0.049mg/m^3 and the max. daily concentration of SO_2 is 0.036mg/m^3, which both meet the grade II standard as stipulated in Ambient Air Quality Standard (GB3095-96). The daily TSP density exceeds the standards, because the projects in Caofeidian region are under construction, and the dust caused by sea reclamation, construction and transport are all over the port area.

(2) Status quo of seawater environment quality

In Jul. 2007, the Fisheries Research Institution of Tianjin was entrusted to make large scale survey on status quo of port area in Caofeidian Industrial Zone, and the survey results have been validated by Marine Environmental Monitor Center of Hebei.

According to the survey results, the pH value, dissolved oxygen, heavy metals such as mercury and cadmium meet the water quality requirements for the functional zone of the monitoring point, and there is no sample exceeding the standards. The value of other factors under survey such as chemical oxygen demand (COD), biochemical oxygen demand (BOD), inorganic nitrogen, reactive phosphate, petroleum hydrocarbons, copper, zinc and lead exceed the standards to different degree.

The petroleum hydrocarbons are exogenous pollutants, which are introduced into the environment due to human activities. In recent years, with the rapid economic development of construction area, the construction of ocean and coastal projects, frequent shipping activities, more and more petroleum hydrocarbons are introduced into the environment, and as a result, the petroleum hydrocarbons exceeds the values as specified in the standard. Because the petroleum hydrocarbons is diffused and transported quickly in the seawater, the introduction of petroleum hydrocarbons from

neighbor sea area will also cause petroleum hydrocarbons content to rise in the monitoring area. The causes for BOD, inorganic nitrogen and active phosphate to exceed the discharge standards are the introduction of pollutants from continent and seacoast.

The content of organic carbon, sulfide, petroleum hydrocarbons, copper, lead, zinc, cadmium and chromium presented in the sediment meets the quality requirements for sediments of related environmental functional zone, and there is no sample exceeds the standards. The status quo of sediments in sea area under survey is good.

(3) Status quo of marine ecological environment

① Phytoplankton

In the survey, 14 genus 30 species of phytoplankton have been identified, including diatom and euglena. The diatom includes 13 genus 29 species, accounting for 96.7% of the total phytoplankton. The total cell quantity of phytoplankton in different monitoring points varies between 4792-263000 cells/ m^3, with average cell quantity of 34095.133 cell /m^3. The diversity index of phytoplankton (H' value) varies between 1.62 -3.58, with average values of 2.69, so the habitat quality for phytoplankton is average. The evenness (J' value) varies between 0.81-0.98, with average value of 0.92; the abundance (d) varies between 0.22-0.87, with average value of 0.49.

② Zooplankton

In the survey, 12 groups 64 species (including the species which genus are not identified) are identified, and the largest category is protozoa. The zooplankton quantity varies between 426/m^3-25550/m^3, with average value of 3114.9/m^3; the biomass varies between 180mg/m^3-26367mg/m^3, with the average value of 2813.0mg/m^3. The predominant species of zooplankton are (in turn): sword, calanus sinicus and paracalanus prvus. The diversity index of zooplankton (*H*' value) varies between 0.75-4.00, with the average value of 2.67, so the habitat quality of zooplankton is average.

③ benthos

In the sea area under survey, 53 species of benthos are identified, and most of them are annelid. The biomass and inhabit density of benthos are low, with biomass varying between 0.18g/m^2~ 137.42 g/m^2 and an average value of 25.9g/m^2; the inhabit density varies between 30/m^2~ 190/m^2, with average value of 74.0/m^2. The diversity index of benthos varies between 0.50~ 3.73, with average value of 2.32. Therefore, the habitat quality of benthos is average.

④ living beings in intertidal zone

From the samples taken in intertidal zone, 49 kinds of living beings are found, and most of them

are mollusks. In this zone, the average inhabit density is 746/m², and the average biomass is 171.48 g/m². The predominant species (in turn) are: Potamocorbula amurensis Larvae, Mactra quadrangularis, Japanese Macrophthalmus pacicus, Moerella jedoensis and Umbonium thomasi. Generally, the predominance of mollusks, shellfishes, and Polychaeta as well as other species is descending in turn. The level of diversity index (H') and evenness (J') are low. The diversity index ranges from 0.48 to 2.36, with average value of 1.71; the evenness ranges from 0.33 to 0.80, with average value of 0.64; the abundance ranges from 0.43-1.93, with average value of 1.36.

⑤ Chlorophyl A

According to the investigation results, the Chlorophyl A (including flood time and ebb time) varies between (2.1- 26.2) mg/m³, with an average value of 5.3mg/m³ in flood time and 7.0mg/m³ in ebb time.

(4) Acoustic environment

Acoustic environment functional area of the project belongs to Category III Area, and main source of noise pollution is traffic noise.

Main objectives and category of environmental protection :

The proposed project is located to the east of No. 1 Basin Wharf in Caofeidian Industrial Zone, Luannan County, Tangshan City, Hebei Province, adjacent to the north of Huarun Power Plant. The marine function of the project site is salt industry and port traffic area, without important ecologically sensitive areas. The main environmental protection objectives and category determined based on this assessment are listed in Table 6.

Table 6 Main objectives and category of environmental protection

Classification	Environmentally sensitive Protection objects	Location Relationship with this project	Object description	Protection category
Atmospheric environment	Planned comprehensive service area	N, about 2.5km	Administrative and office area	Category II specified in *Ambient Air Quality Standard* (GB3095-1996)
Sea	Water quality of Wave Absorption River		Category IV seawater functional area	Category IV specified in *Seawater Quality Standard* (GB3097-1997)

Applicable Evaluation Criteria

Environmental quality standards	(1) Ambient air: Class II standard specified in *Ambient Air Quality Standard* (GB3095-1996) shall apply; (2) Seawater: Category IV standard specified in *Seawater Quality Standard* (GB3097-1997) and marine sediment complies with Category III standard specified in *Marine Sediment Quality Standard* (GB18668-2002) shall apply;; (3) Acoustic environment: Category III standard specified in *Acoustic Environment Quality Standard* (GB3096-2008) shall apply;.
Pollutant drainage standards	(1) Waste water: Class III discharge standard specified in Table 4 of *Integrated Waste water Discharge Standard* (GB8978-1996) and influent water quality requirements of wastewater treatment plant in the southern part of Caofeidian shall apply;; (2) Noise: Category III standard specified in *Standard of Noise at Boundary of Industrial Enterprise* (GB12348-2008) shall apply;; For noise during construction, Noise limits for Construction Site (GB12523-90) shall apply;; (3) Solid wastes: *Standard for Pollution Control on the Storage and Treatment Site for General Industrial Solid Wastes* (GB18599-2001) and *Standard for Pollution Control on Hazardous Waste Storage* (GB18597-2001) shall apply;.
Total discharge (emission) control objectives	COD 0.14 t/a, ammonia nitrogen 0.01t/a and solid waste 0t/a.

Construction project analysis

Technological process description (as shown in the figure)

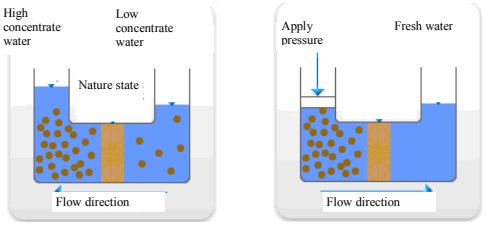
Seawater desalination system uses cooling water from the power plant in winter and raw seawater in other seasons as feed water, which after preliminary pretreatment, enters the fresh water tank, where it is pressurized. The pressurized water is then introduced into UF system, where further pretreatment takes places. The outlet water from UF system will be used as the feed water of RO system. A system consisting of high pressure pump, energy recovery device, and booster delivers the RO feed water to RO membrane stack, and the permeate water is directed into product water tank. Product water pump delivers the product water to use of point. While the brine reject is introduced into energy recovery unit, where the energy is recovered. After that, the brine reject will be transported to Nanpu salt factory for salt production.

The design treatment flow of preliminary pretreatment installation for the proposed seawater desalination project phase I is 117,000 m^3/d, the secondary pretreatment installation design flow is 114,000 m^3/d, and the design flow for RO system is 100,000 m^3/d. The design production water capacity is 50,000 m^3/d with concentrated brine production of approximately 64,000 m^3/d.

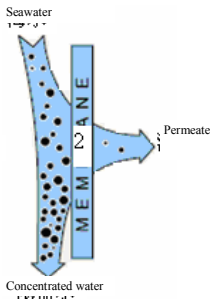
The principle of reverse osmosis

A thin film which allows for selective passage of different materials is called semi-permeable membrane. Generally, the thin film that only allows for passage of solvent instead of solution is called ideal semi-permeable membrane.

The principle of reverse osmosis is illustrated in the figure on the right side. When two brine solutions of different concentrations are separated by a semi-permeable membrane, water will diffuse through the membrane into the concentrated solution. This phenomenon is called osmosis. When osmosis balance is reached, the level of liquid on the concentrated solution will be higher than that of the dilute solution, forming a



pressure difference, which is known as osmosis pressure. Osmosis pressure value is dependent on the inherent nature of the solution, including solution type, concentration and temperature, instead of semi-permeable membrane characteristics. The application of pressure greater than the osmotic pressure on the concentrated solution, however, will force the solvent to flow in the opposite direction from the concentrated side to dilute side, this phenomenon is called reverse osmosis. Reverse osmosis system is designed based on the above theory. By taking advantage of the pressure of feed water, which is pressurized via high pressure pump, and the selective passage characteristic of semi-permeable membrane, it allows for removal of various inorganic ions from the water. Because the pore size of reverse osmosis membrane is generally smaller than $10*10^{-10}$m, it can remove various bacteria, virus and source of heat from the water, thus producing high quality purified water.



Technical process and discharge nodes of the proposed project

(1)Preliminary pretreatment system

This process is intended to remove suspended solids, colloidal matter, particulates, as well as bacteria, alga, etc. presented in source water. Therefore, pretreatment system usually includes such technical processes as disinfection, coagulation, sedimentation, etc. which is discussed respectively as follows:

Preliminary dosing treatment: add flocculant, coagulant and germicide into the seawater

By the action of compressed electric double layer, charge neutrality and absorption, absorption bridge and precipitant enmeshment, the flocculant promotes the small colloidal matter, suspended solids, or even macromolecule organic matter to form larger suspended solid, which, with the help of coagulant, forms larger and dense particulates that can be removed in subsequent treatment process.

The coagulant is used to adjust and improve flocculation conditions and accelerate coagulation process, thus conductive to thorough removal of fine contaminants from the water in the subsequent filtration process. Coagulant also helps improve flocculent

structure. By utilizing the intensified adsorption bridging action of polymeric coagulant, it helps capture the fine particulates in the source water to form gross and dense flocculent. Polymeric coagulants are generally dendriform multiple chain organic polymer, which can be divided into anionic type, neutral type and cationic type. The application of cationic coagulant may result in irreversible damage to the RO membrane, due to the fact that the surface of RO composite membrane has negative charge, which is easy to absorb the positive charge, causing the RO membrane difficult to be cleaned. Therefore, anionic or neutral coagulant with molecular weight ranging from 4-8 million should be used.

Generally, the dosage of flocculant and coagulant should be within 15-30 mg/L and 0.2-1.0 mg/L respectively.

The sodium hypochlorite is added for disinfection and algae removal. In addition, excessive residual chlorine helps control microbiological growth in the pretreatment system, thus preventing system from secondary pollution. The chlorine dosage at the inlet shall be 1-3 mg/L, and the security disinfection chlorine dosage shall be 0.5-1.0 mg/L.

High density clarifier: high density clarification technology incorporates such technologies as coagulation, inclined tube sedimentation, sludge return, etc. Structurally, it is divided into reaction zone, preliminary sedimentation/concentrating zone, and inclined tube clarification zone. The unique flocculation sludge external circulation and return technology enhances the carrier flocculation effect, which accelerates the formation of flocculation and improves the quality of the flocculent formed. Reaction zone can be divided into rapid mix reaction basin and slow plug flow reaction basin. The former allows for thorough mixing of raw water with coagulant, acting as pre-coagulation. While he latter allows the flocculent to fully grow in the slow plug flow, forming a mixture with high quality, dense and easy to separate flocculent in the whole reaction zone. After fully reaction, the mixture flows into preliminary sedimentation/concentrating zone for rapid separation. The effluent of preliminary sedimentation flows into inclined tube settling zone, where the residual flocculent is further removed. While the sludge is swept into the sludge channel after concentration. Part of the sludge is returned to the inlet water, while the remaining

sludge is pumped into sludge disposal system.

(2)Secondary pretreatment system

This process is designed to further reduce turbidity presented in the water so as to ensure the SDI in outlet water is lower than 3 and the residual chlorine is lower than 0.1mg/L. The secondary pretreatment process includes continuous ultrafiltration, removal of residual chlorine, ant-scaling, etc. which are discussed respectively as follows:

Continuous ultrafiltration: the use of continuous ultrafiltration as pretreatment technology other than conventional cascade filtration technology can reduce the contamination problems encountered by RO membrane.

Different from filter plant using sand or other media, the use of CUF microfiltration process as pretreatment installation for RO system can prevent inorganic or organic impurities with size larger than 0.1 mm from passing CUF filter membrane and entering into downstream treatment installation. It is widely used in the pretreatment for RO system due to its highly effective separating capability, safety and reliability.

Dechlorination installation: $NaHSO_3$ is added to remove excess chlorine so as to prevent it from entering RO membrane, since free chlorine will cause damage to RO membrane element. The dosage of $NaHSO_3$ can be based on 3 times of the free chlorine, thus ensuring that the residual chlorine presented in the water entering into RO membrane element is lower than 0.1mg/L.

Antiscalant dosing: Seawater desalination antiscalant is used, which can increase the Stiff & Davis index number from 0 to 1.5, where the calcium and magnesium hardness will not build up and form scaling in the membrane. It can prevent calcium sulfate scaling from forming by increase the relative solubility of scaling material in the water, thus preventing calcium sulfate, etc., especially $BaSO_4$ and $SrSO_4$ crystallization from causing damage to the membrane. It can disperse the iron colloidal matter and fine particulates that may clog membrane pore.

In addition, this antiscalant is composite organic matter, which is not easily to decomposed into nutrients (orthophosphoric acid) for microorganisms, therefore, it

will not cause pollution after being discharged into the environment.

(3) RO seawater desalination system

RO seawater desalination system is comprised of six components including high pressure pump, RO membrane component, energy recovery unit, flushing system, cleaning system as well as control instruments, which are discussed separately as follows:

High pressure pump: in conjunction with energy recovery unit, it provides sufficient pressure for feed water entering into reverse osmosis train. Each RO membrane train is equipped with one high pressure pump, which is usually of multistage centrifugal pump.

RO membrane train: RO membrane component is the core of the whole desalination system. Two separate intakes are used to provide stable feed water for the RO plant. It is capable of removing soluble salt, colloidal matter, organic matter and microorganism presented in the water, ensuring product water quality meets customer's requirements.

Energy recovery unit: the brine discharge has a pressure of over 5MPa, it is a waste if no energy is recovered. As raw seawater flows through energy recovery unit, which allows effective recovery of the energy of brine reject, its pressure can rise up to about 5MPa.

RO cleaning system: after extended service, RO membrane element will be contaminated by materials that cannot be easily removed by flushing, such as long term salinity scaling and organic matter build up, which will lead to membrane element performance decline. Cleaning system is comprised of cleaning chemical tank, cleaning pump, 5μm filter cartridge, flow meter and pipeline system.

RO shutdown automatic flushing system: When RO unit is shutdown, the water remaining within the membrane unit is concentrated, which is easy to cause membrane contamination. Fresh water shall be used to flush the surface of the membrane to displace the concentrated water, so as to avoid membrane performance decline due to deposition of contaminants on the membrane surface. The flushing system shall be used in conjunction with the chemical cleaning system.

Control instruments: online test instruments are equipped to realize control and

monitoring of RO system operation. Such instruments include ORP meter, pH meter, conductivity meter, flowmeter, pressure meter, sampling device, etc.

(4)Operation control of RO system

The operation, standby, and backwash process of pretreatment equipment are controlled via programming controller.

Chemical dosage control: The dosing pumps are automatically controlled by signals from the online flow meter and other measurements instruments installed on each pipeline, to realize automatic dosage of chemicals. The chemical dosage can also be adjusted manually.

The control system performs continuous monitoring on feed water quality after CUF, including SDI, residual chlorine, water temperature and pH. Once the feed water quality does not meet requirements for feed water of RO unit, it will trigger audible and visual alarm and prompt operation personnel to take appropriate measures. Failure to correct the water quality index within 30 minutes will result in interlock of RO high pressure pump, and the system will shutdown.

High/low pressure switches, which are installed before and after the high pressure pump, will trigger automatic interlock alarm and system shutdown to protect high pressure pump and RO membrane from damage, in case of abnormality of system flow and pressure.

Permeate by-pass valve is installed to automatically switch permeate to concentrate water and trigger alarm, in case of the salt concentration of product water exceeding the set value.

Shutdown flushing system is installed, which, in case of shutdown, automatically flushes the system using fresh water to displace the concentrated seawater within the RO membrane unit, so as to prevent the semi-stable oversaturated slightly soluble salt, which is generated after addition of antiscaplant dispersant, from depositing on the surface of the membrane after the system is restarted.

The start/stop of RO unit are realized by controlling the start/stop of high pressure pump, which are dependent on the water level in fresh water tank.

Electrical slow opening valve is installed in front of RO membrane, to prevent the pressure rise, which is resulted from sudden starting of high pressure pump, from causing adverse effect on the membrane. In order to prevent incorrect operation, blow off valve is installed before the RO permeate end, which will automatically blow off

to relieve the pressure in case of overpressure. When RO system is stopped, it will automatically shutdown inlet motorized valve, initiate RO flushing pump, open RO flushing valve, concentrated side air-actuated bleed valve at the concentrated end and air-operated valve at permeate end, to automatically flush the system for 3-5 minutes. See figure 2 for technical process and discharge node diagram.

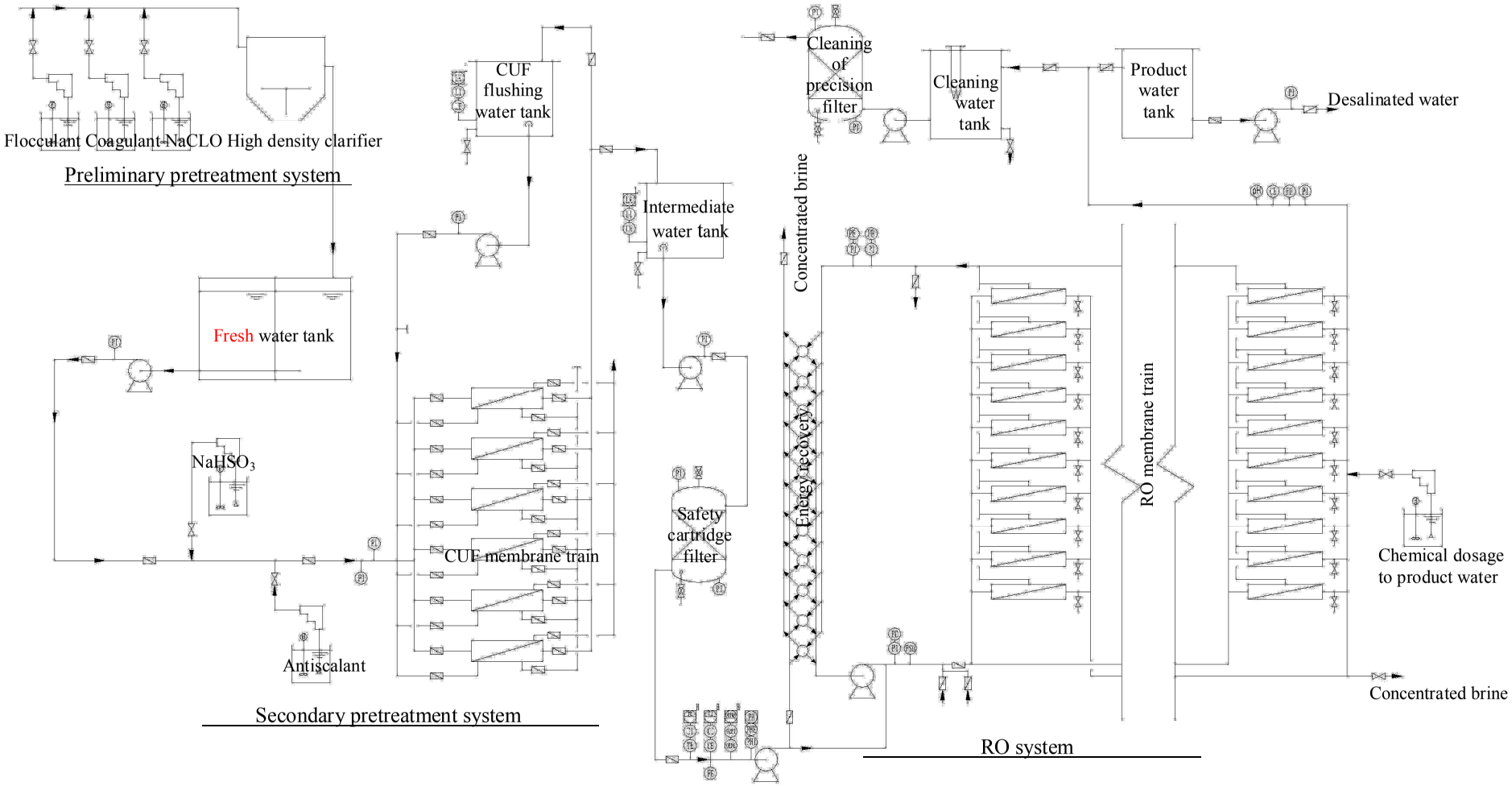


Figure 2. Technical Process and Discharge Node Diagram

Major pollution sources:

Major pollution sources during construction period include:

(1) Emissions: dust emission caused by construction and traffic;

(2) Noise: noised produced by construction equipment. The noise value is 75-80db (A);

(3) Wastewater: construction wastewater and/or domestic wastewater generated during construction.

(4) Solid waste: construction waste and domestic refuse.

Environmental impact assessment during operation

(1) Noise: the noises generated during operation of the proposed project mainly come from various equipment and pumps of pretreatment system and RO system, including RO high pressure pump, energy recovery unit. The noise generated by these equipment is at about 65-85dB (A).

(2) Waste water: sand filter backwash water from pretreatment process, concentrated brine from ultrafiltration process, brine reject from energy recovery and RO system, cleaning waste water from membrane cleaning process, and domestic wastewater.

(3) Solid waste: sludge from sedimentation tank, waste quartz sand, which comes from clarification tank due to regular media replacement, waste filter cartridge, which caused due to regular replacement of cartridge, waste membrane element from UF and RO system, chemical packages, as well as domestic refuse.

Major pollutants and predicted discharge of the project

Content / Type	Emission source	Pollutant	Concentration and quantity (unit)	Discharge concentration and quantity (unit)
Air pollutant	--	--	--	--
Water pollutant	Pretreatment process	SS	300mg/L, 9t/a	100mg/L, 3 t/a
	UF and RO process	Total salt content	640,000m^3/a	640,000m^3/a
	Membrane cleaning	pH	9-11, 219m^3/a	6-9, 219m^3/a
	Domestic wastewater	COD	450mg/L, 0.21t/a	300mg/L, 0.14t/a
		NH_3-N	30mg/L, 0.01t/a	28mg/L, 0.01t/a
		SS	250mg/L, 0.12t/a	60mg/L, 0.03t/a
Solid waste	Pretreatment	Sludge	52t/a	Landfill
	UF and RO process	Quartz sand	7.5 t/a	Recycled by the supplier
		Filter cartridge	1.5 t/a	
		Waste membrane element	10 t/a	Disposed by qualified organization
	Chemicals	Packages	24t/a	
	Employee living	Domestic refuse	1.1t/a	Disposed by environmental and sanitary department

noises	After the project is completed, the major noise sources include RO high pressure pump, energy recovery device, and blower fan. The noise during operation varies between 65-85 DB (A).
Others	
Principal ecological impact:	

Environmental impact analysis

Analysis of environmental impact during construction:

Noises, waste gas, waste water and construction wastes will be generated during construction. Therefore, environmental management and supervision must be strengthened to minimize the impact, and the construction company must carry out the followings carefully.

I. Handling of procedures for construction environmental protection

After going through the procedures for tenders and bids, the construction company shall, within 15 days before commencement of the project, designate a person with relevant materials including construction contract to apply for "Construction Environmental Protection Application Form" from competent environmental protection bureau. Only after being approved can the company go through the construction permit and start construction.

II. Environmental management

(1) The construction company is responsible for dust and noise control and collection & disposal of construction wastes, etc. in the construction site, and must fulfill the tasks carefully according to requirements. The tasks must be broken down and appropriate responsible persons must be designated, and the measures taken and relevant systems must be publicized for inspection by environmental protection administrations.

(2) Environmental supervision station of the competent environmental protection bureau is responsible for environmental supervision of the project. It has the right to punish construction companies for any violation to the rules and regulations.

III. Environmental impact analysis

(1) Atmospheric environmental impact analysis

During construction, the major sources of dusts emissions are sloping field leveling, earthwork construction, transport & storage of construction materials & wastes, construction site, etc. The production processes contributing to dusts are analyzed as follows:

 Part of the yellow earth excavated during foundation excavation will be backfilled, while the remaining yellow earth will be used to elevate the foundation; therefore no

spoils need to be transported away. Temporary stacking of yellow earth excavated during foundation excavation will generate dusts, which can be controlled by covering tarpaulin or dense mesh net and sprinkling water, so as to reduce the secondary dust pollution from causing impact on surrounding environment.

 Dust tends to occur during loading & unloading and stacking of sand and gravel materials.

 In construction sites, vehicle rolling and material scattering will cause secondary dust, affecting the ambient air quality. Priority shall be given to the control of construction dust, which will be present throughout the construction period.

The amount and impact level of construction dust vary depending on onsite conditions, management level, mechanization level and meteorological conditions, and are difficult to be quantified. In the assessment, similar onsite data are used for conducting comprehensive analysis. For construction dust pollution in this project, please refer to Table 7 and Table 8 below for observed data in the two similar construction sites.

Table 7. Dust pollution in a construction site **Unit: mg/m^3**

Monitoring location	50m upwind of the construction site	Construction site	Downwind of the construction site			Remarks
			50m	100m	150m	
Range	0.303-0.328	0.409-0.759	0.434-0.538	0.356-0.465	0.309-0.336	Average wind speed 2.5
Average value	0.317	0.596	0.487	0.390	0.322	

Table 8. TSP concentration change with different distances

Distance to the construction site (m)		10	20	30	40	50	100	Remarks
Concentration (mg/m^3)	No water sprinkling	1.75	1.30	0.78	0.365	0.345	0.330	Measured in spring
	Water sprinkling	0.437	0.350	0.310	0.265	0.250	0.238	

From the above table we may draw the following conclusions:

 Construction sites that with no dust suppression measures taken are heavily affected by dust. Where the wind speed is 2.5m/s, the concentration of dust in the construction site is 1.9 times that of the control point;

 Since the annual average wind speed in Caofeidian is 3.2m/s, and based on data as presented in the above table, if no dust suppression measures are taken, construction dust will affect the area within 150m downwind from the construction site. If dust suppression measures are taken, dust resulting from the construction site may not pose obvious impact on the quality of air in the surrounding environment.

The comprehensive service zone, as the sensitive site nearest to the construction site of the project, is 2.5km from the construction site in the north. Therefore construction dust will not affect the comprehensive service zone. The following measures will be taken during construction period:

 Solidify the ground around the access to the construction site and construction road; install temporary drain pipes and sedimentation tank; use construction wastewater and rainwater after being treated in sedimentation tank for dust control at the construction site; clear the sediments away on a timely basis; keep the construction site free from drifting dust, accumulated water and sludge.

 Transport construction wastes to designated location on a timely basis, random dumping of wastes is not allowed. Effective dust control measures must be taken in the process of loading/unloading, handling and shipping of raw materials, debris and construction wastes.

 Earthwork construction is forbidden in the case of wind scale of 4 or above at the construction site. Sand and gravel, debris and construction wastes shall be packed and covered tightly during transportation to prevent spilling and scattering.

 Construction materials, members and tools shall be stored and stacked neatly in the area as defined by the general layout plan and tagged with proper plate. Cement and powdered lime must be stored in the warehouse or covered tightly, and loose construction materials such as sands and stones and earthwork shall be solidified and covered at the surface to prevent dust from generating.

 Air pollution resulted by decoration-related activities shall be controlled at its

source by using innoxious or low toxicity environment-friendly products.

Adoption of the above measures may minimize the impact of air emission on the surrounding environment during the construction period.

(2) Construction noise impact analysis

During construction, the major noise sources include construction machinery and vehicles. The noise is featured by intermittence, mobility, and high-strength (the noise value at 5m from the noise source is 80-90dB(A)). Point source attenuation mode is used to predict the geometric divergence attenuation from noise source to noise reception point. The calculation will not take into consideration of attenuation resulted from sound barrier air absorption, etc. The prediction formula is listed below:

$$Lr = Lr_o - 20\lg(r / r_o)$$

Where,

Lr－Sound pressure level at distance r from the sound source, dB(A);

Lr_o－Sound pressure level at distance r_o from the sound source, dB(A);

r －Distance between the prediction point and the sound source, m;

r_o－Distance between the monitoring point and the sound source, m.

The predication results of noise at the construction site are shown in Table 9.

Table 9. Noise value with different distances to the sound source **Unit: dB (A)**

Name of equipment	5m	10m	20m	40m	50m	100m	150m	200m
Wheel loader	90	80	78	72	70	64	60	58
Winch	85	79	73	67	65	59	55	53
Bulldozer	86	80	74	68	66	60	56	54
Excavator	84	78	72	66	64	58	54	52
Truck	90	80	78	72	70	64	60	58
Electric drill	81	75	69	63	61	55	51	49
Planer	81	75	69	63	61	55	51	49

As seen from the above table, construction machines tend to generate high noise. In the daytime, the noise exceeding the “Limit Value of Construction Noise” (GB12523-90) occurs at a distance of 40m from the noise source. The comprehensive service zone is 2.5km away from the sound source and will not be affected by construction noise, which will disappear along with the process of construction.

(3) Wastewater impact analysis

Wastewater generated during construction mainly consists of domestic wastewater and construction wastewater. Domestic wastewater mainly comes from washing wastewater, with main pollutants of COD and SS (the concentration is approximately 300mg/L and 150mg/L respectively). It is estimated that up to 60 persons will involve in the project. Based on 80L domestic wastewater per day per person, totally 4.8m^3 domestic wastewater will be generated, which can be spayed directly to the ground. Anti-seepage pit privy is used temporarily, and it shall be disinfected and cleaned regularly for fertilizer. Wastewater generated from construction equipment is discharged into sedimentation tank via drain pipe, and used for dust control in the construction site. Therefore, the generated wastewater will not be discharged, thus not posing impact on the Chaohe River.

(4) Solid wastes

In the construction period, most of the excavated earthwork will be used to backfill the foundation, while the remaining earthwork will be used to elevate the low-lying places, so no spoils need to be transported to outside. Solid wastes mainly consist of construction waste and domestic wastess generated by construction personnel. All of the above are general solid wastes.

Wastes generated during construction shall be delivered to refuse dump for disposal. Domestic wastes shall be transported to garbage transfer station and disposed by environmental protection administrations. All solid wastes will be disposed of appropriately, and will not pose significant impact on the surrounding environment.

Environmental impact analysis during operation:

(1) Atmospheric environmental impact analysis

Heating of the proposed project is supplied by Heating Power Group - Caofeidian Industrial Zone Heat Supply Company in the winter; no boiler will be installed and no atmospheric pollutants will be discharged.

(2) Water environmental impact analysis

Wastewater generated by the proposed seawater desalination plant mainly includes: concentrate brine, sand filter backwash water, sludge wastewater from sedimentation tank, etc. In addition, the wastewater also includes cleaning wastewater from UF

membrane and RO membrane cleaning process as well as domestic wastewater. The wastewater generated from pretreatment process is about 3000m^3/d, including sand filter backwash water, wastewater generated from sedimentation sludge dewatering, etc., which containing large amounts of suspended solids. Such water is returned to the inlet of pretreatment system after sedimentation and filtration. Therefore, no water will be discharged. The plant will generate about 64000m^3/d concentrate brine, which will be delivered to Nanpu Salt Factory for salt production. In addition, it will also generate about 0.4m^3/d UF membrane cleaning wastewater and 0.2m^3/d RO membrane cleaning wastewater (0.6m^3/d in total). The domestic wastewater generated is about 1.3m^3/d, and will be discharged to wastewater collection network after being treated in the septic tank. Major pollution factor in the membrane cleaning wastewater is pH. The pH of membrane cleaning wastewater will be adjusted in neutralization basin before mixing with domestic wastewater. The mixed wastewater will then be discharged into the collection network, via which, it is transported to wastewater treatment plant in the southern part of Caofeidian Industrial Zone. The discharged wastewater shall meet the Category 3 standard "Integrated Wastewater Discharge Standard" (GB8978-1996) in Table 4 and requirements for influent water quality of Wastewater Treatment Plant.

To sum up, wastewater generated from the proposed project is discharged according to the standard and will not cause impact on ambient seawater.

(3) Noise impact analysis

During project operation, noise sources mainly include various equipments and pumps of the RO system and pretreatment system, including RO high-pressure pump, energy recovery unit and blower fan. Noise generated by equipment operation varies between 65-85db. The following measures have been taken to reduce noises in the proposed project: adoption of low-noise equipment and shields, laying of sound-insulation materials for adjacent walls; mount of shock absorption base, and installation of the equipment within the workshop, etc. The equipment will not impact on the sound environment of the plant after distance attenuation.

(4) Solid wastes impact analysis

Solid wastes generated from the proposed seawater desalination plant during project

operation mainly include: sludge generated from all pretreatment sections, waste RO membrane elements, used filter element, quartz sand, chemical package and domestic wastes, etc. In the proposed project, the above wastes are managed according to their chemical properties, i.e., the wastes are stored temporarily by type and area to avoid cross contamination, and are disposed of separately by different qualified organizations.

Sludge: during operation, sludge mainly comes from suspended matter, slity sand, ferric hydroxide and other impurities presented in the seawater. Generally, the SS concentration of seawater in the circulation trench is higher than 100mg/L. The seawater desalination process removes about 75-80% of suspended solid, which after being pretreated, is transported to the sludge treatment system for dewatering treatment. The dewatered sludge will be delivered to the landfill for disposal.

In the proposed project, 20 fixed staff will be employed, and domestic wastes generated by accordingly will be collected and transported away by the environmental protection administration on a regular basis.

The quartz sands used in the filtration basin and the replaced filter cartridge will be recycled by corresponding supplier respectively. The waste membrane element, which is made of aroma polyamide, will be disposed of by organizations qualified for disposal of hazardous wastes.

Certain amounts of chemical reagents are used in seawater desalination process, mainly including ferric chloride, sulfuric acid, sodium hydroxide, sodium sulfite and antiscalant, etc. The package of such chemical reagents will be disposed as toxic and hazardous wastes by qualified organizations.

In the proposed project, the above hazardous wastes are stored in a $50m^2$ temporary storeroom, where the ground will be treated to prevent seepage. The anti-seepage clay layer shall be at least 1m thick, on which 2mm high-density polythene and ceramic tiles will be laid. The anti-seepage coefficient shall be less than or equal to 1.0×10^{-10}cm/s. The above anti-seepage and corrosion-resistant measures will not pose impact on the underground water.

Proposed preventive and control measures and expected effects

Contents / Type	Emission source	Name of pollutant	Preventive measures	Expected effects
Atmospheric pollutant	--	--	--	--
Water pollutant	Pretreatment process	SS	Sedimentation tank	No discharge
	UF and RO process	Total salt content	To be delivered to Nanpu Salt Factory	The wastewater will not be discharged directly into the environment.
	Membrane cleaning	PH	Neutralization basin	Class III discharge standard specified in Table 4 "Integrated Waste water Discharge Standard" (GB8978-1996) and influent water quality requirements of wastewater treatment plant in the southern part of Caofeidian
	Domestic wastewater	COD	Septic tank	
		NH_3-N		
		SS		
Solid pollutant	Pretreatment	Sludge	To be transported landfill for disposal	No discharge
	UF and RO process	Quartz sand	To be recycled by suppliers	
		Filter cartridge		
		Waste membrane element	To be disposed of by appropriate organizations with	

	Dosing system	Package	qualification to treat hazardous wastes	
	Employees living	Domestic wastes	To be disposed of by environmental protection administration	
Noise	During operation, noises mainly come from various equipments and pumps of the RO system and pretreatment system. The following measures have been taken to reduce noises in the proposed project: adoption of low-noise equipment and shield; laying of sound-insulation materials for adjacent walls; mount of shock absorption base, and installation of the equipment in the workshop, etc. The equipment will not pose significant impact on the sound environment of the plant after distance attenuation.			
Others				

Ecological protection measures and expected results:

After completion of the project, the construction company will try to make the plant area green by planting trees and grasses, etc. The green area will be 2000m^2, accounting for 9.3% of the total area.

Results and suggestions

I. Results:

(1) General

Caofeidian 50,000t/day Seawater Desalination Project of Norway Aqualyng AS. has a total investment of 349.11 million Yuan, including investment on environmental protection of 0.35 million Yuan, accounting for 0.1% of total investment. The project is located to the north of Huarun Power Plant, Caofeidian Industrial Zone. Geographic coordinate of the center of the project is 38º58′43.97″N and 118º30′08.51″E. It has a land use of 21,417m^2, including a greening area of 2,000m^2, accounting for 9.3% of land use. There are 20 fixed members for the project, including 3 managers, 5 in charge of equipment maintenance and 12 working for workshop. Except during equipment maintenance, 24h continuous four-shift working system is adopted.

(2) Site selection

The project is located to the north of Huarun Power Plant, Caofeidian Xin-gang Industrial Zone, and 2.5km away from the nearest sensitive point, namely the planned comprehensive service area. The site belongs to industrial land, and Planning Bureau of Caofeidian Industrial Zone, Tangshan has issued the written comment for site pre-selection for the project.

(3) Included works

Buildings in the proposed seawater desalination plant include main workshop (arranged with control room, dosing room, filtration room, pump room, distribution room, warehouse, etc.), clean water tank, clarification tank, and other related facilities, with a total building area of 5006.5m^2.

(4) Industrial policy

According to Industrial Restructuring Directory (Rev. 2005), the proposed Project falls in the category under encouragement, because it belongs to environmental protection, energy conservation and comprehensive utilization project, and conforms national industrial policies.

(5) Project coordination

① Power supply: Installed power of this project is 8333KW, total power

consumption is 10667KW, and the power is connected from Caofeidian power network.

② Heating supply: Heating of the proposed project in the winter is supplied by Caofeidian Industrial Zone Heating Supply Company, a subsidiary of Tangshan Heating Power Group, and there is no newly-installed heating facility.

③Water supply and drainage:

Water supply: Instead of constructing a new seawater intake, the Project shares the same seawater intake located in No. 1 Basin Wharf with Huarun Power Plant. The proposed project uses cooling water from the power plant in winter and raw seawater in other seasons as feed water. The Project has a design raw water flow of 114,000m^3/d, which is completely used as feed water for seawater desalination system. It production capacity is 50000m^3/d, among which 0.6m^3/d is used for membrane cleaning, 1.6m^3/d is used for employees' living water, 3m^3/d is used for greening in the plant area, and the remaining 49994.8m^3/d is delivered to points of use.

Drainage: wastewater generated by this proposed project includes 3000m^3/d from pretreatment process, which will be returned to pretreatment process after sedimentation, 64000m^3/d concentrated brine from continuous ultrafiltration process and RO process, which are delivered to Nanpu Salft Factory for salt production. In addition, membrane elements require cleaning after running for a certain period of time (generally once every 0.5-1 year). During cleaning process, 100m^3 cleaning solution will be prepared, with chemical concentration of several percentages. The alkaline cleaning waste water generated is about 0.6m^3/d, which after the regulation of PH value in neutralization tank, is discharged. 1.3m^3/d of domestic wastewater will be discharged after being treated in septic tank.

(6) Status quo of regional environmental quality and sensitive protection objectives

① Atmospheric environment

According to monitoring results on status quo of environmental quality conducted by Tangshan Environmental Monitoring Center in May 2007, as provided in the Environmental Impact Assessment Report on Assembly and Manufacture Base of No. 22 Metallurgical Construction Corporation Limited, the max. hour concentration of

SO_2 at monitoring point is 0.049mg/m^3 and the max. daily concentration of SO_2 is 0.036mg/m^3, which both meet the grade II standard as stipulated in Ambient Air Quality Standard (GB3095-96). The daily TSP density exceeds the standards, because the projects in Caofeidian region are under construction, and the dust caused by sea reclamation, construction and transport are all over the port area.

② Water environment

In Jul. 2007, the Fisheries Research Institution of Tianjin was entrusted to make large scale survey on status quo of port area in Caofeidian Industrial Zone, and the survey results have been validated by Marine Environmental Monitor Center of Hebei.

According to the survey results, the pH value, dissolved oxygen, heavy metals such as mercury and cadmium meet the water quality requirements for the functional zone of the monitoring point, and there is no sample exceeding the standards. The value of other factors under survey such as chemical oxygen demand (COD), biochemical oxygen demand (BOD), inorganic nitrogen, reactive phosphate, petroleum hydrocarbons, copper, zinc and lead exceed the standards to different degree.

The content of organic carbon, sulfide, petroleum hydrocarbons, copper, lead, zinc, cadmium and chromium presented in the sediment meets the quality requirements for sediments of related environmental functional zone, and there is no sample exceeds the standards. The status quo of sediments in sea area under survey is good.

③ Acoustic environment

Acoustic environment functional area of project belongs to Category III Area, and main source of noise pollution is traffic noise.

④ Main objectives of environmental protection and sensitive points

The proposed project is located to the east of No. 1 Basin Wharf in Caofeidian Industrial Zone, Luannan County, Tangshan City, Hebei Province, adjacent to the north of Huarun Power Plant. The marine function of the project site is salt industry and port traffic area, without important ecologically sensitive areas. The main environmental protection objectives determined in this assessment report are comprehensive service area and Wave Absorption River.

(7) Proposed environmental protection measures

① Waste water

Waste water generated in the proposed seawater treatment plant mainly includes:

3000m^3/d of wastewater from each pretreatment process, which containing a large amount of suspended solid, and will be delivered to the inlet of pretreatment system after sedimentation and filtration treatment. 64000m^3/d of concentrated brine generated from continuous ultrafiltration process and RO process, which will be delivered to Nanpu Salt Factory for salt production. In addition, 0.6m^3/d of cleaning water will be produced during membrane cleaning, which, after adjusted in neutralization tank, will mixed with the 1.3m^3/d of domestic water generated in the construction site, then discharged to Wastewater Treatment Plant in southern part of Caofeidian for treatment. The discharged wastewater shall meet the Category 3 standard "Integrated Wastewater Discharge Standard" (GB8978-1996) in Table 4 and requirements for influent water quality of Wastewater Treatment Plant.

②Noises

Noises during the operation of the Project mainly come from all the facilities and water pumps of RO system and pretreatment system. Main noise sources include RO high pressure pump, energy recovery unit and blower fan. The noise from the equipment operation is between 65-85 dBs. So the low noise equipment shall be selected in the proposed project. In addition, the following measures shall be taken to lower noises, including adopting protective shield, laying sound insulating material, and mounting shock absorption base, and installing such equipment indoors, etc. After distance attenuation, the noise will not pose an evident impact on the acoustic environment at the factory boundary.

③ Solid waste

Solid wastes generated during the operation mainly include: sludge from pretreatment process, waste RM membrane elements, used filter cartridge, quartz sand, chemical agents packages and domestic wastes, etc. The above wastes shall be managed according to their properties, and stored in specified area to prevent cross contamination. And such wastes shall be disposed by different qualified organizations and must not be discharged into the environmental directly.

(8) Total discharge (emission) control

Total discharge (emission) control objectives of pollutant discharged from this project: COD 0.14 t/ammonia nitrogen 0.01t/a and solid waste 0t/a.

(9) Feasibility Results of the Project

Caofeidian 50,000t/day Seawater Desalination Project of Norway Aqualyng AS. Belongs to project of environmental protection and resources conservation and comprehensive utilization and meets national policies. Its land used belongs to industrial land. After the completion of the project, it will effectively relief the fresh water shortage of Caofeidian area. On the basis of careful implementation of all the measures of environmental protection presented in this report, Project is environmentally feasible.

II. Suggestions

(1) Strictly comply with the rule of "Three-simultaneity", and implement the construction and utilization of environmental protection facilities.

(2) Enhance the management over chemical agents.

III. Inspection and acceptance of "three-simultaneity" works

According to ways of environmental management over projects, the facilities for environmental pollutant treatment shall be designed, constructed and put into operation simultaneously together with main works. After completion, final inspection on the facilities for environmental protection shall be carried out. See Table 10 for environmental supervision work during construction period. List of facilities for "three-simultaneity" environmental protection during the operation of the Project sees Table 11.

Table 10 List of environmental inspection and supervision works during construction period

Objective	Description	Acceptance criteria
Construction dust	Enclosing work shall be carried out on the construction site, and enclosing wall with a height of not less than 2.5m shall be installed in a continuous manner.	There is basically no evident dust emission on construction site.
	Dense-eye type safety net shall be used at the outside of the project for a full enclosure.	
	The vehicles into and out of construction site shall have clean tires, and vehicle washing equipment and sedimentation tank	

	shall be installed at the entrance and exit of construction site.	
	The roads and working area within construction site shall be hardened to avoid of dust emission.	
	Earthwork shall be stacked on the construction site in an orderly manner, and some measures, including sprinkling and paulin covering, shall be taken to prevent dust.	
	Special persons are designated to be in charge of sprinkling of construction site, once in a sunny day and twice in a windy day.	
Other exhaust emissions	It is forbidden to set kitchen facilities that produce smoke on the construction site. On the construction site, liquefied gas, coal gas, natural gas or electricity must be used for living and production and coal is not allowed to be used.	Basically no production of other harmful gases
	It is forbidden to burn asphalt, felt, rubber, plastic, leather, and other matters which produce poisonous and harmful dust and odor gases on the construction site.	
Construction noises	Reduce the noises of construction equipment and set simple noise insulation shield	Small influence on surrounding acoustic environment
Domestic wastewater	Temporary anti-seepage pit privy and sedimentation tank	No discharge
Solid construction wastes	Collection and transport of construction wastes and domestic refuses	No discharge
Management	Environmental supervision and monitoring institution and facilities during construction	

Table 11 List of Inspection and Acceptance of "Three-simultaneity" Work of the Project

Item	Pollution source	Measure	Quantity	Investment on environmental protection (10000 Yuan)	Acceptance criteria
Waste water	Pretreatment process	Sedimentation tank	1	10	No discharge
	UF and RO process	Delivered to Nanpu Salt Factory	1		No discharge

	Membrane cleaning	Neutralization tank	1		Class III discharge standard specified in Table 4 "*Integrated Wastewater Discharge Standard*" (GB8978-1996) and inlet water quality requirements of waste water treatment plant in the southern part of Caofeidian
	Domestic wastewater	Septic tank	1		
Noise	Noise sources include RO system, and all kinds of equipment and pumps. Measures shall be taken to reduce noise, including adopting protective shield, laying sound insulating material, and mounting shock absorption base.			5	Category III emission standard specified in *Standard of Noise at Boundary of Industrial Enterprise* (GB12348-2008)
Solid wastes	Sludge	Delivered to landfill for disposal	52t/a	5	No discharge
	Quartz sand	Recycled by supplier	7.5t/a		
	Filter cartridge		1.5t/a		
	Waste membrane element	Disposed by company with qualification for dangerous wastes treatment and disposal	10t/a		
	Packages		24t/a		
	Domestic waste	Collected and Disposed by environmental and sanitary department	1.1t/a		
others	Temporary store room of 50m^2 shall be set to store hazardous wastes. Anti-seepage treatment shall be carried out for the ground of warehouse where hazardous waste is stored. The anti-seepage clay layer shall be at least 1m thick, on which 2mm high-density			10	

	polythene and ceramic tiles will be laid. The anti-seepage coefficient shall be less than or equal to 1.0×10^{-10}cm/s.		
	Greening area is 2000m^2, accounting for 9.3% of total land use	5	
Total		35	

Comments from preliminary review: **Seal** **Handled by:** **____(M)____(D), _____(Y)**
Review comments from competent department of environmental protection administration at the lower level: **Seal** **Handled by:** **____(M)____(D), _____(Y)**
Review comments: **Seal** **Handled by:** **____(M)____(D), _____ (Y)**

Remark

I. The following appendixes and drawings shall be enclosed in this report:

Appendix 1 Project Approval Document

Appendix 2 Other administrative documents related to environmental impact assessment

Attached drawing 1 Geographic Location Map of the Project (it shall reflect administrative divisions and water systems, and indicate the positions of sewage receiving ports, landform and topography, etc.)

Attached drawing 2 Layout Plan of the Project

II. If the report can not specify the pollution from the project and its impact on the environment, special assessment shall be carried out. According to the characteristics of the project and local environmental features, special assessment shall be carried out for one or two items from the following content.

1. Special assessment on atmospheric environment impact

2. Special assessment on water environment impact (including surface water and underground water)

3. Special assessment on ecological impact

4. Special assessment on acoustic environment impact

5. Special assessment on soil impact

6. Special assessment on solid waste impact

The other special assessment (s) not covered in the above can be listed separately. Special assessment can be carried out according to *Technical Guideline of Assessment on Environmental Impact*.

Preliminary review Opinions:

Handled by: Seal

Review Opinions of Competent Department of Environmental Protection at Lower Level :

I. We agree with the conclusion as provide in Environmental Impact Assessment Report concerning Caofeidian 50,000 Tons/Day Seawater Desalination Project of Norway Aqualyng AS., and hold the opinion that the proposed standard is appropriate and preventive measures are feasible.

II. The construction of Caofeidian 500,000 Tons/Day Seawater Desalination Project invested by Norway Aqualyng AS. with total investments of RMB 349,110,000 Yuan is in conformity with the national industry policy, favorable for the implementation of Caofeidian cyclic economy and saving freshwater

resources. This project adopts ultrafiltration followed by reverse osmosis technology to realize seawater desalination.

III. It is agreed to submit to the said project to Hebei Environmental Protection Bureau for approval.

Handled by: Wang Xing Tangshan Environmental Protection Bureau (Seal)

October 28, 2008

Approval Opinions:

JHB

[2008] No. 592

In consideration of the assessment opinion of Hebei Appraisal Center for Environment & Engineering and the preliminary examination opinion of Tangshan Environmental Protection Bureau, the reply to the Environmental Impact Assessment Report concerning Caofeidian 500,000 Tons/Day Seawater Desalination Project is made as follows:

I. Caofeidian 500,000 Tons/Day Seawater Desalination Project, with a total investment of RMB 349,110,000 Yuan, located in the Caofeidian New Harbor Industrial Area, utilize UF. The project uses UF/ RO technology to desalinate

seawater. This Environmental Impact Assessment Report can serve as a basis for the engineering design and environmental management.

II. Attention shall be given to the following problems during project construction and operation: The waste water generated from the pretreatment processes is completely reused after treatment. Concentrated brine is delivered to Nanpu Salt Factory for salt production, and other wastewater is discharged to wastewater treatment plant after treatment. The solid wastes generated are appropriately handled, disposed in accordance with the *Law of the Peoples Republic of China on Prevention and Control of Environmental Pollution by Solid Waste* and the *Category Management Directory of Solid Waste.* Noise reduction measures shall be taken for noise sources to ensure the *f*actory *boundary* noise meet the class 3 standard as specified in Table 1 "*Standard* of *Noise at Boundary of Industrial Enterprises"* (GB12348-2008).

III. The project construction must strictly implement the "Three-simultaneity" system of environmental protection, i.e. the environmental protection facilities must be designed, constructed and put into operation simultaneously with the main work of the project. After completion of the project, the written application for pilot production must be submitted to Tangshan Environmental Protection Agency. After approval, the pilot production may be started. Within 3 (three) months as from the date of pilot production, the application for environmental protection acceptance must be submitted to our Agency in accordance with the established procedures. After acceptance, the project can be put into operation. Should the project contents change, our Bureau shall be informed promptly. In case of the violation against this specification, the legal liability of environmental protection shall be borne accordingly.

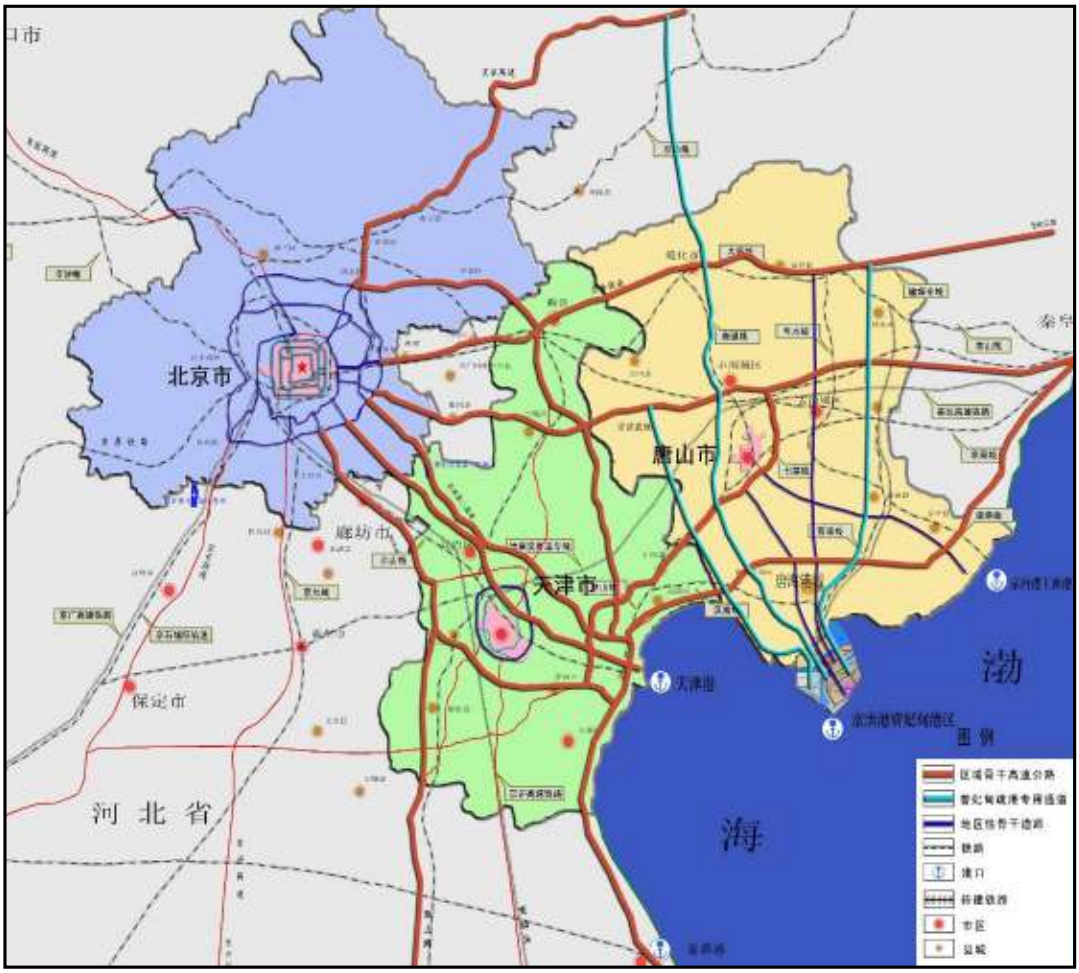
IV. The environmental inspection and supervision work during project construction will be jointly carried out by Our Bureau and Tangshan Environmental Protection Bureau.

V. Your company shall, within 20 working days after receiving this reply,

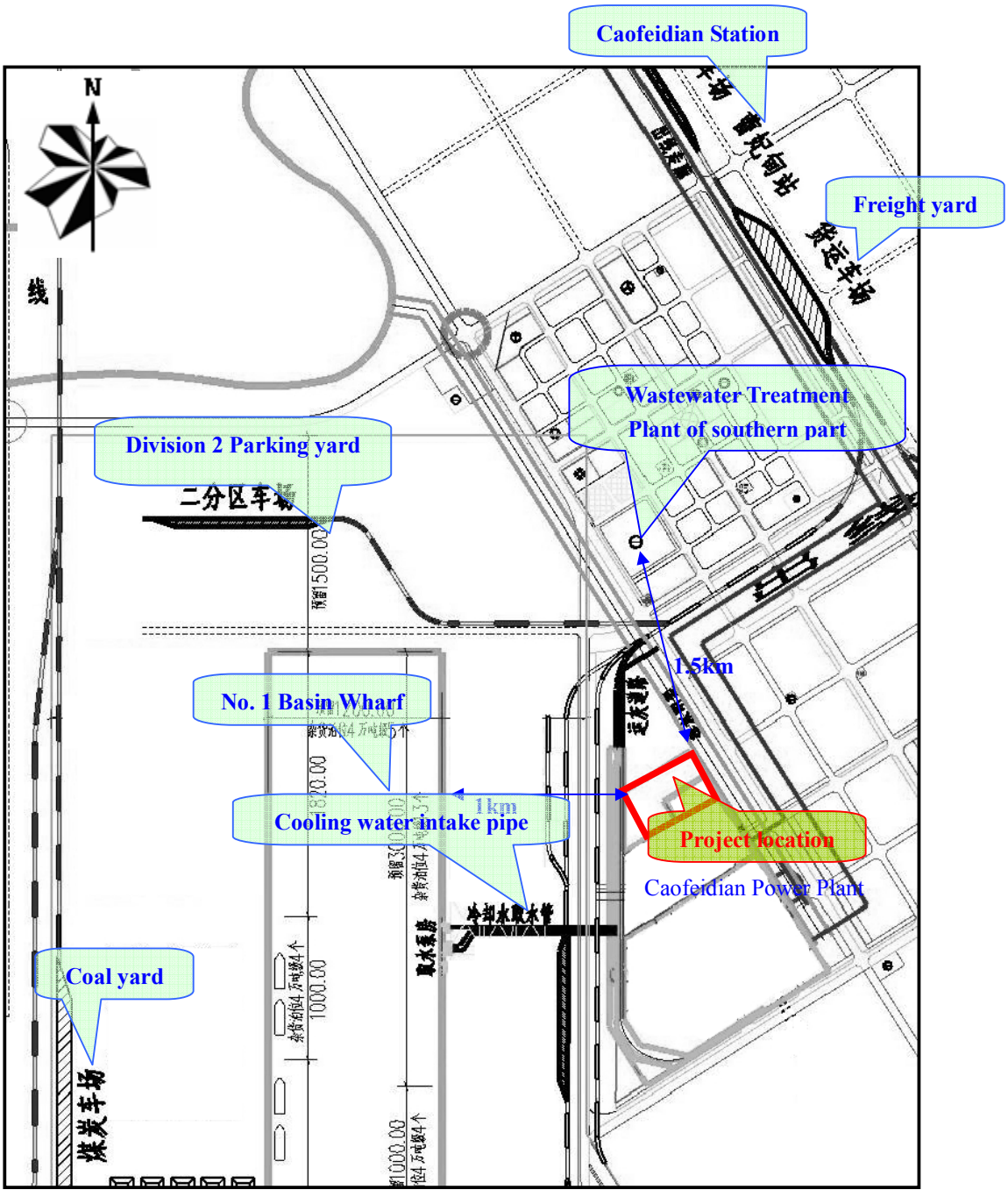
submit the approved Environmental Impact Assessment Report to Development & Reform Commission, Tangshan Environmental Bureau, and receive supervision of Environmental Protection Department at all levels as required. In addition, your company shall report the implementation condition of "Three-simultaneity" to Tangshan Environmental Bureau in accordance with "Implementation Condition of Tree-simultaneity for Construction Projects "

Handled by: Li Qingdong (Signature)

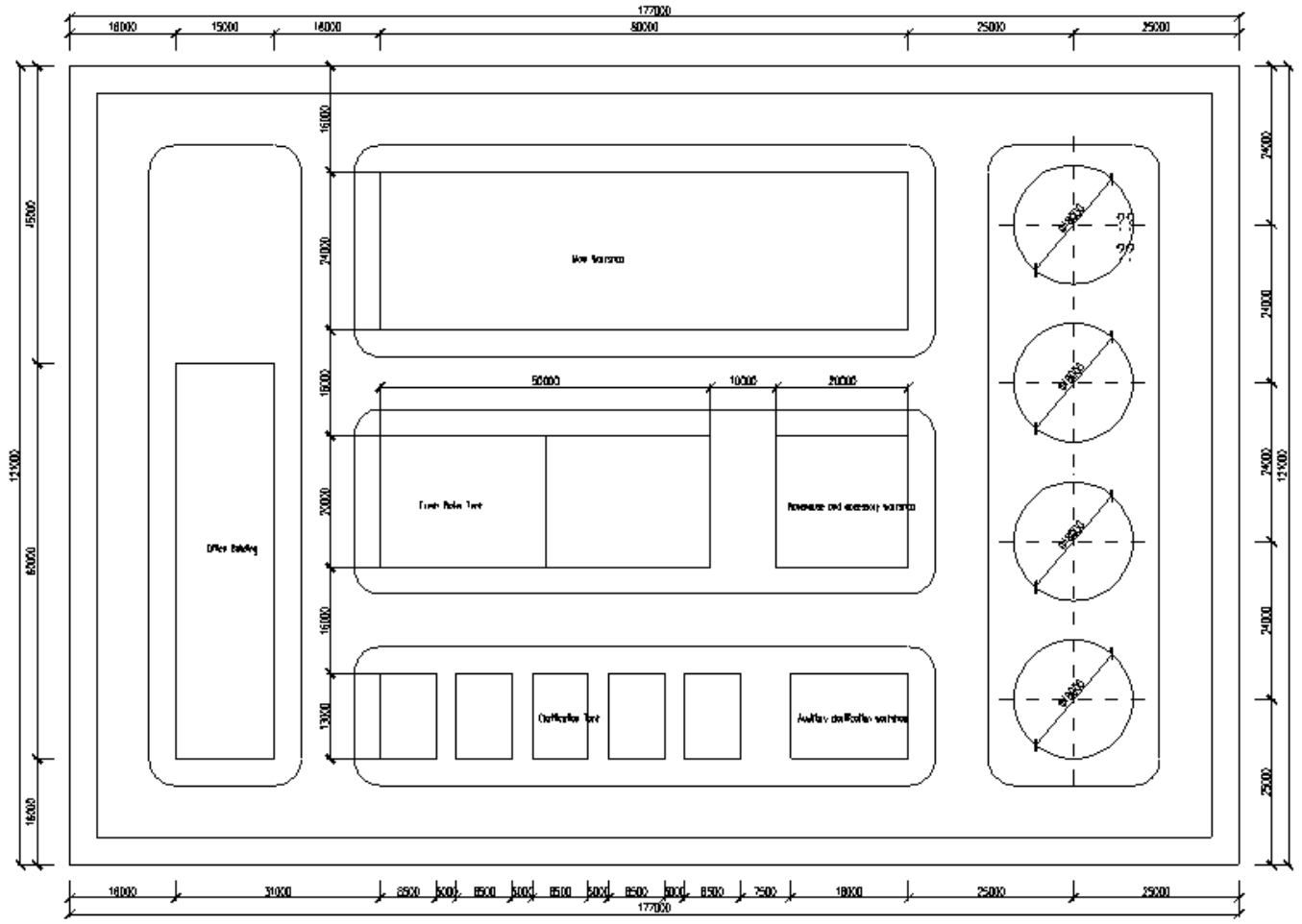
Seal for Construction Project Only of Hebei Environmental Protection Bureau (Seal) November 17, 2008



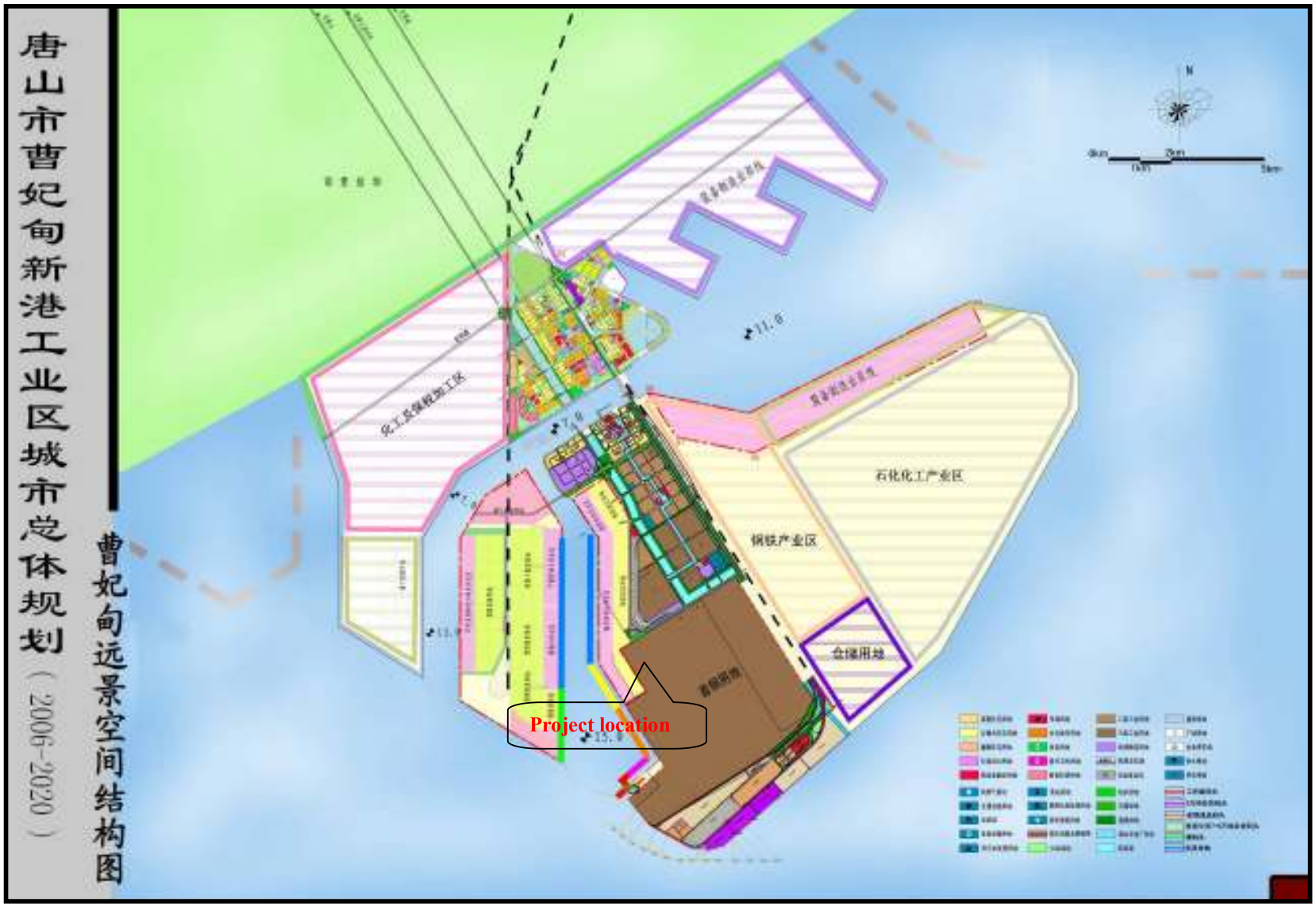
Attached Drawing I Geographic location Map of the Project



Attached Drawing II Circumferential Relationship Map of Project



Attached Drawing III.General Plan Layout of the Factory


唐山市曹妃甸新港工业区城市总体规划（2006-2020）
曹妃甸远景空间结构图
化工及储运加工区
石化化工产业区
钢铁产业区
会堡用地
Project location

Attached drawing V Environmental Function Division Map of Offshore Area of Hebei Province

Review Comments on Environmental Protection of Construction Projects

No.:

<table>
<tr><td rowspan="9">To be completed by the project owner</td><td>Project Name</td><td colspan="3">Caofeidian 50,000 t/day Seawater Desalination Project</td></tr>
<tr><td rowspan="2">Description</td><td>Scale or production capacity</td><td colspan="2">Design flow of 117,000 m^3 of seawater, and production capacity of 50,000 m^3 of production water</td></tr>
<tr><td>Total investment (10,000Yuan)</td><td colspan="2">34911</td></tr>
<tr><td>Construction Site</td><td colspan="3">To the north of Caofeidian Power Plant, Xingang Industrial Area, Caofeidian</td></tr>
<tr><td>Distance from the nearest environmental sensitive site (zone) to the site of proposed project (Unit: m)</td><td colspan="3">Around 5,000 m</td></tr>
<tr><td>Approval method</td><td colspan="3">Approved □ Authoritative ■ Filed □</td></tr>
<tr><td>Expert assessment</td><td colspan="3">To be assessed □ Not to be assessed ■</td></tr>
<tr><td>Grade of authority or filing</td><td colspan="3">State□ Provincial ■ Municipal □ County (City, district) □</td></tr>
<tr><td>Legal representative</td><td>Bai Yu</td><td>Contact person and telephone</td><td>Bai Yu
13801959350</td></tr>
<tr><td rowspan="3">To be completed by environmental protection department</td><td>Environmental protection approval department</td><td colspan="3">State□ Provincial ■ Municipal □ County (City, district) □</td></tr>
<tr><td>Category of environmental protection assessment</td><td colspan="3">Letter of Report □ Letter of Report (Including ____special assessment) □
Form of Report ■ Registration Form</td></tr>
<tr><td colspan="4">Documents required for review and approval:
1. Environment Impact Assessment Report for Construction Project: In 8 copies for hardcopy and in duplicate for electronic document;
2. Approval document of Construction Project Proposals (approved projects) or Filing Approval (filing projects) in one copy;
3. Technical Assessment Opinions on Environmental Impact Assessment Report;
4. Approval Opinions from environmental protection administration at lower level;
5. Other documents to be submitted according to relevant laws, rules and regulations.</td></tr>
<tr><td rowspan="2">Remark</td><td colspan="4">1. The project owner shall be responsible for the truthfulness of all information filled herein;
2. Preliminary consultation opinions shall be obtained from competent investment management department for approval projects;
3. The opinions are only for references during the preliminary work of environmental impact assessment.</td></tr>
<tr><td colspan="4">Foreign-funded project (Norway)</td></tr>
</table>

Handled by (Signature): September 11, 2008

Planning and Construction Management Bureau of Caofeidian Industrial Area

Opinions on Site Selection for Construction Project

No.: GHJS-YXZ-2007-15
December 14, 2007

To Norway Aqualyng Holding AS.,

We have received the documents, drawings and data associated with the Seawater Desalination Project submitted by your company. Through the carefully study, we conclude that your project complies with the related regulations on the planning management of Caofeidian Industrial Area and the overall layout of the industrial area. The project is approved and we hereby make the following opinions on site selection:

I. Location of land use: West side of high tension corridor, link of Tangshan-Caofeidian Highway, and to the north of Huarun Power Plant;
II. Construction nature: seawater desalination and fresh water production;
III. Land use nature: Industrial use;
IV. Plot ratio: 0.4-0.6;
V. Other planning requirements: The specific location and relevant control indexes are to be determined in compliance with the design requirements for detailed planning of the start-up part of Caofeidian Industrial Area; and the land use scale is to be decided upon the project approval opinions and general plan layout review comments;
VI. Besides the above requirements, this Project shall also meet relevant requirements of state planning technical codes and standards.

In the meantime, the following regulations shall be abided by:

1. The project shall be designed by qualified unit, which shall hold corresponding certificates to assume the design tasks.
2. The project owner shall, within six months after receiving this Notice, submit the design plans and relevant certificates to our bureau. Otherwise, the design scope and planning requirements shall be re-applied and re-approved.

Should there be any doubt about the above opinions, please call to our bureau for consultation or make appointment with us for interview.

Contact Person: Dong Jiuyi
Tel: 0315-8820017

Planning and Construction Management Bureau of Caofeidian Industrial Area
(Seal)

Note on Providing Municipal Pipe Network for Tangshan Caofeidian Seawater Desalination Project

October 30, 2008

Tangshan Caofeidian Seawater Desalination Project invested by Norway Aqualyng AS. is located on the west side of high tension corridor of Caofeidian industrial area, east of the link for Tangshan-Caofeidian Highway, and north of Huarun Power Plant. After the project is put into operation, the electricity, water and heat supply, domestic sewage discharge and other matching infrastructures will be provided completely.

It is hereby noted!

Development & Reform Commission of Tangshan Caofeidian Industrial Area (Seal)

Certification

November 4, 2008

To Hebei Provincial Environmental Protection Bureau,

As a sea salt manufacturer close to Caofeidian Industrial Area, we have agreed to accept and handle, within our factory, all concentrated seawater discharged by Caofeidian 50,000 ton/day Seawater Desalination Project Phase I Project, which is invested by Norway Aqualyng AS.

It is hereby certified!

Hebei Nanpu Salt Factory (Seal)

Letter of Intent for Waste Solid Treatment

Parties: Party A: Norway Aqualyng Holding AS.
Party B: Tianjin Hejia Veolia Environmental Services Co., Ltd
Validity: November 4, 2008 to November 3, 2009

Contract:
Party B boasts industrial hazardous wastes disposal and treatment system, and holds related qualifications granted by the state Ministry of Environmental Protection. In the meantime, it also obtains the approval from Tianjin municipal Bureau of Environmental Protection for waste disposal. Whereas Party B agrees to accept and handle all wastes produced by Party A, the following Letter of Intent is hereby concluded by Party A and Party B.

I. Waste name and major physical and chemical characteristics:

No.	Waste Name	Quantity (ton/year)	Major Hazardous Composition
1	Waste membrane elements	10	Aromatic polyamide
2	Packages of chemical reagents	24	$FeCl_3$, SO_4, NaOH, $NaSO_3$

The Project is planned to be put into operation in January, 2010.

II. Wastes collection and disposal
Party A shall seal, pack and store well all wastes produced during its production, without any leakage, and provide the detailed information about all these wastes to Party B. Both parties shall make the settlement by means of "Hazardous Waste Transfer Bill".
Within two days after receiving the notice from Party A, Party B shall go to Party A's site to collect and transport the wastes, except that Party A transports the wastes on his own. Party A shall provide necessary assistances (eg. forklift) to Party B. And Party B is not allowed to produce secondary pollution during the waste transport and disposal. Party B shall assume full responsibilities for any pollution arising from or in connection with the above disposals.

III. Fees: fees related with wastes treatment and transport services shall be decided upon the actual amount of wastes produced.

IV. Notes:
1. This Letter of Intent is written in quadruplicate, with each party holding two respectively;
2. Either Party may terminate the contract in case the other party breaching the contract;

3. This Letter of Intent is signed on November 4, 2008.

Party A:
Name: Norway Aqualyng Holding Ltd
Add: North Huarun Power Plant, Caofeidian Industrial Area, Tangshan City
Person Responsible: Bai Yu
Contact Person: Bai Yu
Tel.: 1380159350
Fax:
Signature & Seal:

Party B:
Name: Tianjin Hejia Veolia Environmental Services Co., Ltd
Add: No. 69, Erba Road, Jinnan District, Tianjin City
Person Responsible: Lu Xiqiang
Contact Person: Cao Xiaoguang
Tel.: 022-28569812
Fax: 022-28569803
Signature & Seal:

Note on the Owner of Tangshan Caofeidian Seawater Desalination Project

November 3, 2008

Located in Caofeidian Industrial Area, Tangshan Caofeidian Seawater Desalination Project is invested by Norway Aqualyng AS. The project manager is Bai Yu (ID Card No.: 632521196108230015), CEO of the Company in China. At present, the preliminary work of this Project is being carried out. Please submit the feasibility study report and the environmental impact assessment of the Project to our commission for approval.

It is hereby noted!

Development & Reform Commission of Tangshan Caofeidian Industrial Area (Seal)

Approval Form of Total Discharge (emission) of Major Pollutants for Construction Projects in Heibei Province (Trial Implementation)

<table>
<tr><td colspan="5">I. Profile of construction project</td></tr>
<tr><td>Project Name</td><td colspan="4">Caofeidian 50,000t/day Seawater Desalination Project</td></tr>
<tr><td>The Project Owner (Seal)</td><td>Norway Aqualyng AS.</td><td>Category of Industry</td><td colspan="2">Treatment, utilization and distribution other water of D4690</td></tr>
<tr><td>Construction Site</td><td>North Huarun Caofeidian Power Plant, Xingang Industrial Area</td><td>Discharge of waste water</td><td colspan="2">Wastewater Treatment Plant in the Southern Part of Caofeidian</td></tr>
<tr><td>Nature of Construction</td><td>Newly built■ Renovated/ Expanded□</td><td colspan="3">Project Type: Encouraged ■ Others □</td></tr>
<tr><td colspan="5">II. Pollution reduction and discharge control indexes stipulated by various governments (Only intended for renovated or expanded projects)</td></tr>
<tr><td>COD (Ton/year)</td><td></td><td>SO_2 (Ton/year)</td><td colspan="2"></td></tr>
<tr><td colspan="5">III. Prediction on Increased discharge (emission) of major pollutants of the proposed projects (Deduction capacity to be filled in item “pollution control”)</td></tr>
<tr><td>COD (Ton/year)</td><td>0.14</td><td>SO_2 (Ton/year)</td><td colspan="2">0</td></tr>
<tr><td colspan="5">IV. Discharge (emission) deduction of major pollutants as specified in the reduction plan</td></tr>
<tr><td>COD (Ton/year)</td><td></td><td>SO_2 (Ton/year)</td><td colspan="2"></td></tr>
<tr><td colspan="5">V. Reduction plan for total discharge (emission) of major pollutants and index trade
This Project mainly discharges domestic sewage and membrane cleaning wastewater. After being treated, such wastewater is discharged to the South Waste Water Treatment Plant via the wastewater collection network in the industrial zone. The intermediate water after treatment can be used for roads, greening and other purpose of low-quality water, without increasing the total amount of wastewater discharged in the area.</td></tr>
</table>

VI. Preliminary approval opinions from county level environmental protection department: Handled by: Approved by: Unit (Seal): Date:
VII. Approval opinions from city level environmental protection department: Handled by: Approved by: Unit (Seal): Date:
VIII. List of documents provided:

Note:

1. The pollution reduction control indexes required by governments at various levels are only intended for use for renovated or expanded projects. Enterprises concerned shall sign responsibility documents with the governments.

2. Reduction plan for total discharge (emission) of major pollutants and index coordination:

(1) Alternative measures for total pollution reduction shall specify the pollution control processes, reduction capacity, completion time, whether taking into consideration discharge volume, the trading of the reduced discharge capacity, etc.

(2) Alternative measures for total pollution reduction by closed enterprises shall specify the major products, yield, and time when the enterprises are closed, as well as the trading of the reduced discharge capacity, etc.

3. The environmental protection departments shall, in the review and approval opinions issued, indicate the truthfulness of the pollution reduction measures provided by relevant enterprises, as well as whether such measures are accepted.

Letter of Entrustment

Sep. 15, 2008

To Hebei Qizheng Environment Technology Co., Ltd,

Norway Aqualyng AS. hereby entrusts Hebei Qizheng Environment Technology Co., Ltd to carry out the environmental impact assessment report on **Caofeidian 50,000t/day Sea Water Desalination Project.** We hope that your company works out the detailed report on an earlier date. The specific requirements, charges and other problems are to be stipulated in the Contract.

Entrusted by: Norway Aqualyng AS.

Entrusting date: Sep. 15, 2008

Registration Form of Construction Project Environmental Protection Approval

Unit (Seal): Hebei Qizheng Environment Technology Co., Ltd Completed by (Signature): Handled by (Signature):

<table>
<tr><td rowspan="2">Project</td><td>Name</td><td colspan="3">Caofeidian 50,000 t/day Seawater Desalination Project</td><td>Construction Site</td><td colspan="4">North Huarun Caofeidian Power Plant, Xingang Industrial Area, Caofeidian, Tangshan City
Geographic Coordinate: 38°58′43.97″N, 118°30′08.51″E</td></tr>
<tr><td>Project Description and Scale</td><td colspan="3">The design production capacity of this proposed project is 50,000 tons/d, and the product water shall comply with the requirements as specified in Hygienic Standard for Domestic Drinking Water (GB5749-85). All buildings concerned are to be newly built, with the total floor area of 3,454m^2, including the major workshops, office building and other auxiliary facilities.</td><td>Nature</td><td colspan="4">■Newly built □Renovated/ Expanded □Technological upgrading</td></tr>
<tr><td></td><td>Category of Industry</td><td colspan="3">Treatment, utilization and distribution of other water of D4690</td><td>Management category of environmental impact assessment</td><td colspan="4">□ Report preparation ■Report form preparation □Fill-in and submission of report</td></tr>
<tr><td></td><td>Total investment (10,000 Yuan)</td><td colspan="3">34911</td><td>Investment in environmental protection(10,000 Yuan)</td><td>35</td><td>Proportion (%)</td><td colspan="2">0.1</td></tr>
<tr><td rowspan="4">The owner</td><td>Project owner name</td><td colspan="2">Norway Aqualyng AS</td><td>Tel</td><td>13801959350</td><td rowspan="3">Assessor</td><td>Name</td><td>Hebei Qizheng Environment Technology Co., Ltd</td><td>Tel</td><td colspan="2">83033193</td></tr>
<tr><td>Correspondence</td><td colspan="2">North Huarun Caofeidian Power Plant, Xingang Industrial Area, Caofeidian, Tangshan City</td><td>P.C.</td><td>063200</td><td>Correspondence</td><td>No. 67, Yuhua West Road, Shijiazhuang City</td><td>P.C.</td><td colspan="2">050051</td></tr>
<tr><td>Legal representative</td><td colspan="2">Bai Yu</td><td>Contact person</td><td>Bai Yu</td><td>Certificate</td><td>GHPZYZ No. 1231</td><td>Fees (10,000 Yuan)</td><td colspan="2"></td></tr>
<tr><td></td><td>Class of environmental quality</td><td>Air:</td><td>Class II</td><td>Surface water:</td><td></td><td>Ground water:</td><td></td><td>Noise:</td><td>Class III</td><td>Seawater:</td><td>Class □</td><td>Soil :</td><td></td><td>Others :</td><td></td></tr>
</table>

Status quo of environmental conditions	**Environmental sensitivity**															
Pollution up-to standards discharge and total discharge control (To be filled for industrial construction projects)		**Present works (Built + Under-construction)**				**This Project(Planned to build, adjust or change)**						**Overall Works(Built +Under-construction + Planned to build, adjust or change)**				
	Discharge and major pollutants	**Actual discharge concentration (1)**	**Permitted discharge concentration (2)**	**Total actual discharge (3)**	**Rated total discharge (4)**	**Predicted discharge concentration (5)**	**Permitted discharge concentration (6)**	**Production (7)**	**Self-deduction (8)**	**Predicated total discharge (9)**	**Rated total discharge (10)**	**Waste deduction through new facilities (11)**	**Deduction replaced by regional balance (12)**	**Predicated total discharge (13)**	**Rated total discharge (14)**	**Discharge increase/ reduction (15)**
	waste water							0.69								
	COD*					300	300	0.21	0.07	0.14	0.14					
	Ammonia nitrogen *					28	30	0.01	0.00	0.01	0.01					
	Oil															
	Exhaust emissions															
	SO2*															
	Dust*															
	Industrial dust*															
	Nitrogen oxide															
	Industrial solid waste*															
	Other															

	related pollutions																

Note: 1. Discharge increase or reduction: (+) stands for increase and (-) for reduction;

2. (12): Amount reduced especially for this project by means of "regional balance" for the areas where this Project is located.

3. (9)=(7)-(8),(15)=(9)-(11)-(12),(13)=(3)-(11)+(9)

4. Measuring unit: waste water discharge——10,000t/year; exhaust emissions——10,000 standard m^3/year; Industrial solid waste discharge——10,000t/year; water pollutant discharge concentration——mg/L; air pollutant discharge concentration——mg/m^3; water pollutant discharge——t/year; air pollutant discharge——t/year

Major Eco-Damage Control Indexes

Impact and measures / Objectives of eco-protection	Name	Class or type	Impact (Severe, ordinary or small)	Impact means (Occupation, separation or block, or all above)	Avoiding or prevention, or protection measures	Investment in avoiding (10,000 Yuan)	Investment in new construction or adjustment of functional plans (10,000 Yuan)	Investment in relocation value adding or protection (10,000 Yuan)	Investment in project protection and control (10,000 Yuan)	Others
Nature reserves										
Protection zone of water sources								——		
Major wetland		——						——		
Scenic spots								——		
World natural or humanity heritage sites		——						——		
Rare animals							——			
Rare plants							——			

Category o / Land occupied	Basic farmland		Woodland		Grassland		Others	Relocation or resettlement	Population relocated from the lands occupied by the project	Population relocated due to environme	Resettlement in other	Nearby resettlement	Others
	Temporary occupation	Permanent occupation	Temporary occupation	Permanent occupation	Temporary occupation	Permanent occupation	Farmland						

Area								**population**						
Areas reduced or recovered							**——**	**Areas for controlling water and earth loss**	**Project control (Km^2)**	**Biology control (Km^2)**	**Reduce water and land loss (Ton)**	**Control rate of water and land loss (%)**		
Noise control	**Project evasion (10,000 Yuan)**	**Noise barrier (10,000 Yuan)**	**Sound insulation window (10,000**	**Noise reduction by forestation**	**Low-noise equipments or processes (10,000**	**Others**								
									0.06	**0.01**				

Registration form for Acceptance of Environmental Protection "Three simultaneity" upon Completion of Construction Project

Unit (Seal): Completed by (Signature):

Handled by (Signature):

Construction Project	Project name				Construction site			
	Industrial category				Construction nature	□Newly built □Renovation or expansion □Technological upgrading		
	Designed production capacity		Commencement date	Year___Month___	Actual production capacity		Date of trial run	
	Total investment estimate (10,000 Yuan)				Total estimate of environmental protection investment (10,000 Yuan)		Proportion (%)	
	Environmental impact approval department				Registered number of approval		Date of approval	
	Preliminary design approval department				Registered number of approval		Date of approval	
	Environment acceptance approval department				Registered number of approval		Date of approval	
	Designer of environment protection facilities		Constructor of environmental protection facilities			Supervisor of environmental protection facilities		

	Total actual investment (10,000 Yuan)						Actual environmental protection investment (10,000 Yuan)			Proportion (%)				
	waste water treatment (10,000 Yuan)		Waste gas treatment (10,000 Yuan)		Noise treatment (10,000 Yuan)		Solid waste treatment (10,000 Yuan)		Greening and eco-protection (10,000 Yuan)		Others (10,000 Yuan)			
	Capacity of newly added waste water handling facilities	t/d					Capacity of newly added waste water handling facilities	Nm^3/h		Average annual working time	h/a			
Project owner			P . C .				Tel			Environment assessor				

(To be filled for industrial construction projects)	Pollutants	Previous discharge (1)	Actual discharge concentration of this Project (2)	Permitted discharge concentration of this Project (3)	Waste produced from this Project (4)	Self-deduction of waste of this Project (5)	Actual discharge of this Project (6)	Total rated discharge of this Project (7)	Waste deduction through new facilities (8)	Total actual discharge (9)	Total rated discharge (10)	Deduction replaced by regional balance (11)	Discharge increase/ reduction (12)
	Waste water												
	COD												
	Ammonia nitrogen												
	Petroleum hydrocarbons												
	Exhaust emissions												
	SO^2												

	Smoke												
	Industrial dust												
	Nitrogen oxide												
	Industrial solid waste												
	Other related pollutions												

Note:1. Discharge increase or deduction: (+) stands for increase and (-) for reduction;

2. (12) = (6)-(8)-(11), (9)= (4)-(5)-(8)- (11) +(1)

3. Measuring unit: waste water discharge——10,000t/year; exhaust emission——10,000 standard m^3/year; Industrial solid waste discharge——10,000t/year; water pollutant discharge concentration——mg/L; air pollutants discharge concentration——mg/m^3; water pollutants discharge——t/year; air pollutants discharge——t/year

Appendix: National Standards (2003) Industrial Classification

Code	Industry Name	Code	Industry Name	Code	Industry Name
1	Farming	34	Metal Products	68	Banking
2	Forestry	35	General Purposes Equipment Manufacturing	69	Negotiable Securities
3	Animal husbandry	36	Equipment Manufacturing for Special Purposes	70	Insurance
4	Fishery	37	Transport Equipment Manufacturing	71	Other Finance
5	*Services* for Farming, Forestry, Animal Husbandry and Fishery	39	Electric Equipment and Machinery	72	Real Estate
6	Coal Mining and Dressing	40	Telecommunication Equipment, Computer and Other Electronic Equipment	73	Renting
7	Petroleum and Natural Gas Extraction	41	Instruments, Meters, Cultural and Office Machinery	74	Commercial Services
8	Ferrous Metals Mining and Dressing	42	Arts and Other Manufacturing	75	Research and Trial Development
9	Nonferrous Metals Mining and Dressing	43	Waste Resources and Materials Recycling and Processing	76	Professional and Technology Services
10	Nonmetal Minerals Mining and Dressing	44	Production and Supply of Electric Power and Heat	77	Exchange and Popularizing Services
11	Mining and Dressing of Other Minerals	45	Production and Supply of Gas	78	Geological Prospecting
13	Agriculture and Sideline Food Production	46	Production and Supply of Water	79	Water Conservancy
14	Food Production	47	Housing and Civil Engineering	80	Environment Conservancy
15	Beverage Production	48	Building and Installing Industry	81	Public Facilities Conservancy
16	Tobacco Processing	49	Building and Decorating Industry	82	Resident Services
17	Textile Industry	50	Other Building Industry	83	Other Services
18	Textile, Garment, Shoes, Caps	51	Transport via Railway	84	Education
19	Leather, Furs, Down and Related Products	52	Transport via Road	85	Health Care
20	Timber Processing, Bamboo, Cane, Palm Fiber and Straw Products	53	Urban Public Traffic	86	Social Security
21	Furniture Manufacturing	54	Water Transport	87	Social Welfare
22	Papermaking and Paper Products	55	Air Transport	88	News and Publishing Undertakings

23	Printing and Record Medium Reproduction and Audio-visuals	56	Transport via Pipeline	89	Radio, Television, Film
24	Cultural, Educational and Sports Goods	57	Loading, Unloading, Portage and Other Transport Services	90	Culture and Arts
25	Petroleum Processing and Coking	58	Storage	91	Sports
26	Raw Chemical Materials and Chemical Products	59	Post	92	Entertainment
27	Medical and Pharmaceutical Products	60	Telecommunication and Other Information Transfer Services	93	Chinese Communist Agencies
28	Chemical Fiber	61	Computer Services	94	Government Agencies
29	Rubber Products	62	Software Industry	95	C.P.P.C. and Democratic Party
30	Plastic Products	63	Wholesale Trade	96	Masses, Social Organization and Religious Bodies
31	Nonmetal Mineral Products	65	Retail Trade	97	Masses Autonomous Body
32	Smelting and Pressing of Ferrous Metals	66	Hoteling Services	98	International Organizations
33	Smelting and Pressing of Nonferrous Metals	67	Catering Services	99	Other Industries