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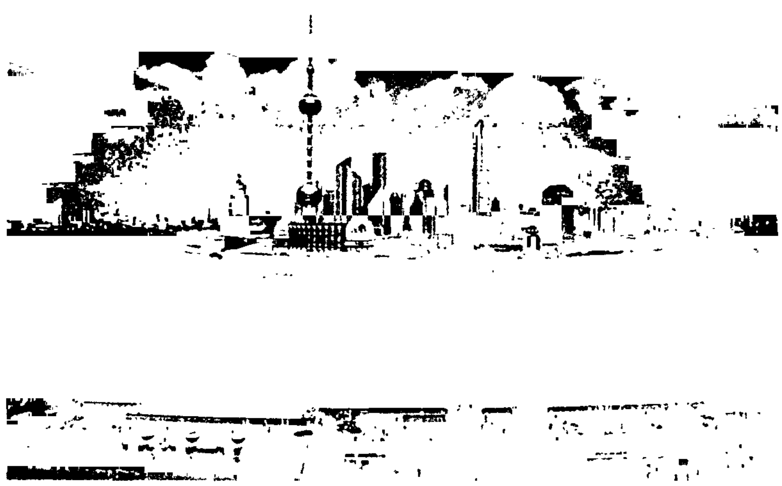
SHANGHAI WATER & ENVIRONMENT
CONSTRUCTION COMPANY LIMITED

SHANGHAI URBAN ENVIRONMENT PROJECT

DESIGN, REVIEW AND ADVISORY (DRA) SERVICES

Environmental Assessment

SummaryReport



March 2002

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SHANGHAI URBAN ENVIRONMENT PROJECT (SHUEP)

Environmental Assessment SUMMARY REPORT

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Shanghai Urban Environment Project

Environmental Assessment SUMMARY REPORT

Shanghai, People's Republic of China
(March, 2002)

1.0 INTRODUCTION

1.1 Project Background

The Shanghai Municipal Government (SMG) is seeking the World Bank funding for its proposed Shanghai Urban Environment Project (SHUEP) through an Adaptable Program Loan (APL) facility of US$700 million in three phases between 2002 through 2010. The SHUEP will support financial, institutional and policy reforms for urban infrastructure development and management, and physical investments in wastewater treatment, municipal solid waste, urban infrastructure upgrading, urban environment and landscaping improvement, and Upper Huangpu river wastewater management (see ***Figure 1*** for map of project components). The overall objective of SHUEP is through the effort of environmental improvement and institutional strengthening to help implement Shanghai's sustainable development strategy and to provide its citizens of over 13 million people and the greater Shanghai area with long and extensive environmental and urban infrastructure benefits. The specific components in APL I, including wastewater, solid waste, urban upgrading, and institutional strengthening, have been identified, while those for the later phases have a broad framework but details are to be defined.

In 2001, the SMG established and adopted an ambitious and forward looking Tenth Five Year Development Plan (2001-2005) for the city, with an aim to enhance the economic, financial, trade and manufacturing stature of Shanghai and to ensure Shanghai's position as a sustainable global competitive city-region and an international economic, trade and shipping centre at the heart of one of the country's most developed regions, the Yangtze River Delta. For the five year period, the Plan aims at maintaining Shanghai's economic strengths and robust growth, promoting Shanghai's service sector, improving Shanghai's environmental conditions towards a Liveable City, enhancing Shanghai's innovative capacities, strengthening urban management, and improving the quality and standard of living for its citizens.

Continued improvements of urban environmental infrastructures and their management through policy and institutional reforms and physical investments are one of the corner stones for the successful implementation of the Tenth Five Year Plan and SMG's Long Term Development Strategy well beyond the Five Year Plan. Sector master plans for wastewater, solid waste and forestation/landscaping have been completed with specific policy and physical investment targets, which are expected to be approved by SMG soon. The current SHUEP fits well into the Tenth Five Year Plan and the Sector Master Plans, and the framework for the three-phased APL is consistent with and supports the city's long term development strategy and overall development, environmental protection and urban improvement objectives.

An Environment Assessment (EA) was conducted for each of the physical works in SHUEP Phase 1 as well as a framework EA for the entire SHUEP. The EA is to identify in early stage of potential environmental benefits and consequences of the project, propose measures to avoid, mitigate or otherwise compensate negative environmental impacts during construction and operation, and allow incorporation of mitigation measures into the project engineering design where appropriate. On the basis of the component EAs, which are expected to be approved by the Shanghai Environmental Protection Bureau (SEPB) in March 2002, a project wide environmental impact assessment (EIA) report and environmental management plan (EMP), collectively known as the EA documentation, has been compiled by the Shanghai Academy of Environmental Sciences (SAES), with the assistance from the project Design, Review and Advice (DRA) consultants, Binnie, Black and Veatch. This document is an executive summary of the EA documentation.

1.2 Basis for the EA

The basis for the EA is:

- Terms of Reference (TOR) for Environmental Impact Assessment on various components in the World Bank Financed Shanghai Urban Environment Project, (December, 2002);
- Environmental Protection Law of the People's Republic of China (December,1989);
- Guidelines for Environmental Management of Construction Projects (November 1996);
- Operational Policies, Bank Procedures, and Good Practices OP/BP/GP4.01: Environment Assessment, the World Bank, (January, 1999), as well as other World Bank safeguards policies if triggered following an initial screening, such as pest management, cultural properties, involuntary resettlement, etc.; and
- Feasibility study reports for physical works in project components, prepared by Shanghai Urban Construction Design and Research Institute, Shanghai Municipal Engineering Design and Research Institute, (December 2001 to January 2002).

The environmental quality and discharge standards applied in this EA are determined based on the functions and zoning of the impacted area and as designated by relevant authorities. These standards are:

- Surface Water Quality Standards, Class II for Yangtze river, and Class II, III, IV and V for different sections of Huangpu river and its tributaries;
- Ambient Air Quality, Class II;
- Urban Environment Noise Standards, Class I;
- Soil Environmental Quality Standards, Class III;
- Integrated Wastewater Discharge Standards, Class II;
- Nuisance Odor Emission Standards, Class II; and
- Industrial Enterprises Boundary Noise Limits, Class II.

2.0 SHUEP PROGRAM

A preliminary framework SHUEP program has been developed based on detailed studies of the priorities of urban environment infrastructure improvement needs and thorough consultation with relevant SMG agencies to ensure compliance with the city's long term development strategy, Shanghai City Master Plan, Tenth Five Year Plan and sector master plans. The SHUEP framework is summarized in Table 2-1.

Table 2-1 SHUEP Framework

Objective	Policy Initiative	Physical Investments
SHUEP Phase 1 (2002-2007)		
• Support wastewater, solid waste and landscaping master plans • Protect water resources in Upper Huangpu river • Improve information management	• Water conservation • User fees and waste reduction • Contract service • Innovative project financing • Independent mechanism for price setting	• Shanghai sewerage project III (SSP 3) • Laogang MSW landfill extension • Small scale wastewater treatment plants in Upper Huangpu • Old City greenbelt • Technical assistance (training, asset management, permit trading, waste tariff, food waste disposal, environmental revolving fund)
SHUEP Phase 2 (2003-2008)		
• Continue to support solid waste master plan • Support the landscaping and forestation master plan on outer ring road • Protect and upgrade historic areas of the old city • Introduce new approaches for industrial area redevelopment and project financing	• Water conservation program; • Corporatisation of 50% of solid waste services • At least 20% private participation in infrastructure projects	• Solid waste disposal phase II (source separation, transport fleet upgrading, non-hazardous industrial waste disposal) • Forestation (outer ring road) • Upgrading of Old City historical area • Rural area wastewater treatment • Redevelopment of a large industrial community • Technical assistance (capacity building, landscape management, sludge management, etc.)
SHUEP Phase 3 (2006-2010)		
• Support industrial community redevelopment and restructuring • Support CNG program in Shanghai • Upgrade wastewater treatment facilities	• Corporatisation of 30-50% of solid waste services • Completion first stage water conservation • Continue attracting private funding in project financing	• Industrial community redevelopment 2 • Landscaping 3 • Wastewater treatment facilities rehabilitation • Technical assistance (capacity building, fuel restructuring, issuance of municipal bonds, etc.)

3.0 SHUEP FRAMEWORK ENVIRONMENTAL ASSESSMENT

3.1 Compliance with Shanghai Master Plan

As a long term development strategy, Shanghai has adopted a City Master Plan (1999-2020) which has been approved by the State Council, with an objective for Shanghai to become an international centre for economics, financing, trade and shipping. Shanghai's Tenth Five Year Plan (2001-2010) is part of the implementation of the long term strategy. SHUEP's goals and physical investments completely comply with the city Master Plan which calls for centralized sewage treatment, including centralized wastewater treatment for Upper Huangpu Catchment, to protect drinking water sources in upper and lower Huangpu areas and to protect the environment.

The solid waste component in SHUEP will not only support the Master Plan's requirements for environmentally sound disposal of municipal solid waste but also contribute to the protection of surface water quality and overall environmental and living conditions of Shanghai. The Shanghai City Master Plan includes greening and landscape in the inner city, ring road, and throughout the city with an ambitious goal of 35% green coverage by 2020. In all three phases, APL will fund greening and landscape components. The Master Plan also calls for preservation of the Old City and historical sites in Shanghai. APL will fund urban upgrading and in particular, the Old City preservation and improvement.

The policy, financial, institutional and capacity building initiatives are an integral part of SHUEP and are the assurance for efficient and effective implementation, operation and sustainable development of urban environment infrastructure and management system. This complies with the policy spirit and principles of Shanghai City Master Plan as well as the direction of the city's reform.

3.2 Huangpu Riverside Development

Following the successful development of the Pudong area, SMG has recently launched another enormous development program along the Huangpu riverside. The program is to convert a total of 5.83 km^2 in four blocks of mostly industrial, dock, and warehouse land into financial, trade, tourist attractions and upper scale residential prime river side development with a total investment exceeding RMB100 billion. This is part of the long term development strategy and will help cement Shanghai position as an international economics, financial, trade and shipping centre in the 21 century.

The riverside redevelopment program puts high demands on environmental quality, particularly Huangpu river quality and urban environment infrastructure. The riverside lands will become more environmentally sensitive. It can be expected that the water quality classification and river function zoning in the urban reaches of Huangpu river will become more stringent along with the progress of the riverside redevelopment.

SHUEP will contribute to the improvement of water quality of the Huangpu River and environmental protection of the Shanghai area including the redevelopment zones. In fact, the Old City component, as well as urban upgrading and cultural site preservation, will be part of the redevelopment program.

However, the construction and operation of SHUEP could also result in certain adverse impacts and the impacted area could extend to the riverside lands. Detailed impacts assessment with consideration of the sensitivity of future riverside redevelopment and land uses will be needed during site selection, engineering design, construction and operation of APL funded physical works, and design of mitigation measures.

3.3 Impact Assessment of SHUEP Projects

3.3.1 Air Quality

Ambient air quality is a high priority issue for SMG. Air quality improvement components have been included in the later phases of SHUEP. These will include centralized space heating, and cleaner fuel such as compressed natural gas (CNG) for city buses and taxi, etc. Other components throughout SHUEP will also contribute to the improvement of air quality in Shanghai, such as landscaping and greening, solid waste collection, transfer and hauling upgrading, industrial community redevelopment, etc.

Construction of APL funded physical works will have impacts on air quality from such sources as air-borne dust. Such impacts are expected to be short-term and localized and can be controlled to acceptable levels with appropriate mitigation measures. Sludge disposal, solid waste collection, transfer and disposal can also generate nuisance odor affecting the immediate surrounding areas.

3.3.2 Water Quality

The implementation of SHUEP will significantly reduce sewage discharge into the upper Huangpu River, through the city reaches and to the Yangtze river mouth, as well as Huangpu River tributaries. Together with the Tenth Five Year Plan, SHUEP is expected to significantly contribute to significantly reducing the pollutant load to the Huangpu River. As a result, Huangpu River quality is expected to meet Class IV standards in the middle to lower reaches and Class III in the upper reaches. The project will also contribute to the elimination of below Class V water bodies in all major waterways in Shanghai.

While largely beneficial, SHUEP does pose potential adverse impacts to water quality. Large volumes of wastewater will be collected and, following the treatment, discharged in a single location. While the effluent will meet the discharge standards, which can still be several times higher than the surface water quality standards, the large volume of discharge will place substantial loads on the receiving water body. Careful selection of discharge outfall based on modeling and sensitive receptors assessment will be required each time such discharge is to be included in SHUEP. Other potential impacts to water quality include solid waste hauling by barge, sludge disposal, solid waste landfill leachate infiltration and drainage runoff, pesticide usage in green and landscaped areas, water front construction activities, etc. These adverse impacts can be controlled through analysis of alternatives, impacts assessment, and incorporation of appropriate mitigation measures into engineering designs.

3.3.3 Solid Waste Management

By 2010, Shanghai plans to achieve 98% source separation of municipal solid waste, 20% recycling, 95% collection through compacted container trucks, 100% disposal in a sanitary and controlled manner, and 70% of night soil collected and disposed of through the municipal sewer system and sewage treatment facilities. SHUEP will be implemented in the same period and its municipal solid waste components will help in achieving these goals.

3.3.4 Ecological Conditions

The urban environment improvement (greening and landscape) components in SHUEP will help improve the urban eco-environment and the living conditions. The benefits will primarily be demonstrated in the following areas:

- Alleviation of the "heat island" effect in the city. The high population density, dense buildings and development, and industrial, commercial, transport and other major city activities are all among the cause of the serious "heat island" effect in urban Shanghai. Vegetation, especially large trees will be used to introduce micro-climates. Studies have shown that green space is capable of lowering the area ambient air temperature by 0.6°C.
- Improvement of urban scenery. The greening and landscaping will have positive visual impacts in the urban area largely dominated by concrete and glass towers. Old Town

upgrading, cultural property preservation and industrial community redevelopment will improve the environmental conditions in these areas.

- Air quality and noise control. Plants are known to be able to reduce air borne dust, absorb certain air contaminants, and release healthy ions. Thick trees and woodland can also help attenuate noise.

3.3.5 Land Acquisition and Resettlement

A certain amount of land will be permanently occupied by physical works in SHUEP. Houses on the land will be demolished and residents, relocated and resettled. Most of the land is urban land or sterile land in the suburbs already reserved for infrastructure projects. The redevelopment of these land, particularly those for greening, landscape, Old City upgrading and industrial community redevelopment will help improve the impacts areas, including reduction of population density, increase in land value, and neighborhood environment improvement.

The residents and organizations on the acquired land will be relocated mostly to the outer part of the city. The impacts will be mixed. The residents will lose their current convenience of being in the urban center such as public transport, shopping, education, entertainment, and other services and institutions typically located in the downtown areas. However, the relocated residents will enjoy much improved living conditions - up to four times more living space than their current residences, better surrounding environment and ambient surrounding conditions such as much more green and open space, low noise, better air quality, less traffic congestion, etc.

3.3.6 Cultural Properties

One of the objectives of SHUEP is the preservation of cultural properties through Old City upgrading and cultural property preservation components. The implementation of the program will provide better protection of the cultural properties.

However, cultural property preservation and upgrading components require special assessment by cultural heritage professionals. Any mis-design, even with the intention of preservation, or inappropriate construction activities could pose potential damage to the valuable historical and cultural sites or architecture. Professional archaeological screening will also be needed in the physical works sites to ensure SHUEP projects will not impact currently unknown archaeological and other cultural sites.

3.3.7 Policy and Institutional Reform

Policy and financial reform, capacity building and institutional strengthening will be an integral part of SHUEP and critical to its success. Through these initiatives, SHUEP will aim to achieve:

- Substantial corporatization of municipal services to ensure urban environment infrastructure will operate efficiently and sustainably;
- Establishment of reasonable and affordable service tariff system for water and municipal solid waste so that the municipal services will eventually be financially self-supporting;
- Effective water conservation program to reduce water usage rates and preserve the natural resources;
- Private participation in infrastructure project financing in order to widen funding sources, optimize capital structure in urban environment projects and balance risks between public and private parties in infrastructure development;
- Successful issuance of municipal bonds – another non-government funding source;

- Establishment of an independent price setting mechanisms for municipal services; and
- Waste management mechanisms, including permitting and permit trading, solid waste management, wastewater treatment plant operations, etc.

4. PROJECT DESCRIPTION - SHUEP PHASE I

The first phase of SHUEP has been defined and is to start in 2002. There are four physical components in SHUEP Phase 1 and a detailed EA has been conducted for each of these components. The remainder of this summary is focused on the findings and recommendations of the Phase 1 EA. The components of the Phase 1 EA are summarized in Table 4-1.

Table 4-1 Shanghai Urban Environment Project Components – Phase 1

Components	Description	Scope of Service
Urban wastewater management	• 13.59 km trunk sewerage conveyor and 1 new pump station • 168 km sewer, 9 sewage pump stations • 12 storm water systems with 83 storm water pipe lines and 10 pump stations • a 500,000 t/d wastewater treatment plant • sludge disposal works • Two pilot repair schemes for SSP 1 facilities	• Three urban areas • 163.34 km^2 urban area • 2.39 million population
Municipal solid waste management	• food waste collection system with 5000 collection containers and 200 vehicles • MSW container berth rehabilitation • Laogang landfill expansion Phase IV to sanitary landfill standards • Solid waste management information system	• food waste collection system is for entire urban area • 4900 t/day • landfill disposal is to service about 45% MSW in Shanghai
Old City urban environment improvement	• 8.96 ha. greening space • relocate 5,357 residential households, 254 organizations, 175 small businesses, and a total of 200,000 m^2 building space.	• Old City area of Huangpu district
Upper Huangpu wastewater management	• 3 wastewater treatment plants (14,000 and 2×100,000 t/d, respectively) • 9.57 km sewers • 6 pumping stations	• 13 villages & townships for Fengxian WWTP • 5 townships for the Fengjing WWTP
Technical assistance	• Institutional strengthening and training • Pollution permit trading system • Solid waste management and technology • Environment infrastructure management • Water resources management and policy • Environmental investment revolving fund	• Shanghai

Figure 2 shows the wastewater management zones of Shanghai, and ***Figure 3*** shows the service areas of SSP 3. ***Figure 4*** shows the location of the Laogang landfill Phase IV, and ***Figure 5*** shows the location of the Old City Park. ***Figure 6*** shows the locations of the 3 no. WWTP's proposed for the Upper Huangpu catchment.

5.0 ENVIRONMENTAL BASELINE

5.1 General setting

The project area, Shanghai, is located at the Yangtze river estuary in eastern China at 31°14' north latitude and 121°29' east longitude. Shanghai is bordered by the Yangtze river estuary to the north, East China Sea to the east, Hangzhou Bay to the south and Zhejiang and Jiangsu provinces to the west (***Figure 1***). The general topography is plain with slight slopes from northwest to southeast towards the Sea, with the average elevation of 3.87 m. Shanghai has a total area of 6340 km^2 with urban area 3924 km^2 and rural area of 2416 km^2.

5.2 Climate conditions

Shanghai has a subtropical monsoon climate with four distinct seasons. In general, it is mild and humid in spring, hot and rainy in summer, clear in autumn and cold and relatively dry in winter. Average annual temperature is around 15°C with extremes of over 40°C and –10°C. The average annual precipitation is about 1100 mm, 60% of which typically falls between May to September each year. The most extensive precipitation occurs in a 40 day period known as plum rainy season between June to July when precipitation can reach 370 mm. The prevailing wind directions are from southeast in April through August and from northwest from November through February next year. The annual average wind speed is about 3.0 m/s.

5.3 Water resources, hydrology and quality

Bordering Shanghai to the north, the Yangtze river estuary is an enormous water body with irregular semi-diurnal tide. The freshwater in the river has an average flow of 29,000 m^3/s at this section. Although receiving large pollution loads from upstream, water quality at the Yangtze river estuary is generally good due to its vast assimilative capacity. However, the river can carry with it up to 5 kg/s silt in the flood season and can be saline due to the tide effect during the drought period. The other bordering water body, Hangzhou Bay, is brackish with generally good quality except high nitrogen and phosphorus concentrations. Both these water bodies are ecologically important for being one of the major fish habitats in China.

The Huangpu River flows through the city proper with a drainage area of over 5000 km^2 within the Shanghai municipality and a network of tributaries in the alluvial plain. The Huangpu River originates from Taihu Lake and is also subject to irregular semi-diural tide. At Wusong Kou, mouth of the Huangpu, the average tidal level is 3.28 m with maximum of 5.27 m. The maximum flood tide is 12,100 m^3/s and the maximum current velocity, 1.8 m/s. Typically, high tide lasts 4 hours and 33 minutes while ebb tide, 7 hours and 52 minutes forming a 12 hours and 25 minutes tidal cycle.

The Huangpu River has been suffering severe pollution from human activities along the river. Due to the tidal effect, especially during high tides, pollutants discharged into Huangpu River cannot be freely drained into the Yangtze river and are built up in the discharging reaches resulting in pollution incidents, although the tidal inflow from Yangtze river will alleviate the pollution in the lower reaches of the Huangpu. As a river flowing through the heart of Shanghai, Huangpu river is the most important water body to the city. It is a water source for agriculture, industrial and domestic uses, the navigation waterway to Shanghai port, and the receiving water of the city's runoff and wastewater discharges.

5.4 Vegetation

Plants in the project area include mainly aquatic vegetation, agricultural vegetation and those planted together with urban development. At the intertidal zone, vegetation is primarily reed. Fresh water vegetation further inland includes foxtail alga, goldfish alga, black alga, duckweed, purple float, water lettuce, etc. Agricultural growth in the rural area of Shanghai includes crops, vegetables, cole, etc. There are woodland, parks, roadside trees, bushes, lawns, and other green areas throughout the city. This mostly man-planted vegetation includes Cinnamomum, Camphora, Magnolia, cedar, Chinese rose, cape jasmine, metasequoia, larch, holly, coral trees, etc.

5.5 Aquatic life

There are nearly 170 species of fish and 120 species of zooplankton in the project area's fresh water, semi-saline water and marine water bodies. In the sediment, there are about 100 species of benthic organisms.

5.6 Socio-economic environment

By the end of 2000, Shanghai had a total population of 16.74 million including 13.22 million permanent and registered population and 3.52 million transient population. The average population density city-wide was 2084 per square kilometer while that in the urban area was 2897.

Shanghai's economic systems have been undergoing a restructuring and optimization process. The city's agricultural sector's total output was RMB 21.65 billion in 2000, mostly vegetable, fruits, flowers, poultry, diary products and domestic animal breeding. As the most important and largest industrial base in China, Shanghai's year 2000 industrial output was RMB 6921.5 billion. About 71.1% of the output was from Shanghai's six pillar industries: automobile, electronic and telecommunication, iron and steel, petrochemical and fine chemical, power generation equipment, and home electronics industries. Shanghai has given first priority for development of the city's service sector, focusing on finance, trade and information technology. The year 2000 total output in the service sector was RMB 228.3 billion, a 100% increase compared with 1995. By the end of 2000, the agriculture, industry and service sector outputs reached a ratio of about 1 to 8.5 to 50.2. Along with the economic restructuring, the industrial employment had dropped to 42.1% of the total labor force in 2000 while the service sector employment increased to 46%.

Over the past decade, urban infrastructure in Shanghai has had considerable development. Table 5-1 summarizes the main utilities and other urban infrastructure in Shanghai.

Table 5-1 Utility and Urban Infrastructure in Shanghai

Item	Unit	1990	2000
Purified water supply	million m^3/d	4.63	10.48
Water main length	km	3,483	15,943
Gasified coal supply	million m^3/d	3.38	9.84

Household uses gasified coal	million	1.13	2.56
Road length in the city	km	1,663	5,204
Sewerage pipe length	km	1,892	4,452
Wastewater treatment capacity	million m^3/d	0.410	1.890
Green space area	ha	3,570	12,119
Public green area	ha	983	4,555

As a result of these rapid developments in urban infrastructure, Shanghai has made substantial improvement in public services and urban environment. The notorious black colour and smell of the main stream Suzhou creek crossing downtown Shanghai has basically been eliminated, and water quality in the Huangpu River has also been improved. TSP and NO_X in the ambient air has dropped by 7.1% and 8.1%, respectively, due partially to the uses of cleaner fuels. The city has also expanded its green and landscaped area, which is now about 22% of the total urban area.

The standard of living has also been substantially improved. By year 2000, the average salary was RMB 15,420 per year. There were 55 hospital beds and 38 doctors per 10,000 population. On a per capita basis, the public green area had reached 4.6 m^2.

5.7 Water quality

Based on a year 2000 investigation, Shanghai has 55,979 pollution point sources discharging a total of 5.04 million m^3/d and 1,704 t/d of COD and 123 t/d of ammonia nitrogen. These sources are 40.6% from industry, 58.7% from municipal ones and 0.7% from animal farm pollution sources, respectively. Of the total wastewater, 1.45 million m^3/d from 15,340 sources are collected and discharged through centralized outfalls outside the urban area, 0.77 million m^3/d from 6,860 sources are treated at sewage treatment plants and 2.82 million m^3/d from 33,779 sources are discharged directly in the area surface water bodies. As a result of these discharges, main waterways throughout the Shanghai area have been seriously polluted. Almost all the Huangpu River sections fail to meet their designated water quality standards.

5.8 Laogang landfill existing environmental conditions

The Laogang landfill expansion component is located adjacent to the existing Laogang landfill, which is about 60 km from downtown Shanghai. The site is bordered by Zhaoyang farm, Binhai township and Laogang township to the west, Dazi canal to the south and the East China Sea to the north and east. The nearest residences are located about 1,000 m from the site.

Based on environmental monitoring at the Laogang site, the existing environmental conditions of the Laogang landfill is described as follows:

- Air: H_2S and NH_3 concentrations in the ambient air at the site and immediate vicinity were about 30-90% and 6-13% higher than their respective standards. The foul smell intensity is about Class 2.3 and 1.3, respectively.
- Water: at the solid waste unloading berth, concentrations of total phosphorus and COD exceed Class V of surface water quality standards. Further away from the site and at a location near a chemical enterprise, the NH_3-N is about three times that of the standard. Water quality at the Yangtze river estuary is generally good with only total phosphorus and NH_3-N exceeding the Class II standards slightly.

- Groundwater: groundwater is brackish with high hardness. Chloride, NH_3-N and hardness are all much higher than their respective limits. Permanganate value and As are 60% and 10% above the standards. Other parameters, including heavy metals and volatile phenols are below the standards.
- Soil: Testing programs show heavy metals in the soil tested are all in compliance with applicable standards.

Photographs of the existing Laogang landfill site are shown on ***Figure** 7.*

5.9 Minxing Wastewater Treatment Plant (WWTP) site conditions

The Minxing site is currently occupied by obsolete factories, surrounded by the Huangpu River on the east and urban roads in other directions. Traffic is currently the main sources of noise and air emissions in the area.

Since 1996, there has been a regular water monitoring program in selected sections up and downstream from the Minxing site. The results show that the water quality at the Huangpu river origin – Dianshan lake – was excellent or Class I or Class II for virtually all water quality parameters, but starts to deteriorate as the river flows downstream towards the city. At the Yangpu bridge just passing downtown Shanghai, water quality is at its worst. Further downstream, water quality starts to recover due to the reduced discharge and natural degradation. At the Huangpu River mouth, water quality reaches good quality again to Class II and III for most parameters. Water quality parameters which exceed Class V standards include COD, NH_3-N, total phosphorus, and fecal coliform.

5.10 Old City green belt site conditions

Based on the year 2000 statistics, Huangpu District where the Old City is located has ambient air quality (daily average) of 0.216 mg/m^3 for TSP, 0.018 mg/m^3 for SO_2, and 0.060 mg/m^3 for NO_X, respectively. These data represent a Class I standard for SO_2 and Class II standards for TSP and NO_X, indicating a fairly good ambient air quality in the area.

The area noise levels are averaged at 58.9 dB(A) area wide and 72.6 dB(A) on the trunk roads. The road side noise levels exceed the applicable standard (70 dB(A)), indicating the poor acoustic environment due mostly to heavy traffic and narrow streets in the area.

6 ANALYSIS OF ALTERNATIVES

6.1 WWTP siting and process design

There are two alternative sites for the wastewater treatment plant in SHUEP's urban wastewater management component: Minxing Road which is on the Huangpu River bank and Zhuyuan which is located on the Yangtze River bank (See ***Figure** 3*). Aerial views of the sites are shown respectively on ***Figures** 8 **and** 9*. The comparison of key environmental factors for the sites is presented in Table 6-1.

Table 6-1 Comparison of Alternative Wastewater Treatment Plant Sites

Environmental Factors	Minxing Road Site	Zhuyuan Site

Receiving water		Huangpu River	Yangtze River estuary
Receiving water quality and assimilative capacity		Class IV and moderate assimilative capacity	Class II and high assimilative capacity
Receiving water flow and velocity and dilution capacity		318 m^3/s, at 22-78 cm/s in flood and 35-60 cm/s in ebb with moderate dilution capacity	14,500 m^3/s at 31-102 cm/s in flood and 59-88 cm/s in ebb with high dilution capacity
Receiving water sensitivities		No fish habitat but a backup water intake 8 km upstream	Fish habitat and migrating route
Impact to urban Shanghai		Potential effect to Huangpu riverside development	No impact to the urban area
Sludge disposal		Require trucking to the disposal site 32 km away	Pumped to adjacent disposal site, 16 km from WWTP site
Resettlement		Relocate factories with more building space, and resettle some residential houses on site	Relocate factories with less building space, and resettle much more villagers
Sensitivities in the surrounding areas		2 residential areas 250-400 m and 1 park 100 m away	5 villages 18-500 m away
Compatibility with urban zoning and planning		Industry zone but long term plan of the region is science and education and residential	Already adjacent to an existing WWTP; No further development plan yet
Visual impact		Closer to the urban area and some visual impact	Far away from urban area and no significant visual impact
Cost-excl. land/RAP costs	Capital	RMB 771 million	RMB 956 million
	Operating	RMB 0.31/m^3	RMB 0.39/m^3

With all factors considered, including the engineering, economic and financial comparison of the different sites, the Minxing site is selected as the preferred site for the wastewater treatment plant.

Two processes have been proposed: chemical precipitation followed by bio-filter, and anaerobic, anoxic and aerobic (A^2/O) process. The chemical precipitation/bio-filtration process has high loading capacities, better resists shock loads, occupies less land, and can be constructed underground to minimize impacts to the surrounding area. However there is less operating experience in China, a need for high dosage of reagents, requires complex operating procedures and generates more sludge and thus higher operating cost. A^2/O on the other hand, is mature and reliable technology, and a simple operation with low operating cost. But it occupies large land area and is difficult to seal, resulting in impacts of noise and nuisance odor to the surrounding area. Considering the Minxing site is selected for the wastewater treatment plant, the underground, compact chemical precipitation/bio-filtration has been selected as the process to be applied for the WWTP in SHUEP's urban wastewater management component.

6.2 Alternative leachate treatment processes at Laogang landfill

Three alternatives have been proposed for leachate treatment and disposal at the Laogang solid waste and sludge landfill. These alternatives and comparison of key environmental factors are presented in Table 6-2.

Table 6-2 Comparison of Alternative Leachate Treatment at Laogang Landfill

Item	Alternative I	Alternative II	Alternative III

Description	Meet Shanghai Grade II standard and discharged to the sea	Meet Shanghai Grade III standard and convey to a WWTP	Meet Landfill Class III standards and convey to a WWTP
Main processes needed	Biological / denitrification / ultrafiltration/osmosis	Biological / denitrification / ultrafiltration	Oxidation pond
Effluent quality	COD=58, BOD=23, NH_3-N=10 mg/L	COD=240, BOD=92, NH_3-N=20 mg/L	COD=963, BOD=358 mg/L
Impact to the sea (Yangtze river estuary)	Low impact	No impact	No impact
Impact to the WWTP	No impact	Water quality compatible to WWTP influent quality	Water quality far exceeding the WWTP influent quality
Process complexity	Complex	Moderately complex	Simple
Operation skills required	High	Moderate	Low
Capital investment	RMB 54.9 million	RMB 39.9 million +RMB 5.5 million for sewer network	RMB 15.3 million + RMB 5.5 million for sewer network
Operating cost	RMB 25.0/m^3	RMB 9.6+(0.47 for sewer line)/m^3	RMB 6.0+(0.47 for sewer)/m^3

With all factors considered, alternative II is selected as the treatment process for the Laogang landfill as on balance it has low impacts to the receiving water and the WWTP and requires moderate skills and cost for operation.

7.0 ENVIRONMENTAL IMPACTS AND MITIGATION

7.1 Impacts during construction phase

The activities during wastewater treatment plant construction, Laogang landfill upgrading, and green belt construction in the Old City are expected to generate the following adverse impacts:

- *Air-borne dust*, mainly due to earth disturbance, construction vehicle movement, land preparation, and materials handling. At 5 metres from such an activity, the dust concentration is expected to reach 10.1 mg/m^3 while it will reduce to 0.86 mg/m^3 100 metres from the site. Therefore, the impact will be limited to residents located within 100 metres from the construction sites and along the both sides of construction transportation routes. The most impacted area will be the Old City area where commercial and residential buildings are closely located (within 100 m) to the construction site.
- *Noise*, from construction/demolition equipment and vehicular movement. The noise, as high as 110 dB(A) from piling machines, could travel a long distance in the open fields around the sources, affecting residents of nearby neighbourhood communities and villages. Once again the Old City area in downtown Shanghai will be most seriously impacted by construction noise from the green belt sites, especially the first row of buildings facing the sites.
- *Traffic congestion*, caused by pipeline construction and Old City upgrading in the urban area. More traffic will be generated by construction in the already congested streets. The most serious of such impacts will occur in sewer pipeline construction sites as part of the streets

where pipelines are to be laid will be closed during construction, reducing the traffic capacity and affecting the egress and access to neighbourhood communities.

- *Waste discharge from construction camps.* The discharge of sewage from construction camps will create new pollution sources to the surface water environment. Such potential impacts are expected mainly at the SSP 3 WWTP and Laogang landfill construction sites where utilities services may not be available and construction workers need to camp out in temporary facilities in the field. Other pollutants from such camps include solid waste and waste oil from machinery maintenance.
- *Earth materials.* The massive demolition at the Old City site and pipeline construction will generate a large amount of excessive materials/construction waste. While some may be needed by the earthworks, site preparation and construction of the wastewater treatment plants, most of the demolition waste will need to be disposed of, occupying landfill or other land space.
- *Land impact.* SHUEP Phase 1 will occupy 33.8 ha for the SSP 3, 336 ha for the Laogang landfill and 8.96 ha for the green belt. Except the Laogang site which is on reclaimed land, the WWTP and green space will require large scale demolition and resettlement. Although most of the land to be occupied will be in the urban area, some will be cultivated land, resulting in reduced farm and agricultural output. The lost cultivated land is however a very small portion compared with the total cultivated land in the suburb Shanghai.
- *Water impacts*, are expected to be caused by construction activities near water bodies. The Minxing wastewater treatment plant will be built at the bank of the Huangpu River and Laogang landfill expansion will be on reclaimed land adjacent to the Yangtze estuary. Construction activities close to these water bodies could possibly cause the discharge of turbid or even oil and grease contaminated surface runoff into the water bodies.

7.2 Water impacts

Due to the tidal effect, both upstream and downstream of the Minxing road discharge outfall will be impacted by the effluent from the Minxing WWTP which is expected to be 120 mg/L for COD. Following the discharge into the Huangpu River, the effluent will be gradually diluted, transformed and degraded to eventually reach the background water quality levels in the Huangpu. The most sensitive areas of the receiving water are upstream from the outfalls, including Yangshupu waterworks (a backup water intake which is used only in the event of an emergency), 8.5 km from Minxing outfall, downtown and urban area which a long stretch of riverside area centered at the Bund, 11.5 km from Minxing outfall, and Nanshi waterworks, 18 km. A mathematical model predicts that the maximum incremental increase in COD at Yangshupu waterworks is 3.01 mg/L, in BOD, 0.75 mg/L, that at Nanshi waterworks in COD is 2.86 mg/L and in BOD, 0.7 mg/L. This indicates that the effluent discharge to Huangpu river will impact the urban area including the two waterworks intakes, but the impacts are moderate and will not change the water quality classifications for the area. A photograph of the Huangpu River at the Minxing outfall site is shown on ***Figure 10***.

As described above, the leachate from the Laogang landfill will be contained, collected and treated by an on-site leachate treatment facility. The effluent from the on-site pretreatment will be conveyed to another WWTP for further treatment. As such there will be no impact to the Yangtze river estuary where the landfill is located. In fact, a significant improvement can be expected at the landfill site. The previous three phases of the landfill have only simple treatment by an oxidation pond. The high strength leachate still contains very high COD and other pollutants following the oxidation pond treatment. The current discharge of oxidation pond effluent which is worse than average sewage to the Yangtze estuary will be intercepted following the landfill upgrading. The effluent, together with leachate from the new landfill phase, will be treated by the new leachate treatment facility. There will be no more discharge of high organic content effluent into the Yangtze estuary and the sea following the landfill upgrading.

From the regional perspective, SHUEP will contribute significantly towards the improvement of area water quality. Of the total of 2.82 million m^3 of raw sewage currently discharged directly into surface water bodies throughout the service areas, 1.274 million m^3 will be intercepted and collected by SHUEP Phase 1, which is approximately 45% of the total. Either diverted to a more suitable discharge point (0.44 million m^3/d) where there is better environmental assimilative capacity and less sensitivity or treated by the proposed Minxing WWTP (0.5 million m^3/d), this large portion of wastewater will be completely removed from the service areas. This will not only improve the water quality, environmental aesthetics and community sanitation within the service area, but also in the regions downstream from the service areas.

Through the treatment at the WWTP, the total pollutant loads to the environment will be reduced by 47,552 tons/year of COD, 41,325 tons/year of SS, 3,789 tons/year of NH_3-N. Such pollution load reduction will help achieve and maintain the environmental quality targets and improve the area surface water quality.

Other potential benefits which would result from the improvement of the area water quality through the SHUEP include:

- Improved sanitation and hygiene for residents near surface water bodies, many of which are now heavily contaminated;
- Increased property values for land and real estate near surface water bodies;
- Improved recreation and environmental aesthetics to the communities of the project area;
- Increased revenue from tourism;
- Recovery and improvement of bio-diversity and ecosystem; and
- Strong support to the SMG's massive initiative of re-development Huangpu river banks.

7.3 Air and odour impacts

The primary air emissions from the wastewater treatment plants and municipal solid waste landfill will be nuisance odours generated from grit removal tanks, primary tanks, sludge handling processes, and solid waste collection, transfer and disposal. The pumping stations could also be a source of such odours. The main constituents of such odours are NH_3, H_2S, and methyl sulfide.

At the Minxing WWTP, most unit operations and treatment processes will be underground and air emissions will be collected, treated and discharged via a 16 m stack. An air diffusion model was used in the EA to predict the concentrations of the air emission constituents which cause the odour. The modeling results are compared with the residential and Japanese control standards shown in Table 7.1. The results show that under the normal climate conditions, the ground concentrations of the H_2S and NH_3-N are far below the residential control standards. Under the temperature inversion conditions, however, the distance to reach the residential area standards varies from about 120 m from the treatment plant to about 200 m. Within this distance, there is no residence (all are beyond 250 m) but the Gongqing Forest Park is located about 100 m at its closest point to the WWTP where both H_2S and NH_3-N will exceed the control standards.

Table 7.1 Odour Standards

Items	NH_3	H_2S	Methyl sulfide
Smelling threshold (mg/m^3)	0.1	0.0005	0.0001
Identification threshold (mg/m^3)	1.5	0.06	0.0007
Control standards (mg/m^3)	1-5	0.01-0.2	0.002-0.01
Type of smell	Acidous	Bad egg	Acidulous sulfur

Operation of Shanghai's existing sewage pumping stations indicates that odour emissions from these sources could impact the surrounding areas and emission collection and treatment are needed to control the impacts to acceptable levels. In SHUEP Phase 1, all pumping stations will be equipped with odour control and treatment facilities. With such control facility, the impacted areas will be mostly reduced to less than 5 m for most of the pumping stations. Of the 19 pumping stations, only Bingzhou road and Wenshui road pumping station have sensitive receptors in close distance (5 and 10 m, respectively), which are close to or within the protective distance (4.6 and 11 m, respectively).

There will be positive impacts in terms of air quality related to odour. Currently, surface water bodies in the service areas may have nuisance odour in the summer time from the poor water quality as a result of direct discharge of untreated municipal wastewater, impacting the areas near the water bodies including any residential and other sensitive receptors. SHUEP Phase 1 will intercept over 45% of these direct discharges which will contribute significantly to the improvement of water quality and help eliminate the nuisance odour even in the summer.

7.4 Noise impacts

Main noise sources during the operation phase includes lifting pumps, sludge pumps, blowers in the wastewater treatment plants, submerged pumps in the pumping stations, and trucks, bulldozers and compactors in the landfill. The noise intensity at the sources is expected to be 90-95 dB(A) for wastewater treatment plants and landfills and 72-81 dB(A) at the pumping stations.

Noise modeling during the EA indicates that the distance for noise to meet both day time and night noise standards will be 2 m from the pumping station when 1 pump is in operation to 14 m when 8 pumps are in operation. As the design distances of pumping houses to the station property lines will be 10-50 m, all 19 pumping stations will meet the noise standards. As most of the facilities, including noise sources at the Minxing treatment plant will be underground and there is no noise sensitive receptors within 200 m from the sources, noise of the WWTP is not expected to have significant impacts.

7.5 Sludge disposal impacts

Following sludge thickening and dewatering, the Minxing WWTP will generate 271 m^3/day or 99,000 m^3/year of combined primary and secondary sludge with an average water content of 65%. This sludge will be trucked to Bailonggang dedicated sludge landfill on the Yangtze river bank some 32 km from the Minxing site, which receives sludge from the major WWTPs in the Shanghai area.

Major potential concerns with regard to sludge transportation include leaking, odour, noise and impacts on traffic. A truck route through some trunk roads of Shanghai has been selected and will cross Huangpu river via Yangpu bridge. Ten water tight trucks will be used for sludge transportation to prevent leaks and odour emission along the route. The sludge transportation is scheduled in evenings to minimize the impacts on traffic. The trucks will be washed daily in a dedicated truck washing area within the WWTP and the wash water will be drained to the treatment processes.

The Bailonggang sludge landfill has 600 t/d capacity and is designed with sanitary landfill standards. The leachate is contained, collected and diverted to Bailonggang wastewater treatment plant located immediately adjacent to the landfill. The Bailonggang site is on reclaimed land, and as the Yangtze river estuary shoreline is moving outwards by about 40-60 m every year, there is substantial land resources to expand the life of the landfill. Strong nuisance odor from the sludge landfill will be another potential impact. There are no sensitive receptors in the immediate adjacent areas surrounding the Bailonggang site. Furthermore, daily coverage of newly deposited sludge with a 20-30 cm layer of clean soil will minimize nuisance conditions at the landfill.

7.6 Resettlement and socio-economic impacts

Resettlement and compensation plans have been prepared and are covered in a separate "Resettlement Action Plan" (RAP). The summary of land acquisition and people affected is shown in the following table 7.2.

Table 7.2 Project affected land statistics

Component	Permanent Land Acquisition	
	Land Acquisition (ha)	People Affected
SSP 3	33.8	1310
Old Town urban upgrading	8.96	5357 (households)

The area affected the most is the Old City area which is the oldest section of Shanghai with the highest population density. The project will change the area completely, with more green space, better protection of cultural heritage and reduced population density. Although the relocated residents lose their convenience of being in downtown, their living conditions such as living space and environmental quality will be substantially improved. Laogang landfill site is situated on reclaimed land and no residents are affected.

There are other socio-benefits from the implementation of SHUEP Phase 1. They are:

- Improvement of the image of Shanghai as an international economic, financing and trade center, improvement of the investment environment and infrastructure, and foundation for sustainable development;
- Increase of the environmental awareness of Shanghai citizens and the general public which will be the public support for further investment in environmental protection and improvement;
- Protection of public health from the significant reduction of pollutants loads discharged to the environment and proper handling of municipal solid waste;
- Role model for other cities in the region especially along the Yangtze river area for urban and environmental infrastructure development; and

- Protection of cultural heritage through improvement and landscape of surrounding environment.

7.7 Groundwater and soil impacts

Potential impacts to groundwater quality and soil contamination will be primarily from the Laogang municipal solid waste landfill and the Bailonggang sludge landfill, due to potential leachate infiltration into the ground. However, both landfills are designed with sufficient engineering control including horizontal and vertical impermeable liners to contain the leachate, which will be collected and diverted to Bailonggang wastewater treatment plant. The sanitary landfill design standards at the landfills have virtually avoided potential impacts to the groundwater.

In fact, a major improvement at the Laogang landfill can be expected. The previous three phases at the landfill have only limited leachate treatment before discharge. An increase in heavy metal concentrations in the surrounding soil have been recorded due to the early phase landfill operation. The upgrading and Phase IV expansion will also include the leachate from the earlier phases, resulting in significant reduction of adverse environmental discharge at the site.

7.8 Fly control

Fly is a major nuisance typically associated with municipal solid waste landfill operations. Observations at earlier phase operations at Laogang landfill indicate that fly population density is directly related to the area of the filling zone and the duration of exposure of the zone before covering. At the Laogang landfill Phase IV, the fly density is not expected to increase as the filling zone area and the exposure duration will not increase. In fact, the filling operation in Phase IV will change to promptly cover the waste and reduce the exposure duration. This will help reduce the fly population in the area.

Early observations also show that fly population density decreases quickly over the distance from the waste unloading and filling zones. Since there is no residential or other sensitive receptors in close distance to the landfill, the impact of flies will be limited.

7.9 Cultural heritage

Huanpu District where the Old Town is located is the origin of Shanghai and contains many buildings with cultural heritage. The project area directly relates to the municipal designated cultural heritage sites of Dajing Pavilion also of the Ming Dynasty (1573-1619), and Shanghai Bookstore from the modern revolutionary history (early 1900's).

The project will demolish old and obsolete buildings surrounding the Dajing Pavilion, and these will be replaced with well-designed greening and landscaped areas. This will place the pavilion in the middle of green areas, much like its original surrounding when it was first built. The substantially reduced commercial, traffic and other urban activities in the immediately adjacent areas will also help preserve and protect the ancient architecture.

The Shanghai Bookstore, a site utilized by the Chinese Communist Party in its early years will be relocated, in an area more appropriate for the building with better access. The new building will be built identical to the existing one.

7.10 Pest management

Within the urban area of Shanghai, synthetic pesticides are prohibited in trees, bushes, lawns and other green and landscaped areas. The biodegradable and less persistent biological pesticides are applied instead. May and June of each year is the breeding time for most pest in the Shanghai area and that is the time for pesticide application. Typically, the pesticide application is through sprays with an average of 1 m^3 pesticide for approximately 1000 m^2 green area.

The SHUEP Old City greening component will need about 35.8 kg biological pesticide per year. In addition, the project will also require 1,792 kg of organic fertilizer and 27 kg urea. The green area will have 60 cm top soil in which bushes and lawns are planted. The pesticide, as well as fertilizer application is limited to the area only and is not expected to have lasting residues and significant impact to the soil, groundwater or the surrounding areas due to the controlled application and easy biodegradability.

Pesticide storage, handling and applications could pose a risk to workers, residents in the neighbouring area and the general public on the green, through direct contact, particularly by people and children playing on the green area during the pesticide application time. This will require strict management, including scheduling, controlled access, weather conditions at the pesticide spaying time, and other management measures to minimize the risk.

7.11 Environmental mitigation measures

Design Phase

- All project component sites will be carefully selected to avoid or minimize potential impacts to the environment;
- Layouts at the Minxing WWTP, Laogang municipal solid waste landfill and other project facilities will be designed in such a way that the sources of noise and odours will be as far away from the surrounding sensitive receptors as possible, such as the Gongqing park and villages; and
- Mitigation measures requiring design such as solid waste and sludge landfill sites drainage control, leachate collection and diversion to the treatment plants, leachate treatment, nuisance odour emission collection and treatment from wastewater treatment plants and pumping stations, noise control facilities, etc., will be incorporated into the engineering design.

Construction Phase

- Construction sites, transportation routes and materials handling sites will be water-sprayed in dry and windy days 2 times a day (morning and afternoon), especially if these sites are near sensitive receptors, such as Dajing Pavilion, villages and residential areas;
- Construction activities will be scheduled carefully to minimize the impact of noise from construction machinery to the surrounding environment. Night time uses of certain noisy machines such as pile-drivers, concrete vibrators, etc. will be prohibited;
- In conjunction with relevant authority, road and river traffic plans will be prepared ahead of construction in the congested urban centers, particularly in areas where roads or waterways must be closed or semi-closed for pipe and sewer installation and river side or in water construction;

- Sewage and other waste from construction camps will be collected and diverted to municipal systems to avoid contamination of the surrounding areas;
- Compensate appropriately and promptly the relocated and resettled residents, farmers, commercial operations, schools, institutions and other organizations according to relevant laws, regulations, guidelines and rates of the government or the World Bank;
- Temporary land occupation, particularly in the farm land, will be planned well ahead of the construction in consultation with the farmers and others affected to minimize the loss of crops. At the end of the temporary uses, the land will be re-stored to its original state; and
- Demolition materials and spoil from SHUEP components will be disposed of appropriately in designated sites only; These sites will be rehabilitated by proper coverage and landscaping. Disposal of such wastes in farmland, ponds or rivers will be strictly prohibited.

Operational Phase

- Properly follow the operation procedures and ensure WWTPs, solid waste landfill, and sludge disposal facilities operate as designed;
- Develop contingency plans for power failure, overflows, equipment malfunctioning and other conditions which may affect the proper functioning of the plants resulting in discharge of raw wastewater into the receiving environment;
- Develop a management plan for pesticide and fertilizer application in the green area to protect the safety of the public and workers; and
- Maintain regular consultation with the residents in the nearby communities and respond promptly to any concerns they may raise with regard to the operations of the wastewater, pumping stations, sludge handling, and solid waste disposal facilities.

8. PUBLIC CONSULTATION

8.1 General

Stakeholders from the public were consulted during the project EA, particularly those who will be directly affected by SHUEP Phase 1, such as urban and rural residents near proposed pipelines, pumping stations, wastewater treatment plants, municipal solid waste and sludge disposal sites, and the Old City area. The primary methods applied in the public participation included public meetings, interviews, questionnaires, internet and public media such as newspapers. The EA team organized and chaired the public meetings and public opinion surveys.

Two rounds of public consultation are planned. The first round, which took place in late 2001 at the EA TOR stage, focused on the environmental screening to define public concerns and to assist in identifying key environmental issues for detailed assessment. The second round, which is taking place in early 2002, is designed to draw public responses and recommendations on the initially developed mitigation measures for the potential adverse impacts identified. A 24 hour telephone hotline has been set up since the beginning of the EA, to further solicit and address environmental issues from the public. In addition, a website dedicated to SHUEP Phase 1 EA was designed and published in Shanghai Environment Online (http://www.envir.online.sh.cn) on December 29, 2001. Within 20 days, the website had had 50,000 hits from more than 20 countries.

8.2 Public meetings

In all two rounds of public participation, public meetings/hearings were held as an effective method to solicit public concerns and opinions on project environmental issues. Details of these meetings/interviews are summarized in Table 8-1.

Table 8-1 Summary of Public Meetings/Interviews

Component	Date	Locations	No. of participants
SSP 3 (Minxing)	18-24 Dec 2001	Yangpu District	30 Second meeting to be held in March 2002.
Laogang landfill	10-25 Dec 2001	Laogang (2 meetings)	60 (30 at each meeting)
Urban environmental improvement	Oct – Nov 2001	9 no. meetings on site	1000 (100 to 200 at each meeting)
Upper Huangpu WWTPs	Feb 2002	Jinshan, Fengxian, Fengjing	Questionnaires only. Public meetings to be held in March 2002

8.3 Public Opinion Survey

Public opinion surveys have been adopted as one of the key tools for public consultation. The questionnaires, prepared by the EA team, were distributed to the public. Questionnaires were distributed with no restriction of time and locations which would allow more people to participate. It is therefore, a good supplementary method to the public meetings/hearings. Details of the public surveys are summarized in Table 8-2.

Table 8-2 Public Opinion Survey (No. of People Surveyed)

Background	Item	SSP 3	Laogang	Urban Improvement	Upper Huangpu WWTP	Total
	Total	148	96	100	100	444
Sex	Male		65	54	68	
	Female		31	46	32	
Age	18-30	19	11	12	42	84
	31-45	52	42	18	43	155
	45-60	56	39	52	14	161
	>60	21	4	18	1	44
Profession	Public servant	12	13	34	19	78
	Framer	23	46	-	13	82
	Professional	-	5	8	26	39
	Worker	76	29	21	31	157
	Merchant	12	1	24		37
	Other	25	2	13	11	51
Education	Primary school	19	6	2	5	32
	Junior high	45	37	29	26	137
	High school	62	36	32	42	172
	University	19	14	33	25	91
	Other	3	2	4	2	11

8.4 Public concerns and responses

The majority of the public surveyed are well aware of various components of the SHUEP and understand the benefits, significance and adverse impacts. The public survey shows that the project has received wide public support. However, the public also expressed concerns for potential adverse impacts, both long-term and short-term, during the construction and operation phases of the SHUEP from their own perspective. For the each of the concerns expressed during the public consultation, a corresponding mitigation measure has been developed and communicated to the concerned public. The following table summarizes the concerns, mitigation measures and public satisfactory rate to the mitigation measures.

Table 8.3 Public Concerns and Responses

Main public concern	Mitigation measures
Air-borne dust in construction phase	• Periodical water spray • Speed limit for vehicles
Noise in construction phase	• Rationalize construction schedule • Minimize night construction
Traffic block during construction phase	• Excavation controlled in line with specifications • Good planning to relieve traffic congestion
Spoil disposal in construction phase	• Careful selection of disposal site • Reclamation of disposal site
Odor in operation	• Keep odour sources covered or indoor • Promptly coverage of solid waste in landfill to minimize the odor
Fly at landfill	• Sufficient thickness of trees planting to isolate the landfill and minimize fly from leaving the landfill
Noise in operation phase	• Proper insulation of noise sources
Resettlement transparency	• Information disclosure • Public notice on compensation procedures, rates and standards
Compensation for farmland acquisition	• Compensate according to state policies
Compensation for house demolition	• Compensate according to state policies

8.5 Information disclosure

Advertisements have been placed in the most popular newspapers in Shanghai (Wenhui Daily and Jiefang Daily) and a dedicated website to describe the project components and its potential impacts and to invite the public to express their concerns about the project. In addition, the draft EA reports and other project related information including project environmental information have been placed in Shanghai Academy of Environmental Sciences and Shanghai Library for public reviews and comments. A telephone hotline manned by the EA team's environmental specialists is another source of information to the public about the project and potential project impacts.

9.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Several organizations, both government and corporate bodies, will take the responsibility for environmental management. These organizations and their responsibilities for environmental management the SHUEP APL I are:

- Shanghai Planning and Development Commission, the overall leading agency for the project implementation will take the ultimate responsibility for environmental protection and management;
- Shanghai Water Environment Construction Corporation (SWEC) which is the working group for project management designated by the Planning Commission, will be responsible for the day to day environmental management during the construction phase. Their responsibilities will include engagement of professional supervision and monitoring services, allocation of budget for environmental management, response to environmental monitoring reports and taking mitigation actions as appropriate, and handling of any environmental emergency and other adverse impacts not adequately projected by the EA which may occur during construction.
- Shanghai Municipal Environmental Protection Bureau (SEPB) and its municipal counterparts will be responsible for enforcement of environmental regulations and standards and review of environmental monitoring reports.
- Shanghai environmental monitoring stations will be responsible for environmental monitoring for air quality, noise, water quality, and other impacts to the environment by the project during both the construction and operation phases. Sampling sections for Huangpu River and for the Yangtze (Chang Jiang) are shown on ***Figures 11 and 12*** respectively.
- SWEC will be responsible for the day to day environmental management during the operational phase of SSP III, Shanghai City Appearance and Environmental Sanitation Bureau for the Laogang municipal solid waste landfill, Shanghai Huangpu district government for the Old Town upgrading and suburb district governments for Upper Huangpu wastewater treatment plants.

A training program, including both local and overseas training, will be prepared for management and technical staff from above mentioned organizations. Training contents will include environmental regulations, wastewater treatment technologies, environmental monitoring, sludge handling and disposal, and handling and responses to environmental accidents. In total, it is planned that 90 people will participate in the domestic environmental training and 30 in the overseas training.

In order to ensure that the SHUEP Phase 1 will be in compliance with relevant environmental standards and as predicted in this EA, a comprehensive monitoring program has been prepared for water, air and noise. The plan covers both the construction phase and operation phase of SHUEP Phase 1. The monitoring program is summarized in Table 9.1 and the estimated cost for the monitoring program is presented in Table 9.2.

Table 9.1 Environmental Monitoring Program

Environment	Items	Construction Phase	Operation Phase
Water	Parameters	pH, SS, DO, BOD, COD, NH_3-N, oil, phenol, CN, Hg, Cr(VI), Pb, Cu, Cd	pH, SS, DO, PV, BOD, NH_3-N, oil, phenol, CN, As, Hg, Cr(VI), Pb, Cu, Zn, Mn, Cd
	Locations	Upstream and downstream of the adjacent rivers; control sections of Huangpu in project area	Upstream and downstream of the adjacent rivers; control sections in major water bodies in the project area
	Frequency	Six times a year	Three times a year
Groundwater	Parameter	pH, PV, Cl^-, NH-N, phenol, total hardness, Cu, Zn, Hg, As, Cr, Cd, Pb	pH, PV, Cl^-, NH-N, phenol, total hardness, Cu, Zn, Hg, As, Cr, Cd, Pb
	Locations	Around the out of vertical barrier of landfill site	Around the out of vertical barrier of landfill site
	Frequency	Two times a year	Two times a year
Air	Parameter	TSP	Odour, TSP
	Locations		
	Frequency		
Noise	Parameter	dB(A)	dB(A)
	Locations	Construction sites Sensitive receptors	Boundary of the WWTPs, landfill site, pumping stations; nearest residences and villages
	Frequency	Once a week	Twice a year in winter and summer

Table 9.2 Summary of Monitoring Cost

Project City	Environmental Monitoring Cost Estimates (RMB/Year)			
	Equipment	Construction phase	Operation phase	Total
SSP 3	20,000	30,000	20,000	70,000
Laogang landfill	20,000	30,000	20,000	70,000
Urban upgrading	5,000	20,000	5,000	30,000
Upper Huangpu WWTP	20,000	30,000	20,000	70,000
Total	65,000	110,000	65,000	240,000

10.0 CONCLUSIONS

The environmental assessment for SHUEP Phase 1 has drawn the following conclusions:

- All the three phases of APL-supported SHUEP are well integrated with the Shanghai's Master Plan which has been approved by the State Council and will contribute significantly to the strategic objectives for the city's development and environmental protection. SHUEP Phase 1 will play an important role in fulfilment of Shanghai Tenth Five-year Plan (2001-2005) and in the Comprehensive Redevelopment Program of Riverside along the Huangpu River.
- The implementation of SHUEP Phase 1 will increase the wastewater treatment capacity in Shanghai to 714,000 m^3/d, and the solid waste sanitary disposal to 4,900 t/d, which are about 45% of the total wastewater directly discharged into the surface water without being treated

and about 45% of municipal solid waste generated in the city. It will cut the pollutant loads to the water bodies in the region by 47,552 tons/year of COD, 41,325 tons/year of SS, 3,789 tons/year of NH_3-N. As a result, the surface water quality will be expected to improve and to meet the applicable surface water quality standards.

- The Laogang landfill upgrading will provide a sustained sanitary disposal of municipal solid waste but also upgrade the previous phases. As a result, the leachate will be better controlled and treated, groundwater better protected, and the impact to the surrounding areas reduced.
- However, SHUEP will also cause some adverse impacts to the environment. During the construction phase, dust, noise, large scale resettlement and relocation in downtown area, construction camps, construction materials extraction, traffic block and near river construction may affect the residents nearby and environment in the surrounding area. During the operation phase, noise, odours, municipal solid waste and sludge hauling, sludge disposal and land acquisition will impact the villages around the project sites. With a careful design and implementation of appropriate mitigation measures, however, these adverse impacts can be avoided, mitigated or otherwise compensated to acceptable levels.

To further ensure environmental protection and proper implementation of mitigation measures, an environmental management plan has been developed involving government and professional institutions for supervision, monitoring, and management of environmental affairs of the SHUEP Phase 1.

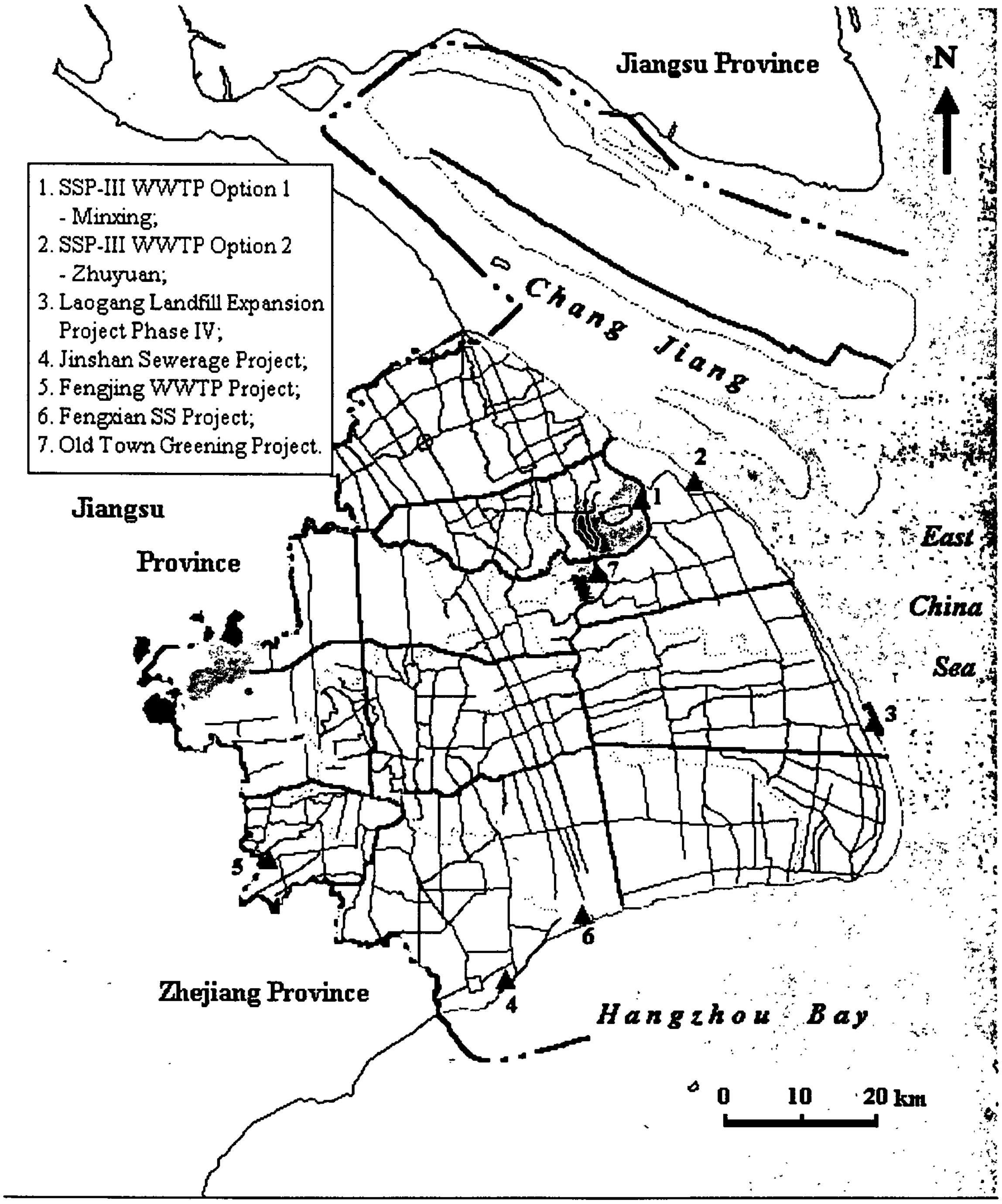


Figure. 1 Location of project components of SHUEP-I

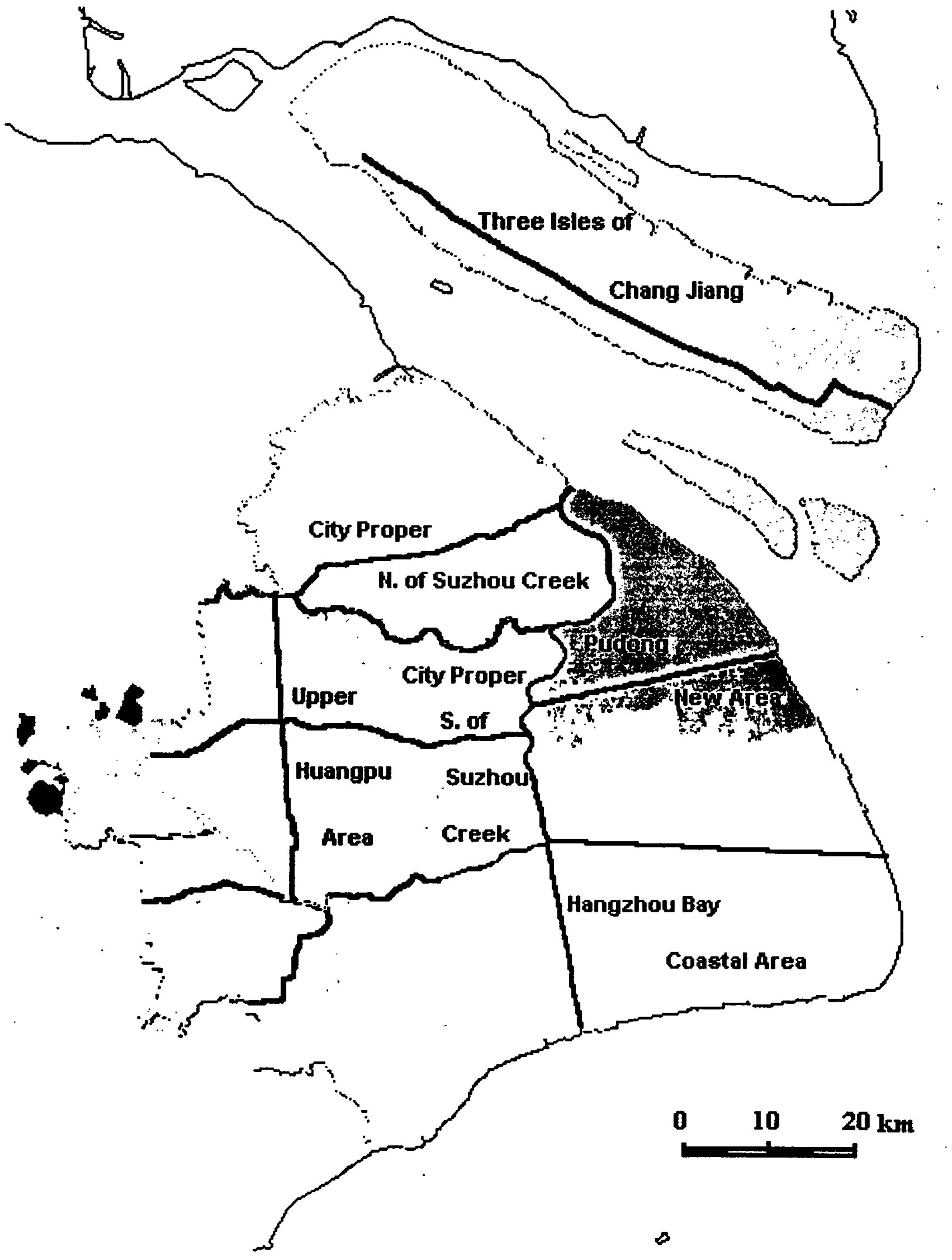


Figure. 2 Wastewater management zoning of Shanghai

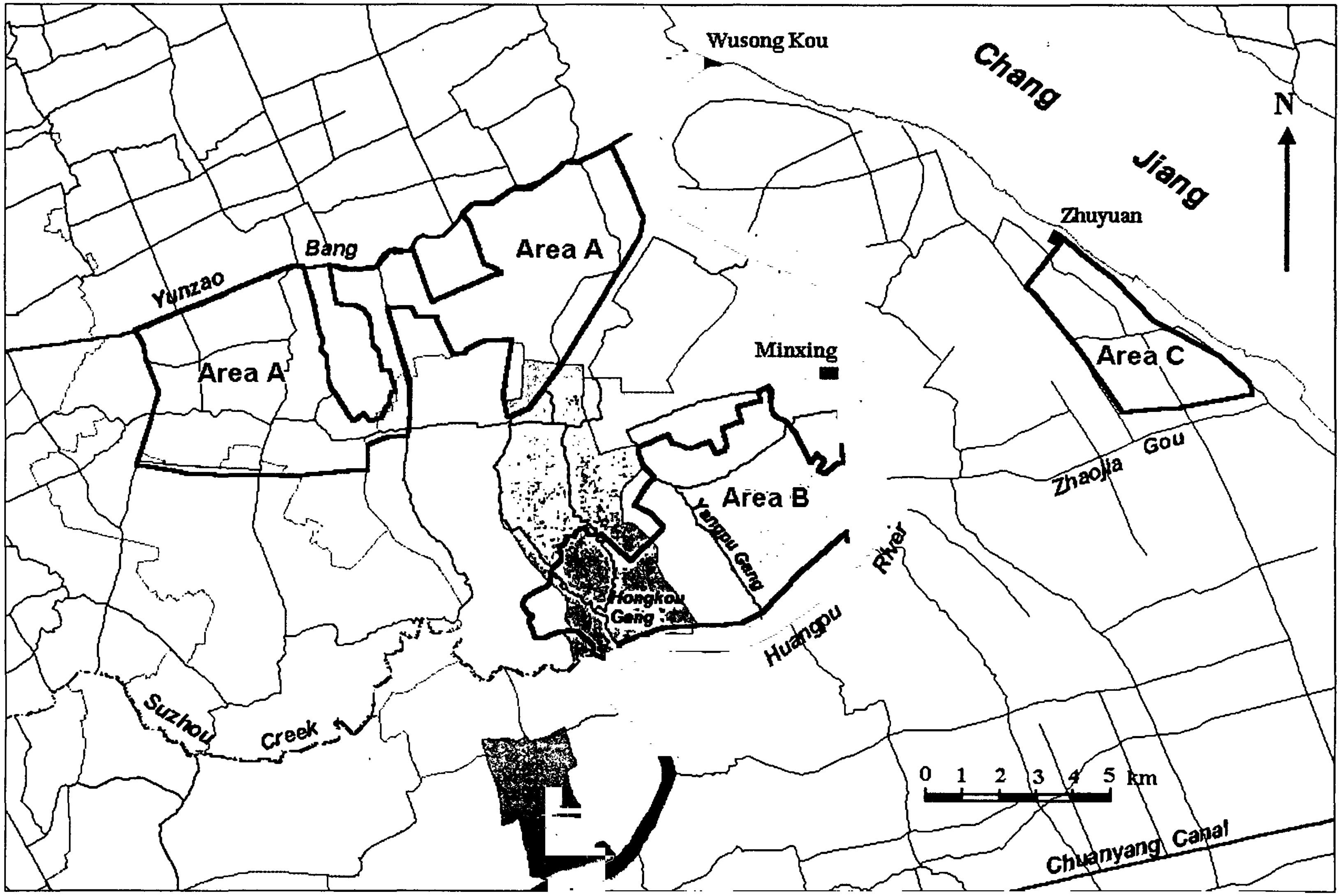


Figure. 3 Service areas of SSP-3

(Fig 03 SSP-III ABC.doc)

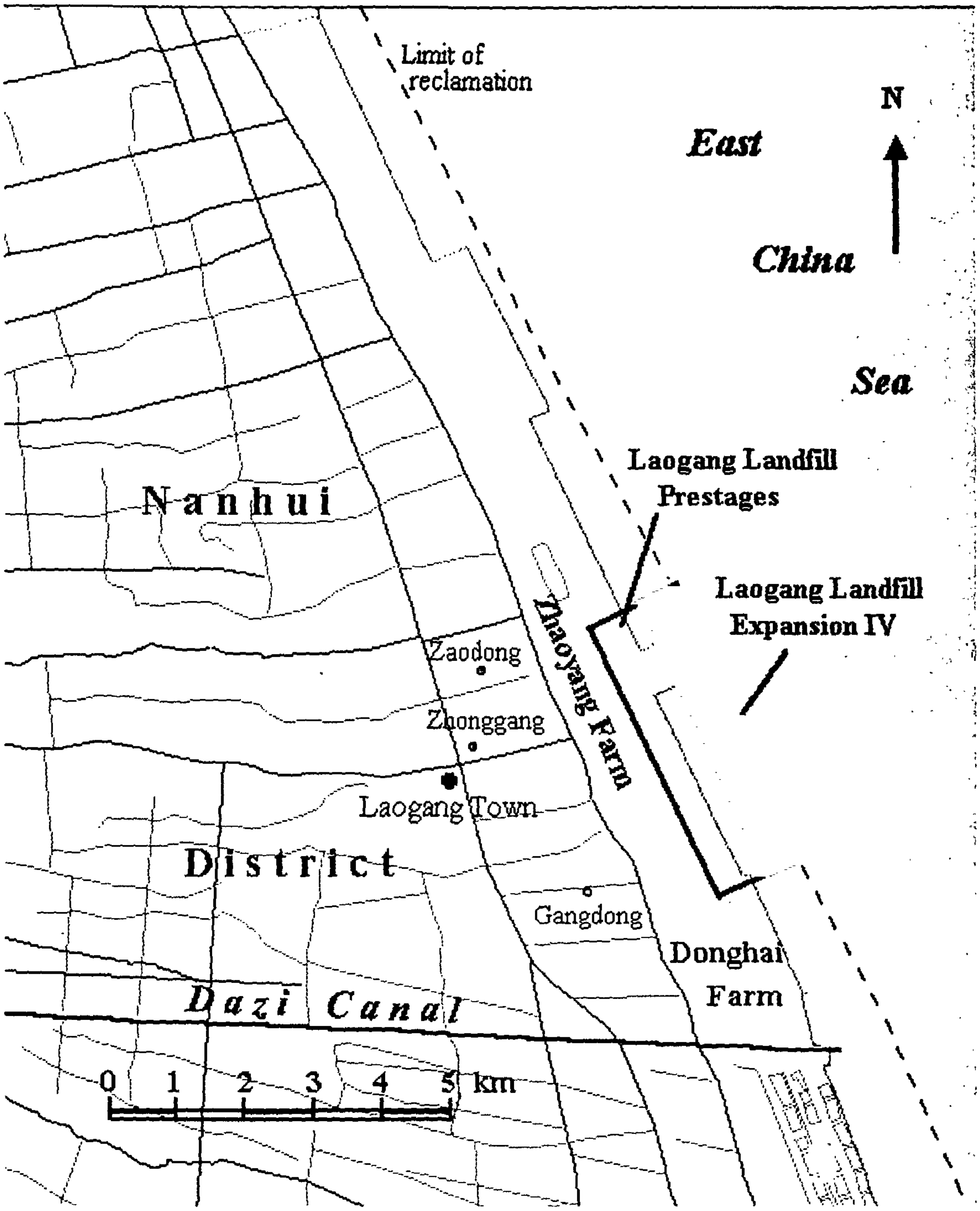


Figure. 4 Location of Laogang Landfill Expansion Phase IV

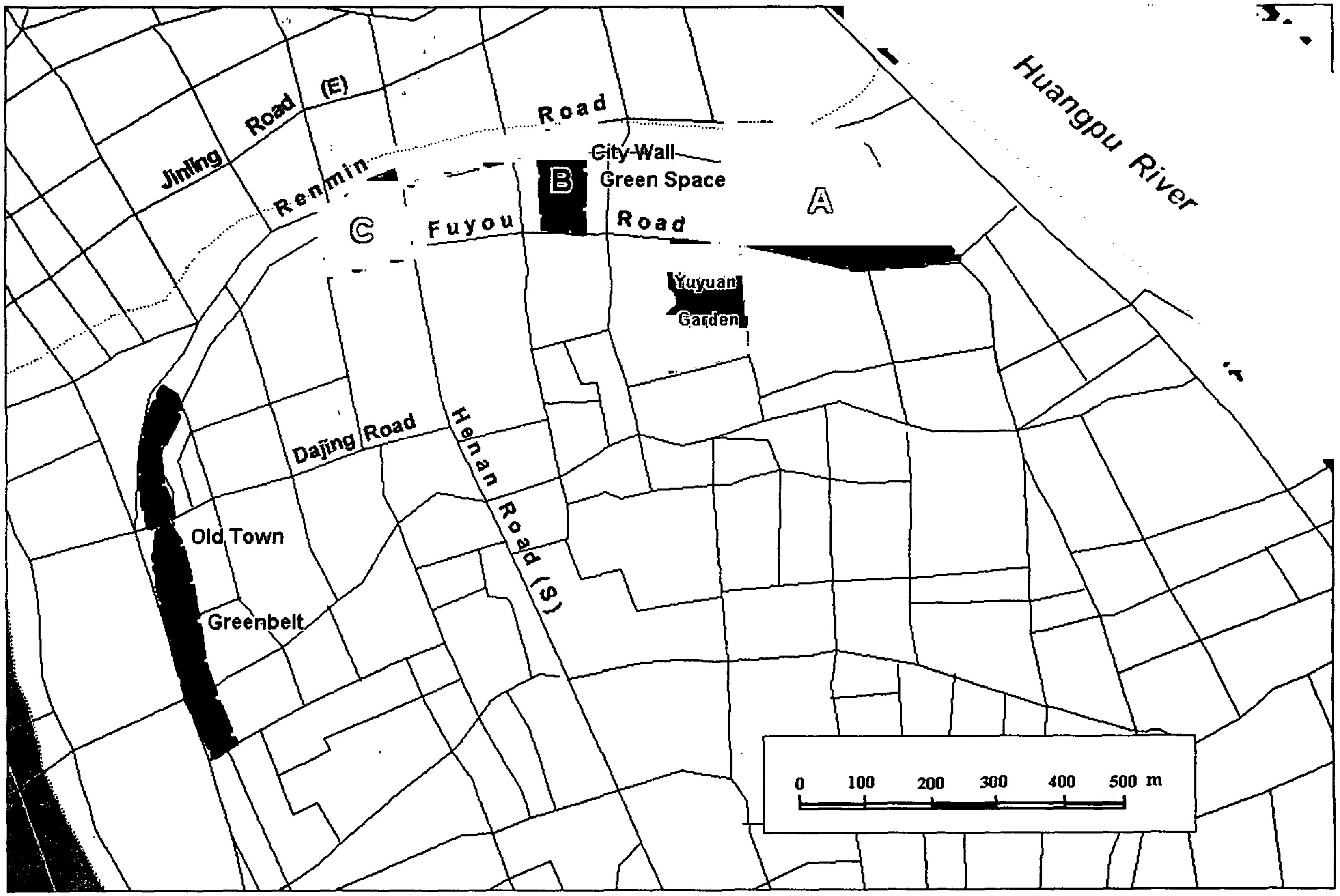


Figure. 5 Layout of Shanghai Old City Greening Project

(Fig 05 Old Town Greening.doc)

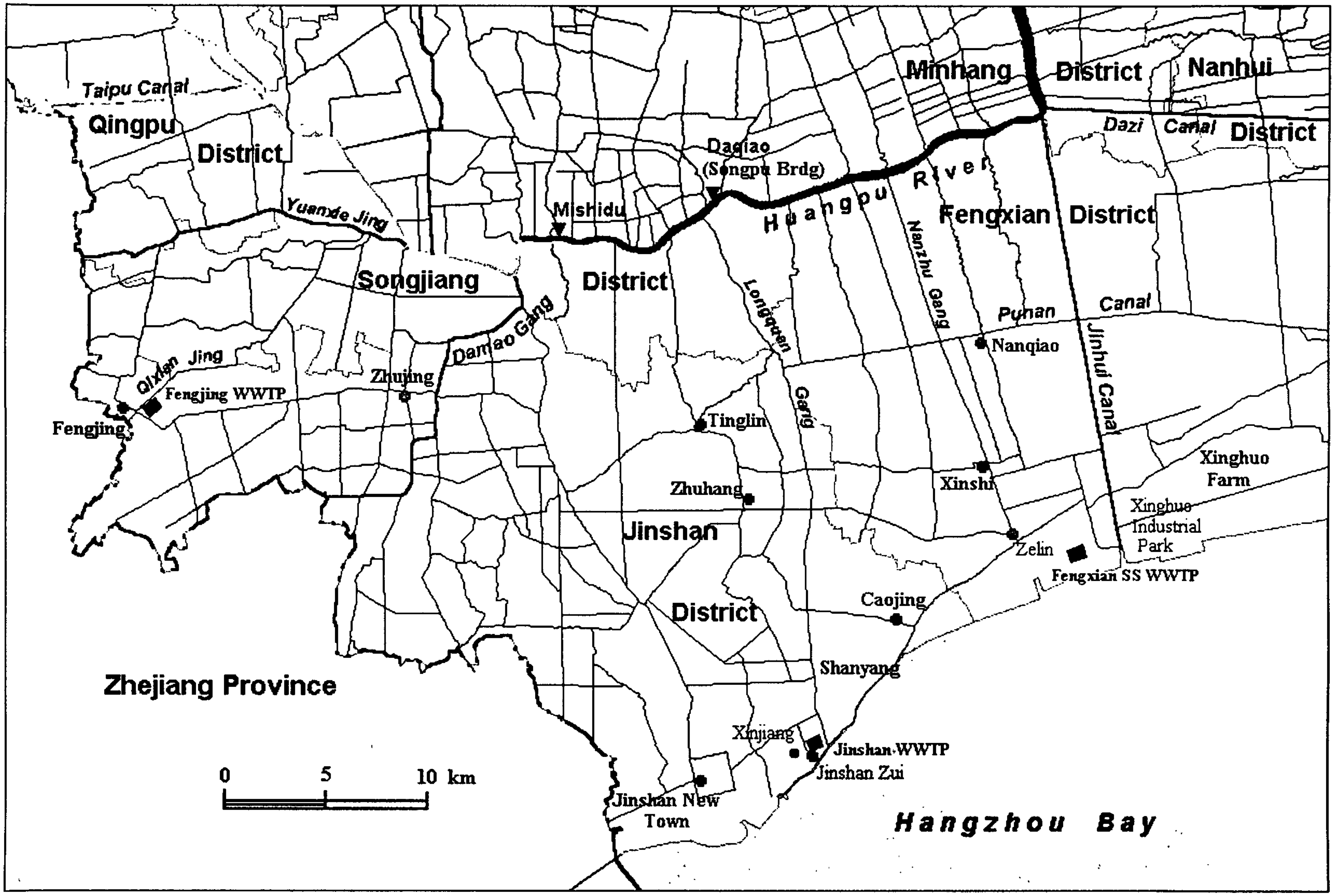
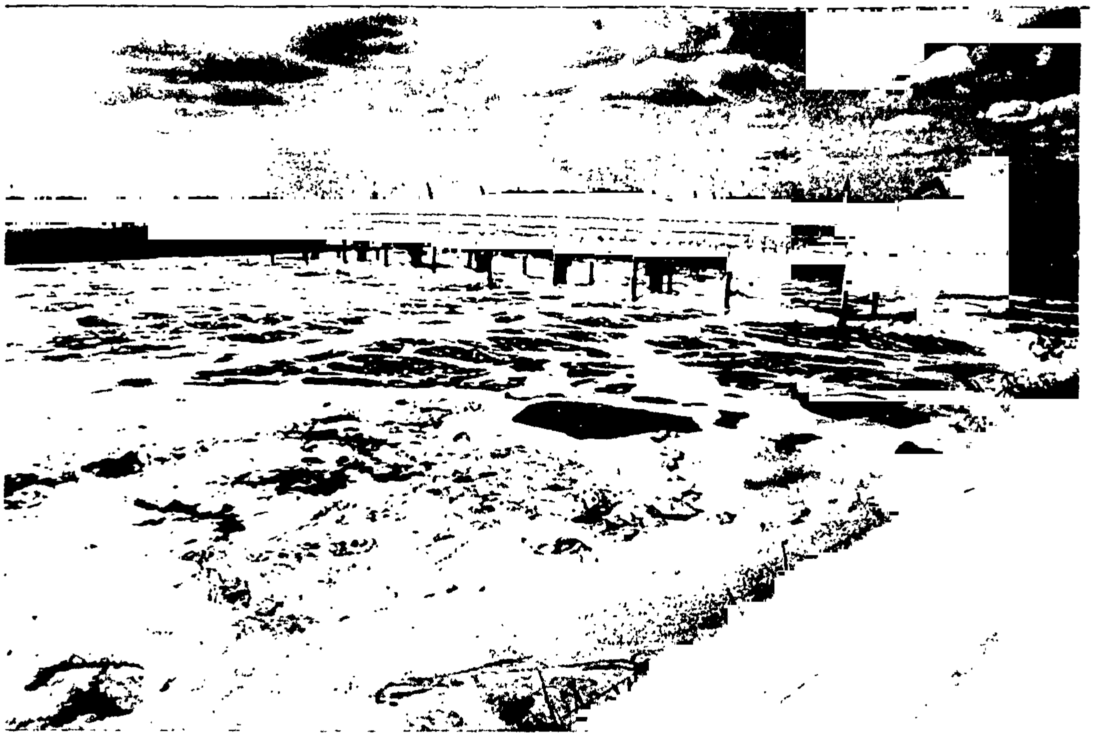


Figure. 6 Location of WWTPs at Upper Huangpu

(Fig 06 Upper HP WWTPs Location.doc)



Existing Laogang leachate treatment plant

Figure 7: Mechanical plant at existing Laogang landfill site

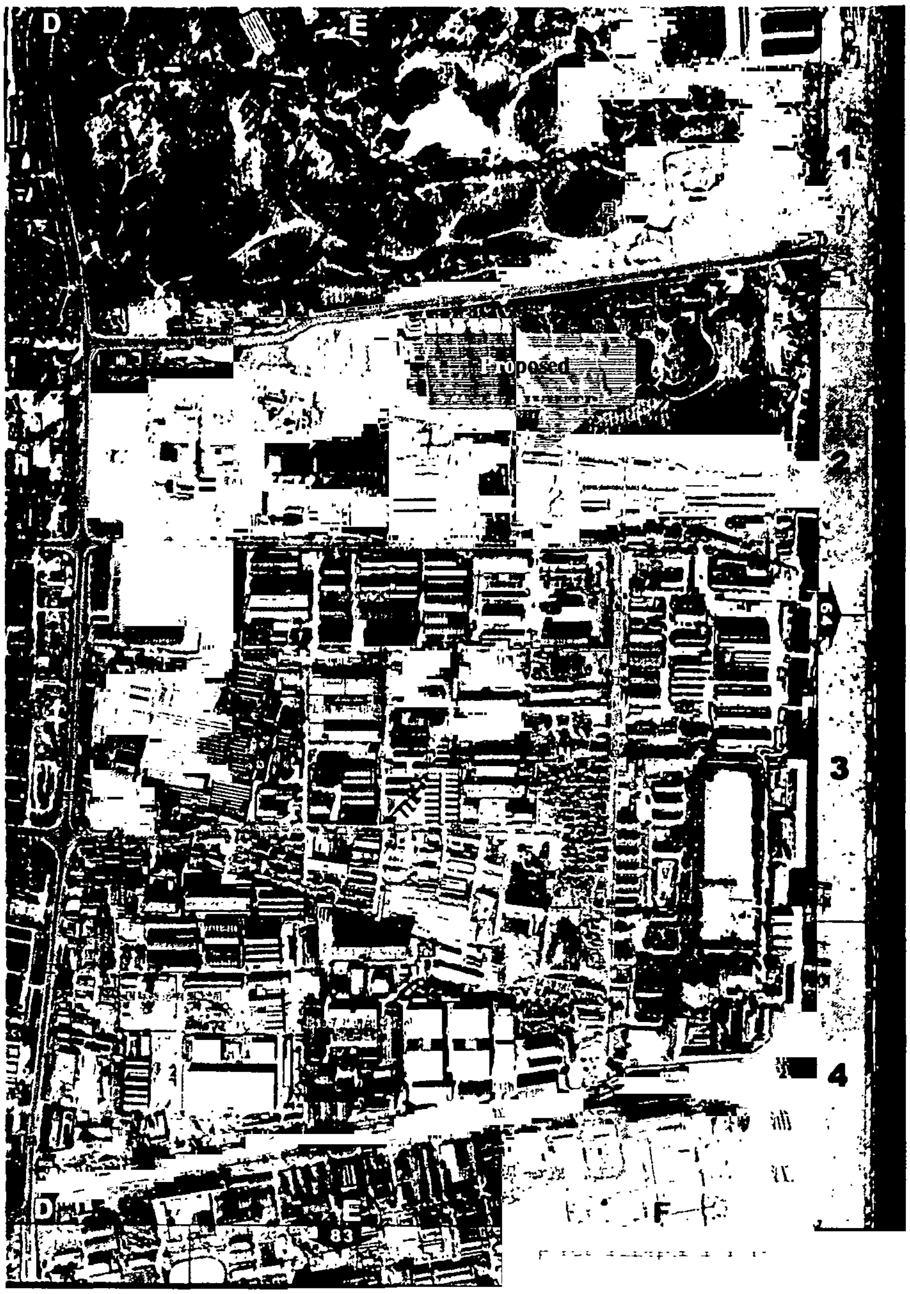


Figure 8: Aerial view of proposed Minxing WWTP site

Figure 9: Aerial view of proposed Zhuyuan WWTP site

Figure 10: Site of proposed Minxing outfall on Huangpu River

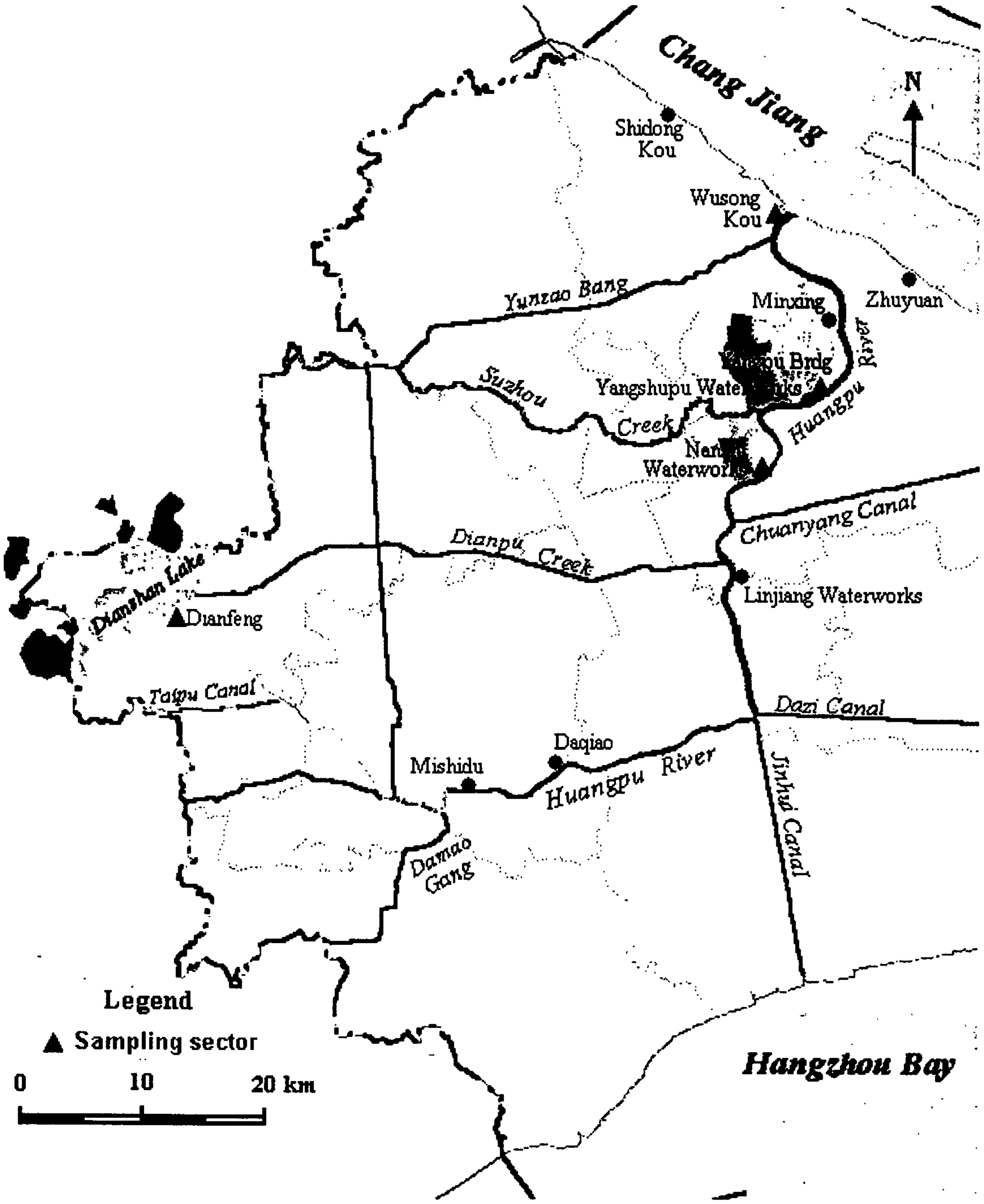


Figure 11: Sampling sections along the Huangpu River

(Fig 11 HP WQ Sampling.doc)

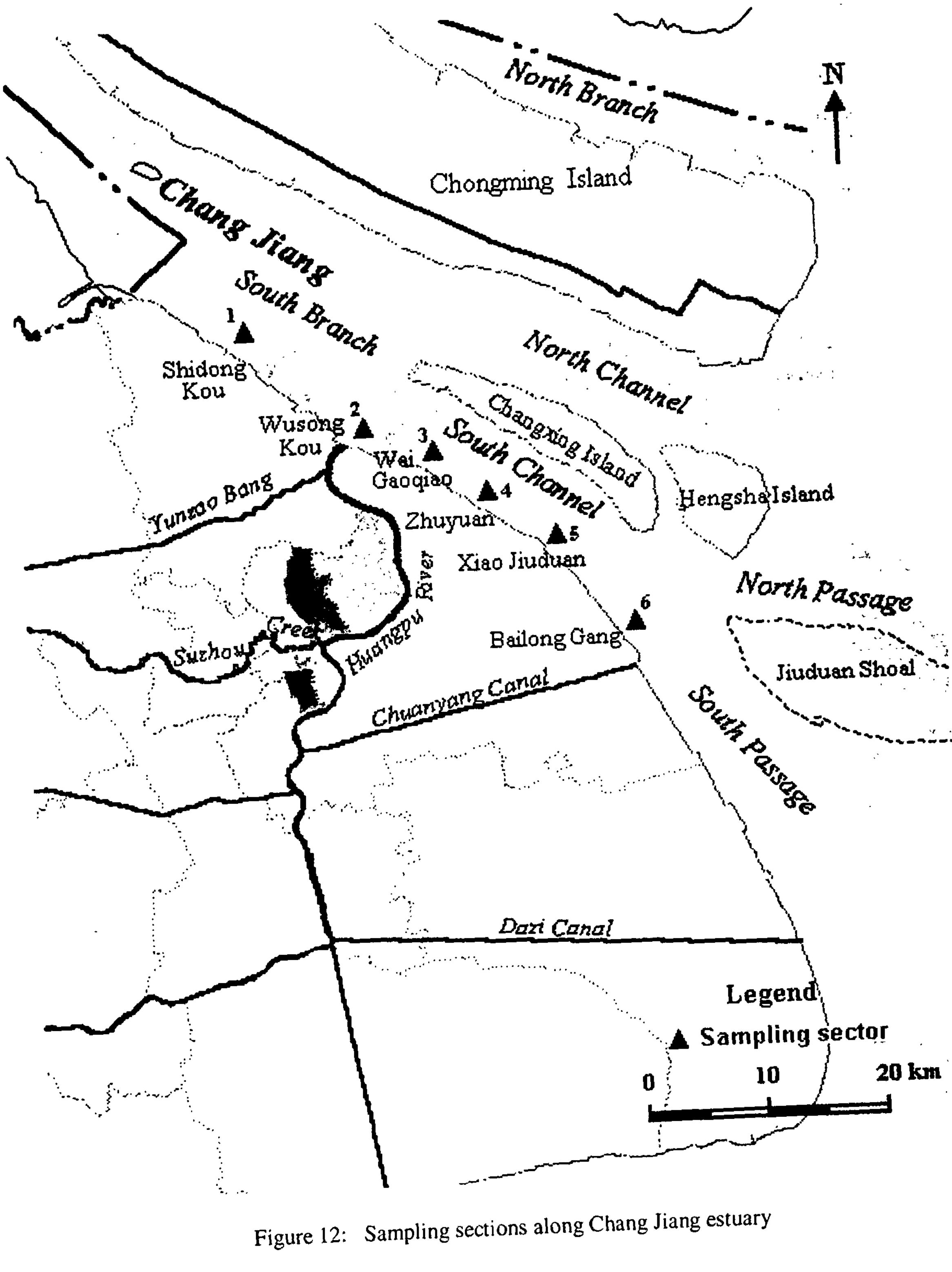


Figure 12: Sampling sections along Chang Jiang estuary

(Fig 12 CJ Sampling.doc)